DRAFT
MONTARA -MOSS BEACH WATER WELL EIR

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A Report Prepared for:

San Mateo County, Department of Environmental Management
Planning and Development Division
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DRAFT
MONTARA-MOSS BEACH
WATER WELL EIR

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Other individuals who have contributed in other ways to the findings presented in this report, are listed in Section 11.2.

1 SUMMARY

The Montara Sanitary District has recently made available fifty-eight new sewer connections within the Urban/Rural Boundary in its service area, which includes the communities of Montara and Moss Beach, California. A total of 159 parcels were entered into a lottery to select which fifty-eight parcels would be awarded a sewer connection. The remaining parcels were placed on a waiting list, and may replace awarded parcels that are unable to connect to the sewer system for any reason. Since the local water company is currently operating under a moratorium and cannot provide new connections, it is expected that these parcels will be served by individual private wells. This EIR describes and assesses the effects of developing 58 dispersed wells serving individual homes on the hydrology, biology, community services, traffic and other elements of the Montara-Moss Beach environment.

The assessment of the amount of growth these connections would create and the concomitant impacts to the environment and to public services are described in Chapter 6, and are summarized in Table 1. The fifty-eight sewer connections could result in a maximum development of fifty-eight parcels, provided water is available. Ninety percent of the 159 parcels on the approved and waiting lists combined are zoned for single-family residential development. The remaining fifteen parcels are zoned either neighborhood business, resource management, or planned agricultural (Appendix A). Effects of developing the 58 parcels on traffic and circulation are expected to be insignificant.

Proposed use of ground water was evaluated for each of six hydrologic sub-units within the Montara-Moss Beach area (Figure 1). In most cases, the annual pumpage expected as a result of the proposed project is generally less than five percent of the ground water stored within developable depths. Perhaps more importantly, anticipated pumping from ground water is generally less than 10 percent of the recharge and outflows thought to occur during years of normal conditions, which is well within the levels meeting the County's policy of maintaining safe yields. An exception is the upper Seal Cove hydrologic sub-unit, where potential pumping is large relative to both storage and recharge/outflow. Expected

TABLE 1

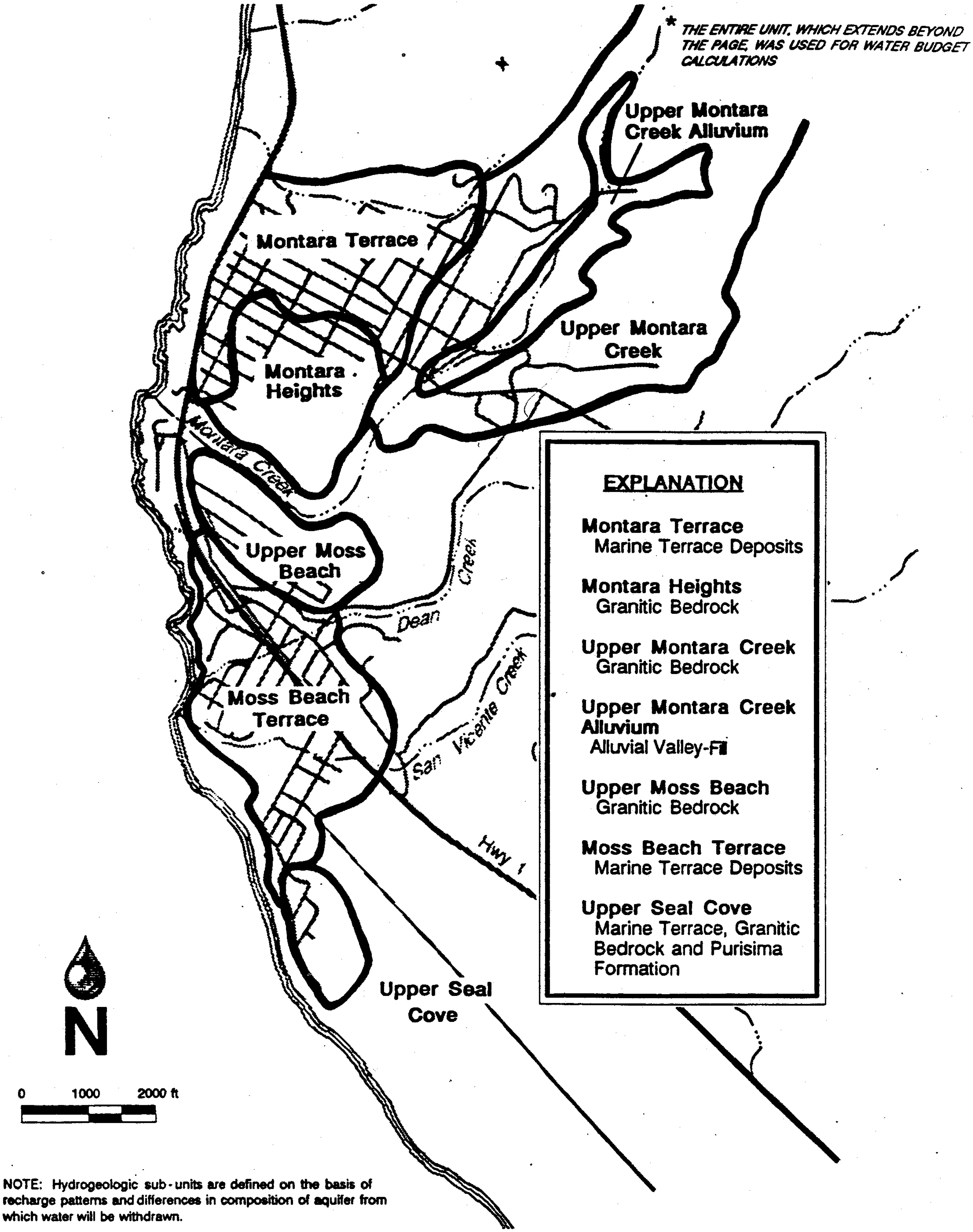
SUMMARY OF PERCEIVED OR SIGNIFICANT EFFECTS AND POTENTIAL MITIGATION MEASURES
MONTARA-MOSS BEACH WATER WELL EIR

Environmental Factor or Impact	Expected Effect	Suggested Mitigation	Feasibility/Duration/Authority
Hydrological			
Withdrawal From Ground Water Storage			
	For all areas, withdrawals are within 40 percent of normal-year outflow, considered a useful estimate of normal safe yield	Monitoring of water levels in all newly-constructed wells	Feasible; recommended in LCP, and within terms of County well ordinance. Monitoring is important in Moss Beach and Montara because (a) lack of existing information and (b) the small, dissected aquifers call for closer observation and management
	For Montara Heights and Upper Moss Beach, possible yield shortfalls during drought.	Well tests should be conducted during late summer months, or higher yields should be required prior to permit issuance	A sound practice for areas where water is obtained primarily from fractures, but currently not part of County policy or ordinance
	For Upper Seal Cove, withdrawals exceed safe yield in many years; complex geology also makes reliability of supply quite low	(1) Late summer well tests, or (2) Higher levels of well performance, or (3) Required hookup to community supply	See above
Depletion of Baseflow in Riparian Areas			
	Very slight; probably less effect than additional community wells in Wagner Valley	General biomonitoring of selected sensitive habitat areas (see Chap. 10)	Feasible and consistent with LCP; can be funded through well-permit fees.

TABLE 1 (continued)

SUMMARY OF PERCEIVED OR SIGNIFICANT EFFECTS AND POTENTIAL MITIGATION MEASURES
MONTARA-MOSS BEACH WATER WELL EIR

Environmental Factor or Impact	Expected Effect	Suggested Mitigation	Feasibility/Duration/Authority
Effluent from Septic Systems			
	Disproportionate effects expected, due to limited renovation potential of soils and the geometry of small, isolated aquifer systems	Septic systems not appropriate for most of area	LCP policy requiring hookup to sewer in urban area; no action by County would limit septic system usage, and protect aquifer systems
Biological			
Loss of Native Grassland Prairie			
	Further Loss of recently-identified resource	Site-specific mitigation including suitable siting of dwelling on the parcel	Parcels identified in Appendix B
Potential Loss of Native Strawberry Genestock			
	Potential irreversible loss of resource identified in LCP as meriting protection	Coordinated, one-time mapping by qualified expert	Areas of likely valuable genestock identified in Appendix B, coordination from County staff required for implementation
Possible Effect on San Francisco Garter Snake,if Present	Effects only if snake is present; if so, potential dessication of habitat	(1) As above (2) Sole confirmed usage by SF garter snake in pond area just east of Upper Seal Cove, where ground water withdrawals are not considered advisable	Section 7 and LCP
Effects on Other Sensitive Habitats	See "Depletion of Base-Flow" above	See "Depletion of Baseflow", above	Feasible and consistent with LCP
Public Services			
Additional Students at Farallone View School	New enrollment will exhaust capacity for additional students at school	Accommodate additional students and accelerate planned expansion	Expected by school district



NOTE: Hydrogeologic sub-units are defined on the basis of recharge patterns and differences in composition of aquifer from which water will be withdrawn.

Figure 1. Location of Hydrogeologic Sub-Units

ground-water withdrawals for each of the sub-units relative to anticipated outflow are shown in Table 2.

Because the proposed project has a limited effect on the hydrologic balance of the area, direct effects on most sensitive habitat areas are expected to be indiscernible. Selective monitoring of certain sensitive habitat areas is, however, recommended. The effects of enabling development on lots served by the wells are diverse. These are described in detail and mitigative measures considered in Chapters 6 and 7, and are catalogued by individual parcel in Appendix B.

The proposed project is considered less environmentally stressful than continuing the current practice of withdrawing increasing volumes of ground water from the Wagner Valley area of upper Montara Creek. By spreading impacts and diversifying sources of ground water, the proposed wells represent a new and positive approach to ground water development. Systematic initial monitoring of water levels in as many of the wells as possible is an important means of obtaining hydrogeologic information needed to better assess the ultimate ground water-potential of the two communities, which may be considerable; a limited longer-term program to develop the record needed to meet Local Coastal Program goals is outlined. Alternatives to the proposed project are intensive management of adjoining alluvial valleys for recharge and storage, and community wells beyond the current urban/rural boundary. Both alternatives represent opportunities to achieve higher-quality water supplies, and to combine water harvesting with practices allowed in watershed lands under other public policies, such as those encouraging open space and agricultural preservation. The proposed project does not preclude implementing these alternatives at a later date.

TABLE 2
EFFECTS OF PROPOSED GROUND WATER PUMPAGE ON STORAGE AND OUTFLOW BY HYDROLOGIC SUB-UNIT

		Montara Terrace	Montara Heights	Upper Montara Creek	Upper Moss Beach	Moss Beach Terrace	Upper Seal Cove	TOTAL (six sub-Units)
Surface Area (acres)		165	110	385	70	195	35	950
Storage:	(acre feet)							
Normal Year		528	330	1500	210	700	35	3300
Dry Year		396	330*	1320	210*	546	9	2750
Critically-Dry Year		132-330	330*	1120	210*	234-468	1-2	1900-2350
Outflow:	(acre feet)							
Normal Year		140	8	123	8	134	13	425
Dry Year*		105	7	97	7	94	5	315
Critically-Dry Year*		35-88	6	70	6	40-80	2	160-250
Effects of Proposed Pumping								
New Units Projected	(units)	9	6	17	4	15	7	58
Anticipated New Gross Use* **	(acre feet)	2.7	1.8	5.1	1.2	4.5	2.1	17-4
New Use As Percent of Normal Storage	(percent)	0.5	0.5	0.3	0.6	0.7	6.0	0.5
New Use As Percent of Normal Outflow	(percent)	1.9	22.5	4.1	15	3.4	16.2	4.1
of Critically Dry Outflow		3.1-7.7	30	7.3	20	5.6-11.2	>100	7-11

TABLE 2 (continued)
EFFECTS OF PROPOSED GROUND WATER PUMPAGE ON STORAGE AND OUTFLOW BY HYDROLOGIC SUB-UNIT

* Storage within the granitic bedrock zones in Montara Heights and Upper Moss Beach is expected to decline during dry years; present information is not sufficient to realistically estimate the extent of this decline.

** Distribution of ground water and outflows within Seal Cove sub-unit is highly variable.

*** Gross use assumed to be 270 gallons per day per unit, or 0.302 acre feet per year.

2 INTRODUCTION

2.1 OVERVIEW OF HYDROLOGIC AREA

Since the initial platting of the Montara and Moss Beach communities, water has been supplied by a private purveyor. The water has been developed from wells and springs, increasingly from the Wagner Valley area of upper Montara Creek, where some of the most continuous and prolific aquifers in the vicinity are found.

The current purveyor, Citizens Utilities Company of California, is enjoined by the California Public Utilities Commission from providing additional connections until supplies and storage are substantially upgraded. Owners of parcels which have recently won rights to sewer connections are seeking alternative supplies of water. The most probable alternative supply for most parcels is an onsite individual well. The information needed to assess the quantity, quality, and reliability of ground water supply is not available, as the community has not needed to know about ground water conditions in the past. The lack of information on the historical levels and fluctuation of ground water have led to significant uncertainty and concerns regarding the adequacy of the ground water resource and the possible environmental effects of developing it.

This report attempts to address these concerns by describing what is known about the occurrence, movement, and quality of ground water in the area, using such information and analyses currently available.

2.2 AUTHORIZATION AND BACKGROUND FOR STUDY

Recognizing these concerns, the San Mateo County Board of Supervisors has requested that the effects of developing the ground water resources by individual wells be assessed. County staff had originally proposed that this evaluation be conducted through a hydrogeologic investigation of the affected area. Following some discussion, the Board ultimately chose to explore these questions through the broader format of the CEQA process. An important aspect of utilizing environmental review procedures was to review consistency with the Local Coastal Program and with other County policies and guidelines.

2.3 CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) COMPLIANCE

An Initial Study was prepared following review of catalogued data, and after discussion with individuals and professionals knowledgeable about the area and its problems (Appendix C). An EIR was determined necessary under CEQA. A Notice of Preparation was developed, and sent to responsible agencies and also to other interested parties through the State Clearinghouse (Appendix D). Representatives of these agencies and other entities were sought out, and their advice and guidance was requested; a list of individuals who assisted with providing information is part of this report (Section 11.2). A draft environmental impact report was issued for public review on March 15, 1989. Response to comments and preparation of the final report occurred during March and April, 1989.

2.4 PROJECT TEAM STRUCTURE AND RESPONSIBILITIES

Kleinfelder, Inc., was selected by the County for conducting the environmental review, due in part to similarity of issues to those which the firm had previously explored in the El Granada area. Hydrogeologic, geologic, and water-quality portions of this report were developed by Kleinfelder staff, and the firm managed and assembled the EIR. Technical coordination was provided by Balance Hydrologics, a specialized firm which developed the hydrologic balances and other water-related portions of the analysis, and managed data collection and report preparation. Assessment of impacts on biota was conducted by Diane Renshaw, whose scope of work also included parcel-by parcel evaluation of potential impacts on plants, wildlife, and sensitive habitat areas. Thomas Reid Associates considered the effects of the proposed water wells and related development on community services, and on growth in the Mid-Coast area. San Mateo County staff assessed effects on traffic and circulation.

Bill Rozar, of the Planning and Development Division, served as project coordinator. Significant assistance was also provided by the staff of the County's Environmental Health Division.

3 PROJECT DESCRIPTION

Fifty-eight new sewer connections have been recently made available by Montara Sanitary District, which includes the communities of Montara and Moss Beach. The connections were allocated by lottery. A total of 159 parcels participated in the lottery; unsuccessful participants were awarded wait-list-status, and may replace awarded parcels unable to connect to the sewer system for any reason. Since the local water company cannot provide new water source connections, the individual owners awarded sewer connections must seek other sources of water supply if they are to develop their property. In virtually all cases, owners are expected to try to develop ground water by constructing individual onsite wells. The proposed project is defined as permitting construction of the individual water supply wells on the parcels awarded sewer connections.

The 58 parcels awarded sewer connections, and the 101 wait-listed parcels, are shown on Plate 1. The awarded parcels are distributed throughout the Montara Sanitary District. One hydrologically significant result of the distribution of parcels is an unintentional but fundamental shift in ground water development strategy from the increasing concentration of community wells in Wagner Valley to a dispersed network of individual supply wells randomly distributed throughout the two communities.

We have often expanded the analysis to also consider, more conceptually and remotely, the effects of developing ground water on some of the wait-listed parcels beyond the 58 awarded sewer connections. This has been done to provide context needed to assess certain impacts cumulatively or at a later stage of local development. Additionally, considerable public discussion of using septic systems or other onsite waste-disposal systems has taken place during recent months. Current County policy is to prohibit onsite waste disposal systems in urban areas. Because a change in this policy could appreciably affect growth rates and ground water quality, the regulatory and environmental constraints affecting septic-system use in the Montara and Moss Beach area were also critically evaluated.

4 CONFORMANCE WITH POLICIES, PLANS AND REGULATIONS

4.1 OVERVIEW

The issuance of well permits under this project would foster new growth and potentially affect natural resources on the San Mateo Mid-Coast. Control of the rate and amount of growth and protection of Mid-Coast resources are required by policies in the San Mateo County Local Coastal Program (LCP) and the San Mateo County General Plan.

The San Mateo County General Plan applies to activities throughout the entire county, while the Local Coastal Program serves as a community area plan with specific policies that apply to the Mid-Coast. While most of the General Plan policies are reflected in LCP policies more specific to the project area, there are General Plan policies related to water supply which apply to this project and which are not specifically discussed in the LCP.

In brief, the LCP encourages infilling, limits annual growth in the Mid-Coast (Montara, Moss Beach, Miramar, El Granada, and Princeton) to 125 permits except when the County Board of Supervisors approves an increase, and requires a balance between water supply and wastewater treatment capacity so that growth can be served without undue harm to the environment. These policies are discussed in Sections 4.2, 4.3, and 4.4, below.

Water supply policies set forth in the San Mateo County General Plan encourage the development of water supplies adequate to support planned land uses, management of water supplies to protect safe yields and water quality, and development of off-stream storage facilities to retain winter runoff and regarge ground water supplies. These policies are discussed in Section 4.4 below.

The concept of developing 58 new wells in the Montara-Moss Beach area is in compliance with the policies set forth in the LCP and the General Plan. While the new development would increase the rate of growth, the growth would still be within limits set in the LCP, and the development would constitute infilling within the Urban/Rural boundary. The drilling of the wells is not expected to endanger safe yields, water quality, or to adversely affect riparian and wetland resources (see Chapters 5 and 6), and would neither preclude nor be adversely affected by the development of off-stream storage facilities. The wells are considered allowable under the General Plan because water is not available from the present water system.

Compliance of individual projects with the policies set forth in the LCP and the General Plan is assured through the Coastal Development Permit required for most development on the Mid-Coast. The San Mateo County planning staff defined an area in the Montara-Moss Beach area in which parcels of 5,000 square feet or greater in size that do not require a variance for development are exempt from the Coastal Development Permit requirement. The exemption is allowed because development of these parcels would already be in compliance with LCP and General Plan policies. Approximately half of the parcels entered into the lottery are exempt from the Coastal Development Permit. Development of these parcels would still require County review through the building permit process. The exemptions are also discussed at the end of section 6.1.2., under Timing of Development.

The compliance of individual parcels which are not exempt would be controlled through the Coastal Development Permit process. Among other issues this process insures the protection of sensitive habitats defined in the LCP, and discussed in sections 5.6 and 6.6. Development occurring on several of the parcels included in this project could directly affect sensitive resources.

The six potential septic systems which may be served by individual wells would not be in compliance with policies relating to the protection of ground water quality, since the effects of septic-system use on ground water quality are potentially adverse (Section 6.4). Septic systems are also indirectly discouraged in the LCP by its definition of infilling as development served by a public wastewater system.

4.2 LOCAL COASTAL PROGRAM POLICIES RELATED TO GROWTH ON THE MID-COAST

Montara, Moss Beach and Miramar constitute a portion of the Mid-Coast Area delineated in the LCP. The Mid-Coast Area also includes El Granada and Princeton. The LCP limits growth throughout all five of these communities to 125 building permits per year. This limit may be raised to up to 200 permits in any given year with approval by the County Board of Supervisors. For instance, the Board approved an increase in the limit from 125 to 150 permits for the year 1987. In 1988 the limit reverted to 125 permits. In approving any change in the number of permits which can be granted in a given year the Board must make a finding that "water, schools and other public works have sufficient capacity to accommodate additional growth." (LCP 1.22.b.).

There are several policies in the LCP which relate to growth in the Mid-Coast area, the text of which is provided below. In summary, the LCP encourages infilling, limits annual growth, and requires a balance between water supply and wastewater treatment capacity so that growth can be adequately served without harm to the environment.

LCP Policy 1.18: Location of New Development

"a. *Direct new development to existing urban areas and rural service centers in order to: (1) discourage urban sprawl, (2) maximize the efficiency of public facilities, services, and utilities, (3) minimize energy consumption, (4) encourage the orderly formation and development of local governmental agencies, (5) protect and enhance the natural environment, and (6) revitalize existing developed areas.*

b. *Concentrate new development in urban areas and rural service centers by requiring the 'infilling' of existing residential subdivisions and commercial areas.*

c. *Allow some future growth to develop at relatively high densities for affordable housing in areas where public facilities and services are or will be adequate and where coastal resources will not be endangered.*

d. *Require the development of urban areas on lands designated as agriculture and sensitive habitats in conformance with Agriculture and Sensitive Habitats Component policies."*

LCP Policy 1.19: Definition of Infill

> *"Define infill as the development of vacant land in urban areas and rural service centers which is: (1) subdivided and zoned for development at densities greater than one dwelling unit per 5 acres, and/or (2) served by sewer and water utilities."*

*L*CP Policy 1.22: Timing of New Development in the Mid-Coast

> *"In order to insure that schools and other public works are not overburdened by rapid residential growth, require that the following limitations on building permits granted in the Mid-Coast for the construction of residences, other than affordable housing, be applied beginning in the first calendar year after LCP certification.*
>
> *a. 125 per year until Phase I sewer and significant new water facilities have both been provided, unless the County Board of Supervisors makes the finding that water or other public works have insufficient capacity, consistent with the protection of sensitive habitats, to accommodate additional growth (see Policy 7.20 [re Pillar Pt Marsh]).*
>
> *b. 125 in the years following the provision of Phase I sewer and significant new water facilities, unless the County Board of Supervisors makes the finding that water, schools and other public works have sufficient capacity to accommodate additional growth. In any year that the Board makes this finding, up to 200 building permits may be granted. The exact number of building permits shall be determined by the Board at the time the finding is made."*

LCP Policy 2.25: Mid-Coast Water Supply Phase I Capacity Limits

> *"Require that Phase I capacity not exceed the water supply which (1) serves the development which can be sewered by the Phase I 2.0 million gallons per day average dry-weather flow (MGD-ADWF) sewer capacity allocated for Mid-Coast areas within the urban boundary and (2) meets the documented needs of floriculturalists within the existing Coastside County Water District Service Area. Use recent data on the amount of water consumed by land use to determine the actual water supply capacity allowed."*

4.3 LOCAL COASTAL PROGRAM POLICIES RELATED TO WATER RESOURCES MANAGEMENT

The LCP sets forth a variety of policies that may affect water resource management in the project area. The extent to which these policies apply may vary, depending in part upon the project alternative under consideration and the specific resource affected. Those policies appearing most relevant to ground-water development and watershed management in Montara and Moss Beach are cited below, including the LCP component from which they were abstracted. The general relationship between the LCP policies cited and the project are discussed together with the policy.

4.3.1 LOCATING AND PLANNING NEW DEVELOPMENT COMPONENT

LCP Policy 1.25: Rural Watershed Monitoring Program

> *"Commencing within one year of certification of the LCP, the County shall, providing funding can be secured, undertake a water monitoring program to determine, on a watershed-by-watershed basis, water availability for new development consistent with LCP resource protection policies. The monitoring program should be completed within five years of LCP certification and subsequent development shall be consistent with the findings of the approved final report."*

This program, still awaiting full implementation, would address perhaps the most critical informational needs for future management of the Montara and Moss Beach ground-water resources. Lack of such data meant that much of the evaluation of the proposed project required use of complex water budgets, which may be less usable for most readers of the EIR than actual monitoring data. If the proposed project were to yield valid hydrogeologic data, useful and used for assessing the resource, it would be in conformance with this policy.

4.3.2 PUBLIC WORKS COMPONENT

LCP Policy 2.32: Ground Water Proposal

> *"Require, if new or increased well production is proposed to increase supply, that:*

a. *Water quality be adequate, using blending if required, to meet the water standards of Policy 2.30.*

b. *Wells are installed under inspection according to the requirements of the State and County Department of Public Health.*

c. *The amount pumped be limited to a safe yield factor which will not impact water dependent sensitive habitats, riparian habitats and marshes.*

d. *Base the safe yield and pumping restriction on studies conducted by a person agreed upon by the County and the applicant which shall: (1) prior to the granting of the permit, examine the geologic and hydrologic conditions of the site to determine a preliminary safe yield which will not adversely affect a water dependent sensitive habitat; and (2) during the first year, monitor the impact of the well on ground water and surface water levels and quality and plant species and animals of water dependent sensitive habitats to determine if the preliminary safe yield adequately protects the sensitive habitats and what measures should be taken if and known adverse effects occur."*

This policy refers specifically to the Mid-Coast area. Under sub-points "c" and "d", a process is described whereby water wells should be developed in a manner that limits ground water withdrawals to a "safe yield". The process includes identification of safe yield and monitoring to determine whether the safe yield rate of withdrawal adequately protects sensitive habitats. In general, this policy becomes increasingly relevant when anticipated annual pumping approaches ground water recharge rates.

The proposed project will be in conformance with these guidelines if wells are installed in accord with the County's water Well Ordinance and if a monitoring program addressing the itemized concerns is implemented (see Chapter 10) and the findings assessed.

4.3.3 AGRICULTURE COMPONENT

LCP Policy 5.21: Water Supply

> *"Establish strategies for increasing agricultural water supplies without endangering sensitive habitats."*

LCP Policy 5.26: Small Water Impoundments

> "a. *Encourage farmers, acting individually or as a group, to develop: (1) their own water supplies by utilizing small offstream reservoirs which draw from winter stream flows or (2) dams on intermittent streams.*
>
> b. *Assist farmers to obtain subsidies for water development and assigning priority for funding to the water-short watersheds which were evaluated in the Agricultural Water Supplies Background Report."*

LCP Policy 5.28: Monitoring of Wells

> *"Request funding from the State to monitor selected wells throughout the Coastal Zone to provide data on long-term well yield and water quality for the purpose of utilizing such information in development review."*

All relate to agricultural activities. Although the project does not directly affect agriculture, the potential development or management of water resources associated with the project could be affected by agricultural water policies. Policy 5.21 establishes that agricultural water supplies should not endanger sensitive habitats, while policy 5.28 suggests a mechanism by which the potential effects of agricultural water development may be assessed. Policy 5.26 suggests a potential means of expanding agricultural water supplies which, in the context of existing joint use of watersheds for domestic and agricultural uses, could expand the firm yield of a given watershed.

4.3.4 SENSITIVE HABITATS COMPONENT

LCP Policy 7.10: Performance Standards in Riparian Corridors

> *"Require development permitted in corridors to: (1) minimize removal of vegetation, (2) minimize land exposure during construction and use temporary vegetation or mulching to protect critical areas, (3) minimize erosion, sedimentation, and runoff by appropriately grading and replanting modified areas, (4) use only adapted native or non-invasive exotic plant species when replanting, (5) provide sufficient passage for native and anadromous fish as specified by the State Department of Fish and Game, (6) minimize adverse effects of waste water discharges and entrainment, (7) prevent depletion of ground water supplies and substantial interference with surface and subsurface waterflows, (8) encourage waste water reclamation, (9) maintain natural vegetation buffer areas that project riparian habitats, and (10) minimize alteration of natural streams."*

In summary, the preceding LCP policies provide that potential negative impacts of water resource development should be avoided, that quantification of available water resource should be pursued, and that needs for various purposes, including sensitive habitat, agriculture, and domestic use, are in balance with available resources.

Additionally the Local Coastal Program is intended to strongly encourage programs to better understand and assess the ground-water resources of the Coastal Zone. These studies are to be directly applicable to regulatory programs which promote safe-yield ground-water management and protect water quality. With exceptions as noted in Tables 1 and 2, the proposed project is consistent with these policies, especially if the County is able to obtain key geologic and water-level data from the new wells (see Section 10.1).

4.4 SAN MATEO COUNTY GENERAL PLAN POLICIES AFFECTING WATER RESOURCES

The County General Plan Water Supply Policies are more recent that those in the LCP, although developed for broader application County-wide. The General Plan identifies water resources issues that may be addressed through the land use planning process. These parallel LCP policies affecting development and management of water resources. Some additional guidance is provided by the General Plan Policies presented below; a brief discussion of the potential ramifications of some specific policies with respect to the project follows.

4.4.1 GOALS AND OBJECTIVES

LCP Policy 10.1: Coordinate Planning

> *"Coordinate water supply planning with land use and wastewater management planning to assure that the supply and quality of water is commensurate with the level of development planned for an area."*

LCP Policy 10.2: Safeguarding Water Supplies

> *"Seek to safeguard the productive capacity of ground water aquifers and storage reservoirs."*

LCP Policy 10.3: Water Conservation

> *"Promote the conservation and efficient use of water supplies."*

LCP Policy 10.4: Development of Water Supplies

> *"Promote the development of water supplies to serve: (1) agricultural uses, as the highest priority; (2) domestic uses; and (3) recreational uses."*

As with the policies of the LCP, the General Plan policies are intended to promote only the water-supply development needed to enable the envisioned rates of growth in each community. Wells are recognized as a viable source of water in urban areas when connections to water systems are unavailable or impractical, and where basic measures to protect public health can be taken. Conservation is encouraged at all levels, from watershed management with stream storage to in-home measures. The proposed project generally conforms with these policies. No explicit commitment to water conservation is incorporated in the project description; measures for water conservation are recommended in Chapter 7 (Mitigation).

4.4.2 GENERAL POLICIES

LCP Policy 10.8: Water Systems for Coastal Areas

> *"Support efforts to provide adequate water systems for the Mid-Coast, rural service centers, and other unincorporated urban areas."*

LCP Policy 10.9 Potential Water Sources

"a. *Support the creation of water supplies which are commensurate with the level of development permitted in adopted land use plans."*

"e. *Encourage the development of offstream reservoirs for the retention of water generated from winter runoff."*

LCP Policy 10.10: Water Supplies in Urban Areas

"Consider water systems as the preferred method of water supply in urban areas. Discourage use of wells to serve urban uses. However, allow wells to serve urban uses when:

(1) No water is available from a water system to serve the area,

(2) There is no threat to public health, safety or welfare presented by the cumulative effects of well drilling in the area, and

(3) The following is demonstrated:

a. Water quality meets County and State standards;

b. The water flow meets County and State standards and is sufficient to meet the needs of the requested use; and

c. The well is a safe distance from potential sources of pollution and other existing wells."

LCP Policy 10.15: Water Supplies in Rural Areas

"Consider the following as appropriate methods of water supply in rural areas: water systems and wells."

LCP Policy 10.16 New Water Systems

"Allow the creation of new water systems in Rural Service Centers and Rural Subdivisions areas only when demonstration is made of at least the following: (1) connections to existing systems are not available; (2) the new water system will use, as a source of supply, wells or springs; and (3) adequate financing for the new water system is available."

LCP Policy, 10.17: Improving Existing Water Systems

"a. *Support, where local residents express an interest, the possible consolidation of water systems under one management and pursue methods of financing this consolidation, such as assessment districts, Federal and State grants, and creation of new districts.*

b. *Support the development of funding sources to make appropriate improvements to the facilities of water systems.*

c. *Allow water systems using surface water supplies to continue this practice when done in accordance with appropriate permits and approvals."*

LCP Policy 10.19: Domestic Water Supply

"Encourage the use of wells or springs rather than surface water for domestic water supplies to serve new development."

LCP Policy 10.20 Well Location and Construction

"a. *Require domestic vertical wells to be located an adequate distance away from the normal watercourse of a stream in order to minimize impacts upon downstream surface water supplies.*

b. *Regulate the construction and location of wells in areas subject to flooding or served by septic tanks in order to minimize adverse impacts."*

General plan policies are directed toward encouraging new water development in rural areas to draw from wells and springs wherever possible. New or expanded systems are to be allowed where connections are not otherwise available or substantial cost savings or reliability of supply can be realized, and in areas where ground water may provide an increasing proportion of supply. While the proposed project is not within a designated rural area, the present water development choices in Montara and Moss Beach share much with supply alternatives in rural service centers (e.g., Thomas Reid Associates, 1987). The proposed project is consistent with these policies, with the possible exception of improved reliability of supply which varies over the study area.

4.4.3 BASIN-WIDE GROUND-WATER RESOURCES POLICIES

LCP Policy 10.18: Aquifer Studies and Management

"a. *Support and cooperate in studies leading to a more thorough understanding of the ground water aquifers, their location, quality, safe yield and migration patterns. Formulate and carry out a management program that would ensure the long-term viability of aquifers for beneficial use.*

b. *Regulate, to the extent not in conflict with State law, the extraction of ground water from aquifers in order to protect the safe yield and prevent overdrafting and saltwater intrusion.*

c. *Discourage activities and operations that would pollute ground water supplies. Encourage the cleanup and restoration of polluted aquifer."*

The policy provides guidance regarding management of aquifers. This general plan policy expands LCP guidance, specifying that aquifers should be studied to identify safe yield, managed to ensure long-term beneficial use, and that ground water withdrawals should be regulated (to the extent not in conflict with State law) to protect safe yield. The proposed project conforms, with exceptions as noted.

4.5 SUMMARY

The County General Plan Water Supply Policies encourage development of water supplies adequate to support planned land uses, without exceeding such needs, water conservation, management of water supplies to protect safe yields and water quality, and development of off-stream storage facilities to retain greater quantities of winter runoff.

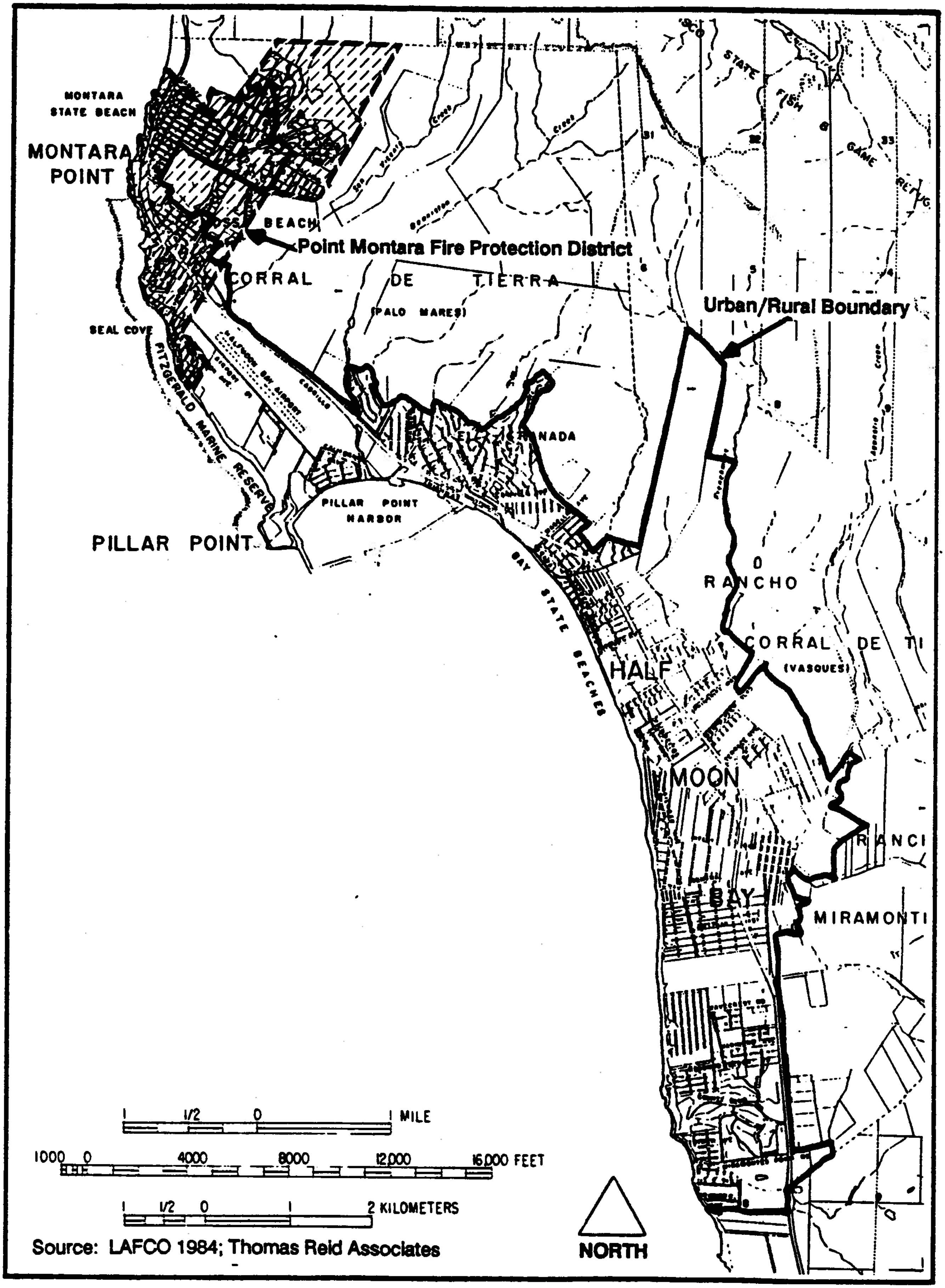
5 ENVIRONMENTAL SETTING

5.1 COMMUNITIES AND GROWTH

The Montara Sanitary District has recently made available fifty-eight new sewer connections within the Urban/Rural Boundary in its service area, which includes the communities of Montara and Moss Beach, California (Figure 2). A total of 159 parcels were entered into a lottery to select which fifty-eight parcels would be awarded a sewer connection. The remaining parcels were placed on a waiting list, and may replace awarded parcels that are unable to connect to the sewer system.

The parcels cannot be developed without provision of water and sewer service, either through connection to local water and sewer utilities or by private well or septic system. Because the water district which serves this area, Citizens Utility Company of California, is currently operating under moratorium on new connections imposed by the California Public Utilities Commission, it is expected that the developers of the fifty-eight parcels with sewer connections will develop private wells for water. In addition, some parcel owners on the waiting list for a sewer connection may decide to apply for a permit to install a septic system rather than wait for a sewer permit.

Focus of this analysis is therefore upon water-supply and sanitary-sewer services, and how these are related to growth.



Source: LAFCO 1984; Thomas Reid Associates

Figure 2. **Location of Project Area and Urban / Rural Boundary**
Study area nearly coincides with boundaries of Point Montara Fire Prevention District.

5.1.1 CURRENT AND ANTICIPATED GROWTH RATES

Existing population in the Montara and Moss Beach areas, including Miramar, is estimated to be 6,000 persons. Virtually all residents live in single-family residences. Based on population patterns observed in the 1980 census, the approximate residential density is 3.0 residents per household. The amount and pattern of residential growth over the past five years in the Mid-Coast area is summarized in the following table of permits issued:

Year	Number of Permits Issued Mid-Coast
1984	30
1985	60
1986	60
1987	133
1988	101
Total	384

Most recently growth in the Mid-Coast Area has been occurring primarily in El Granada, as shown by the following breakdowns for 1987 and 1988:

	1987	1988
Montara	5	10
Moss Beach	9	8
Miramar	10	5
El Granada	109	78
Total	133	101

As described below in Section 5.1.2.6, Montara Sanitary District would be very near currently allotted capacity with these new non-priority connections and with the priority use development that is also proposed (Farallone Vista).

5.1.2 URBAN/RURAL BOUNDARY AND PUBLIC SERVICES

The parcels included in the project are located in the unincorporated areas of Montara and Moss Beach on the urban side of the urban/rural boundary. Services required for development of these parcels include schools, police, water, sewer, and solid waste.

5.1.2.1 SCHOOLS

The parcels entered into the sewer connection lottery are within the Cabrillo Unified School District, which encompasses the area from Devils Slide to San Gregorio (Highway 84), and east to Skyline Boulevard (Figure 3). The district enrollment is 3004. The schools which serve the project area are Farallone View Elementary School, Cunha Intermediate School, and Half Moon Bay High School (Figure 3).

Farallone View Elementary School has an enrollment of 462 students. Classes are limited in K-3rd grades to 30 students per class and in 4th-5th grades to 34 students per class. With the current services provided, capacity for the school is 560 students. The Farallone View Elementary School and the two other elementary schools within the district (El Granada and Hatch Elementary Schools) are using all of the available classrooms and the three schools are considered near enough to capacity to require expansion (B.J. Mackle, pers. comm.). The District is considering expansion plans which may include adding portable classrooms to El Granada and Hatch Elementary Schools to ease crowding and to reduce class size. The addition of two new schools in the next five years is being considered. The school district is planning expansion at the elementary school level due to the fuller lower grades, especially kindergarten, as well as anticipated growth in the area (B.J. Mackle, pers. comm.).

In order to expand, the schools would require amended water and sewer permits. Farallone View is served by Citizens Utility Company of California and Montara Sanitary District. Citizens is currently operating under a moratorium on new connections but expansion at current connections may occur as long as existing water mains and connections are adequate for the increased flow. The Montara Sanitary District has, with

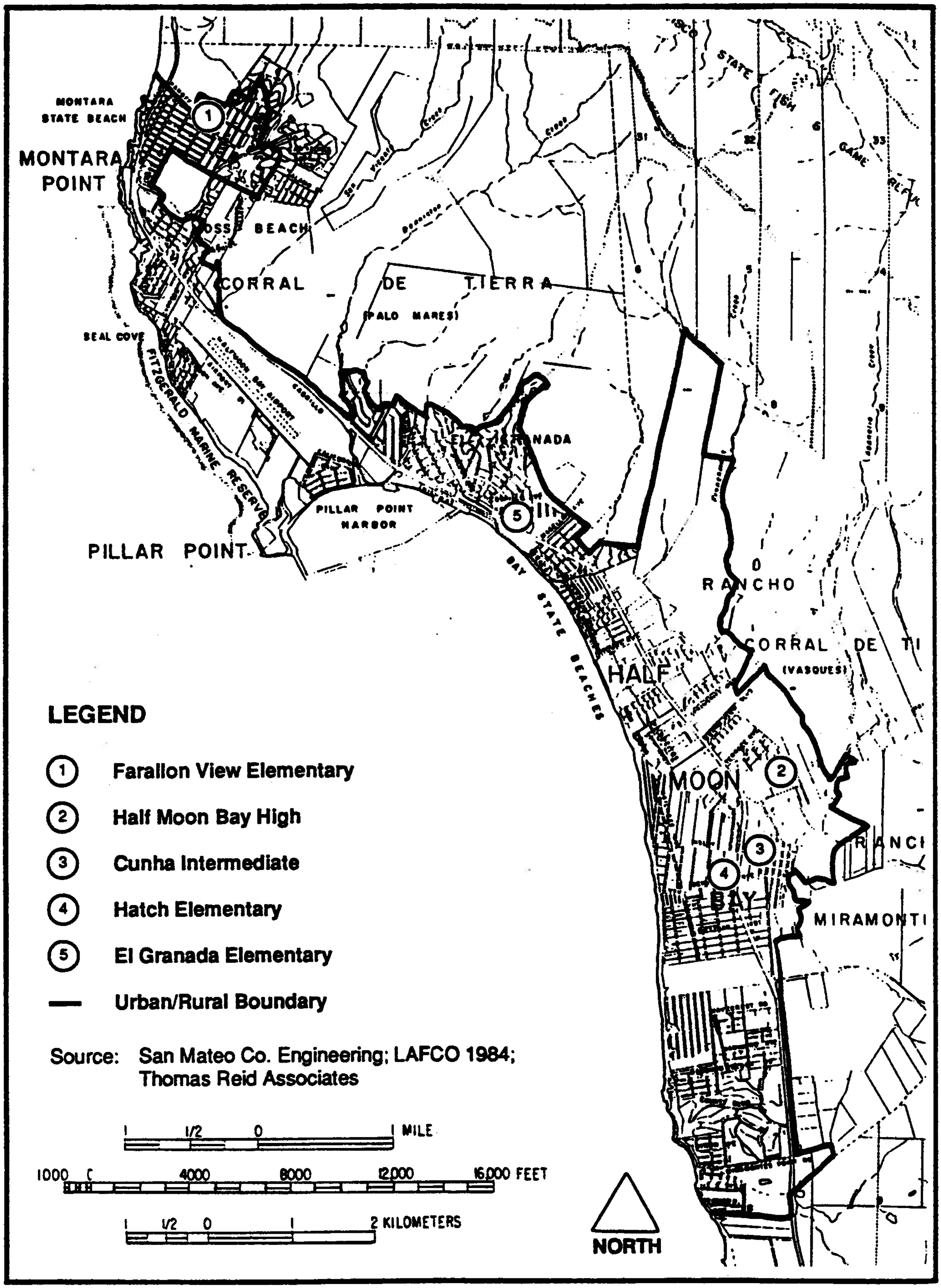


Figure 3. Locations of Schools Serving Montara and Moss Beach.

this project, virtually reached its allotted capacity under Phase I of wastewater treatment facilities at the Sewer Authority Mid-Coastside Treatment Plant (see discussion of wastewater treatment capacity below). Additional capacity will become available when the treatment plant is expanded under Phase II; an EIR on the proposed plant expansion is expected to be finalized in early 1989.

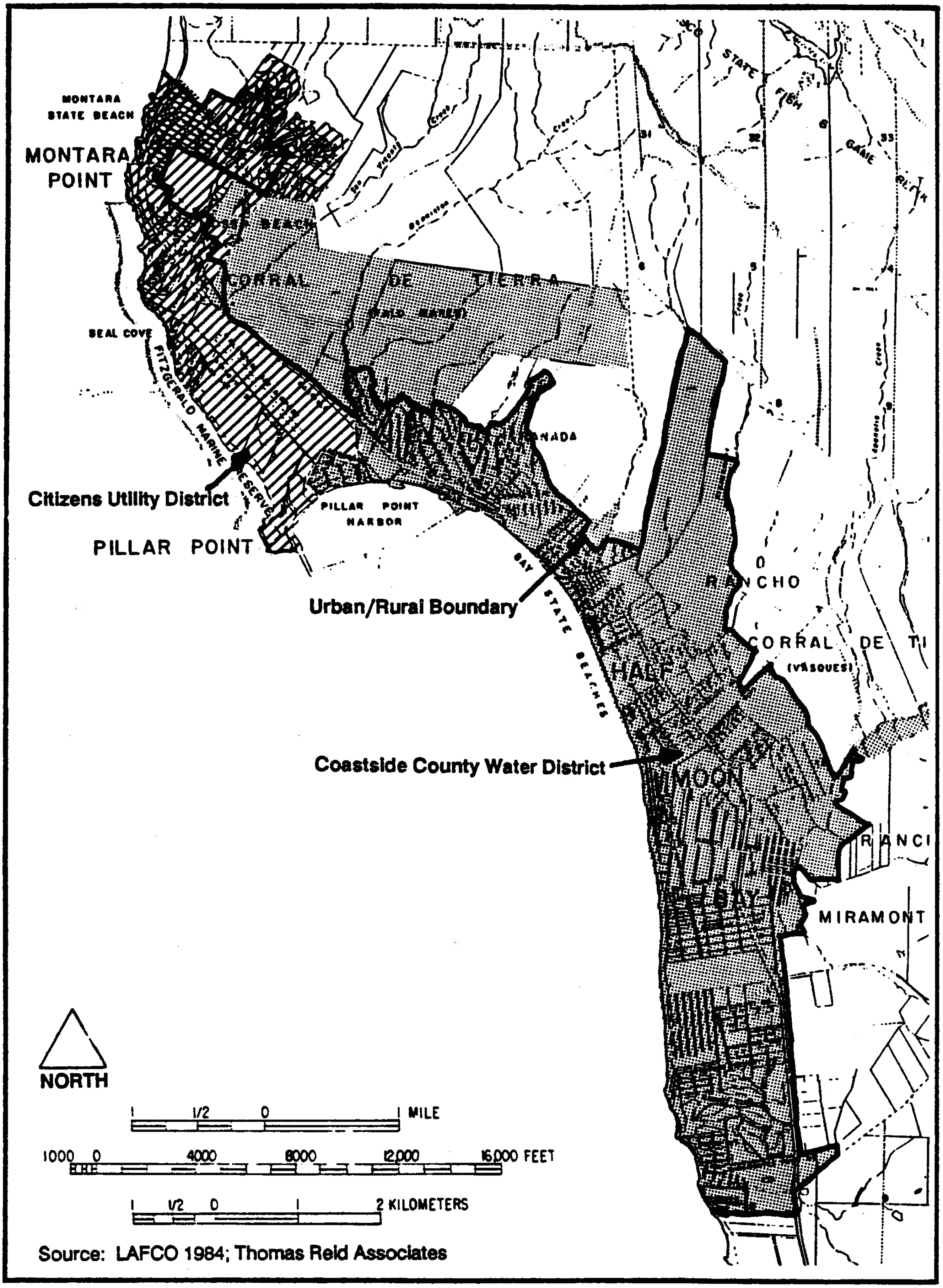
El Granada Elementary School is served by the Granada Sanitary District (GSD), and Hatch Elementary School is served by Half Moon Bay (HMB). Wastewater treatment capacity remains for both GSD and HMB which could possibly be used for expansion of El Granada or Hatch Schools or for serving a new school. Coastside County Water District (CCWD), which serves both of these schools, is operating under a moratorium on new connections. Expansion at existing connections may occur as long as water mains and connections are adequate for the increased flow. A new school would require a new water connection which would be subject to the moratorium.

Cunha Intermediate School has a regular enrollment of 644 and a capacity of 725 students with its current program and services offered. The capacity could be increased through changes in the program and services offered including reduction of special education and use of floating teachers who use other teacher's rooms during the teacher's free period (M.E. Powell, pers. comm.). The school is not considered to be near capacity.

Half Moon Bay High School currently serves 793 students. Its capacity is greater than 1000 students. The high school could accommodate an even greater capacity with changes to services and programs now provided (C. Edwards, pers. comm.).

5.1.2.2 WATER DISTRICT

Water service to the communities of Montara and Moss Beach is provided by Citizens Utility Company of California (Figure 4). A moratorium on new water connections to Citizens has been imposed by the Public Utilities Commission (PUC). Under the PUC



Source: LAFCO 1984; Thomas Reid Associates

Figure 4. Water Districts of the Montara / Moss Beach Area and Adjoining Communities

order, Citizens must increase its water supply capacity to 500 gallons per minute (gpm) before it can serve additional customers. Citizens' water supply capacity is currently 350 gpm. Citizens has applied for new wells in the Pillar Point area which would increase its water capacity and the area is undergoing study to determine the impact of the proposed ground water removal. Existing sources of water are seven wells and a surface diversion at Montara Creek.

5.1.2.3 FIRE PROTECTION

Point Montara Fire Protection District has a service area of about seven and a half square miles and serves the communities of Montara and Moss Beach, a population of about 6,000 (Figure 1). The district has one station in Montara staffed by five full-time fire suppression personnel. An additional fifteen paid volunteers staff the station and assist in fire-fighting. The volunteers receive the same training from the District as the full-time fire-fighters and work weekends and nights with a full-time fire-fighter. Two fire-fighters, whether full-time or paid volunteers, are on each shift. In addition, the calls go directly to the place of residence or work of those fire fighters off-duty at the time. The District is part of the County-wide mutual aid agreement with other districts and the California Department of Forestry.

The water system in the Moss Beach area is subject to inadequate fire flow levels due to inadequate sustained pressure. Citizens Utility Company, which supplies the water for the hydrants, is planning to replace part of the water lines and to install an additional water storage tank which will help to increase the fire flow levels.

The Insurance Services Organization (ISO) rates fire districts according to their ability to fight fires. The ISO rating for Point Montara Fire Protection District is 5 (on a scale of 1 to 10, with 1 the highest rating and 10 the lowest).

5.1.2.4 POLICE PROTECTION

The Montara/Moss Beach area is patrolled by the San Mateo County Sheriff's office.

5.1.2.5 SOLID WASTE

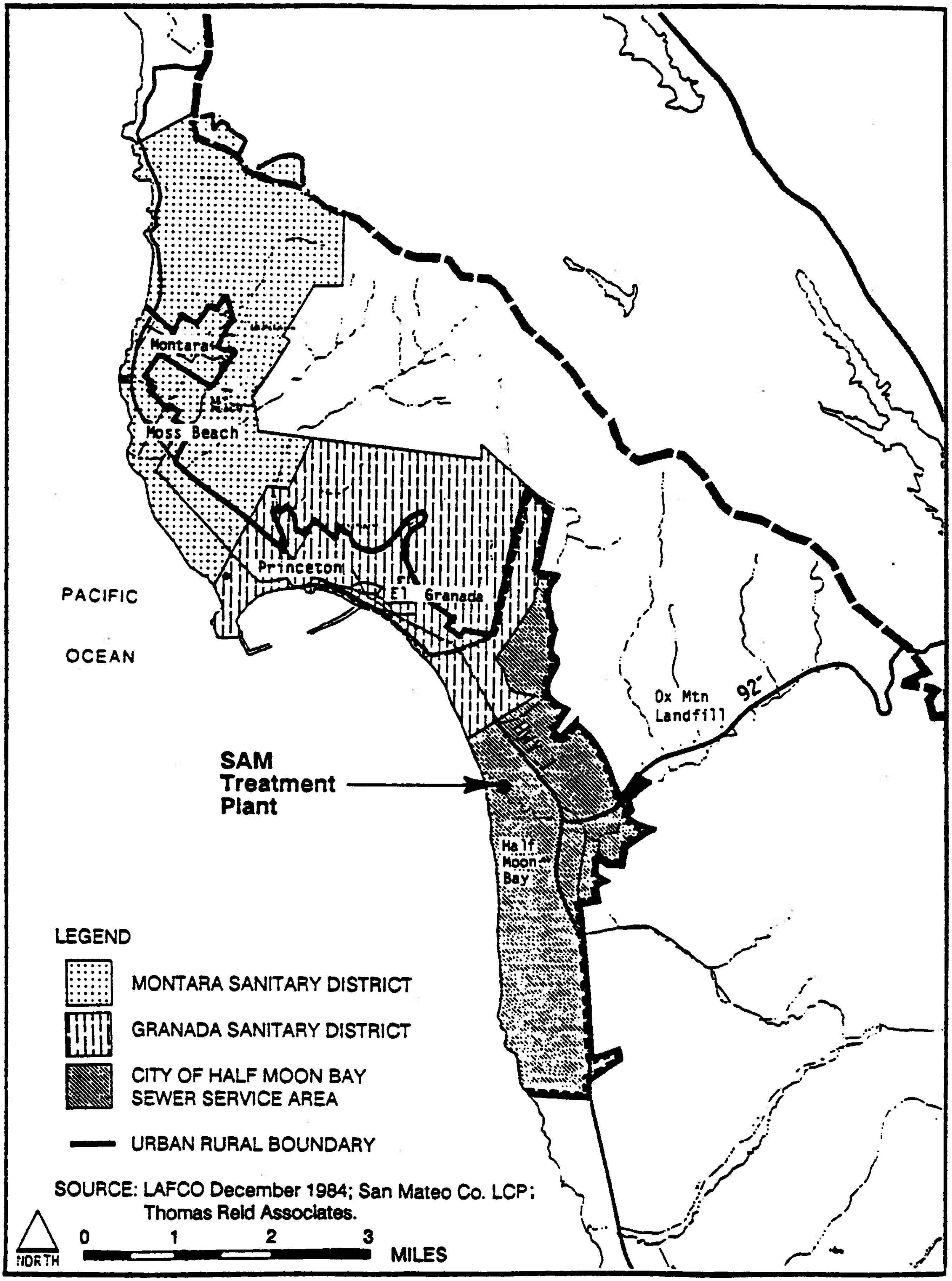
Solid waste disposal in Montara and Moss Beach is provided by Browning Ferris Industries (BFI). The landfill used by BFI is Ox Mountain Landfill located on Highway 92 (Figure 5). Ox Mountain is expected to reach capacity by 1990. An expansion of the landfill into adjacent Apanolio Canyon is currently under review by the Army Corps of Engineers. The expansion would add approximately 80 years of landfill life. If expansion of the Ox Mountain site is not allowed, refuse will have to be deposited at an alternate site.

5.1.2.6 WASTEWATER TREATMENT

The project area is served by the Montara Sanitary District (MSD). The MSD is a member agency of the Sewer Authority Mid-Coastside (SAM), which also includes the Granada Sanitary District and the City of Half Moon Bay. A wastewater treatment plant located in Half Moon Bay and operated by SAM provides treatment of the wastewater generated within the service areas of the three member agencies (Figure 5).

Under the Local Coastal Program (LCP), wastewater treatment capacity on the coastside is phased in order to promote orderly growth. The capacity is allocated to the three member agencies according to need; Half Moon Bay is allocated 50 percent of treatment capacity, GSD is allocated 30 percent and MSD is allocated 20 percent of treatment capacity.

The present wastewater treatment capacity of the SAM plant is 2.0 million gallons per day (MGD). Twenty percent of that capacity, or 400,000 gallons per day, is allocated to MSD. The treatment plant now receives approximately 1.5 MGD. Because it is nearing capacity and because capacity must be reserved for priority land uses under the LCP, an expansion of the plant to 4.0 MGD capacity has been proposed in order to accommodate future growth within the limits of the LCP. This proposal is currently under environmental review.



SOURCE: LAFCO December 1984; San Mateo Co. LCP; Thomas Reid Associates.

Figure 5. **Sanitary Districts and Solid Waste Disposal Areas for Montara, Moss Beach and other Mid - Coast Communities**

With the offering of these additional fifty-eight sewer connections, the Montara Sanitary District has virtually depleted its allotted capacity for non-priority land uses. Also, most of the priority capacity is committed to another project. These conclusions are based on the following calculations:

1. SAM capacity allocations are based on average daily dry weather flow (ADWF), calculated as the average of the three driest months of the year. The ADWF for MSD for the past five years were recorded as follows (data provided by SAM):

   1984: 0.316 MGD
   1985: 0.328 MGD
   1986: 0.350 MGD
   1987: 0.348 MGD
   1988: 0.345 MGD

   Because 1987 and 1988 were drought years and may have affected the rate of water consumption (and hence wastewater generation), and in order to be conservative, the highest wastewater use figure, 0.350 MGD, is used in the calculation of remaining capacity. This means that 0.05 MGD or 50,000 gallons per day of capacity remains in the MSD allotment of 0.4 MGD.

2. Under LCP Table 2.7, as revised, the MSD must reserve 36,368 gallons per day of wastewater treatment capacity for priority land uses. This means that of the 50,000 gpd remaining in the allotment, 13,632 gpd remain for non-priority uses such as single family residences. Ninety percent of the parcels enlisted in the sewer connection lottery are zoned single family residential.

3. A wastewater generation rate of 221 gpd per dwelling unit is the factor used in the LCP. At this rate the fifty-eight new connections would generate 12,818 gpd, which is just within the remaining capacity allotted to MSD for non-priority uses; only 814 gpd capacity would remain.

4. The proposed Farallone Vista housing development, a priority land use because it provides low and moderate income housing, is within the MSD service area. Using the wastewater generation factor of 221 gpd, the 148 units of this development would generate 32,708 gpd of wastewater, and would nearly deplete the MSD allocation for priority land uses (36,368 gpd). The remaining capacity for priority uses would be 3,660 gpd.

5.2 CLIMATE AND PHYSIOGRAPHY

The Montara-Moss Beach area has a maritime Mediterranean climate, with distinct wet and dry seasons. Approximately 90 percent of the incident precipitation is recorded during the months of November through April. Virtually all of the precipitation is as rain with fog secondary.

The weather station at Half Moon Bay has operated since 1931. Mean annual precipitation is reported to be about 25.5 inches. Minimum yearly rainfall for the period of record was about 14.5 inches, observed during the two consecutive drought years of 1976 and 1977. Monthly temperature means range from 50°F (January) to 59°F (September). The narrow range of yearly rainfall totals and seasonal temperature are attributable to the proximity of the Pacific Ocean.

Fog is an integral component of the local climate, most notably during the months of June through September. The Point Montara weather station in some years reports the longest duration of fog among coastal California locations. Fog moderates the heat and drought of the summer season, supporting the important and distinctive agricultural economy of the San Mateo Coastside. While fog does not contribute meaningfully to ground-water recharge or surface runoff, seasonal moisture demands of many plants are met in part from the fog, particularly along the ocean bluffs or along ridgetops below elevations of 1000 to 1400 feet. Fog also reduces evapotranspiration, and is of considerable hydrologic importance in local riparian and wetland areas.

The marine terraces and coastal valleys of the Montara-Moss Beach area extend between the ocean and the crest of Montara Mountain, two miles to the east and approximately 2500 feet higher. The coastal terraces are dissected by streams originating on the steep slopes of the mountain. Watersheds of the streams are small, with San Vicente Creek (about 4 square miles) being the largest. The steep canyons and ravines of the upper watersheds change abruptly, generally at elevations of about 300 feet, to broad, flat-bottomed and steep-walled valleys. The lower valleys are graded to the present level of the sea, and are filled with sediments to depths of up to more than 100 feet above canyons cut into the local bedrock during glacial ages, when the Pacific Ocean stood, at times, several hundred feet lower. While not all the coastal valleys are filled to such depths, the sediments beneath the flat valley floors store some of the more significant ground water resources of the area.

Montara and Moss Beach occupy a physiographic setting transitional between the coastal plain of the San Mateo County midcoast and the bluffs of Montara Mountain and Devils Slide. The prominent coastal terraces of Half Moon Bay and El Granada extend into Moss Beach and Montara, underlain at shallow depth by crystalline bedrock. The veneer of marine deposits forming the terraces are underlain at shallow depth by the bedrock, through which all of the coastal valleys have been cut. The aquifers of Montara and Moss Beach are small, discrete units, separated by the coastal canyons, or other topographic breaks, and are dependent in most cases upon local rainfall as their source of recharge. The limited extent and interconnectedness of the local ground water-bearing horizons are perhaps the most marked of several significant differences affecting ground water development in the two communities, compared with their neighbors to the south.

5.3 GEOLOGY AND GEOMORPHOLOGY

5.3.1 GEOLOGY

The primary geologic units within the Montara-Moss Beach area consist of granitic and sedimentary bedrock overlain by younger marine terrace deposits, slope-wash colluvium, and alluvial valley-fill deposits. A surficial geologic map of the area is presented on Figure 6. The map is adapted from Pampeyan (1981) based on discussions with Mr. Kenneth Lajoie of the U.S. Geologic Survey, Mr. Al Neufeld of San Mateo County, and a limited field reconnaissance. Locations of cross sections developed from this map and other data are shown in Figure 7.

The bedrock units consist of the Montara Quartz Diorite of Cretaceous age (~70 million years) and the Purisima Formation of Pliocene age (~5 million years). The Montara

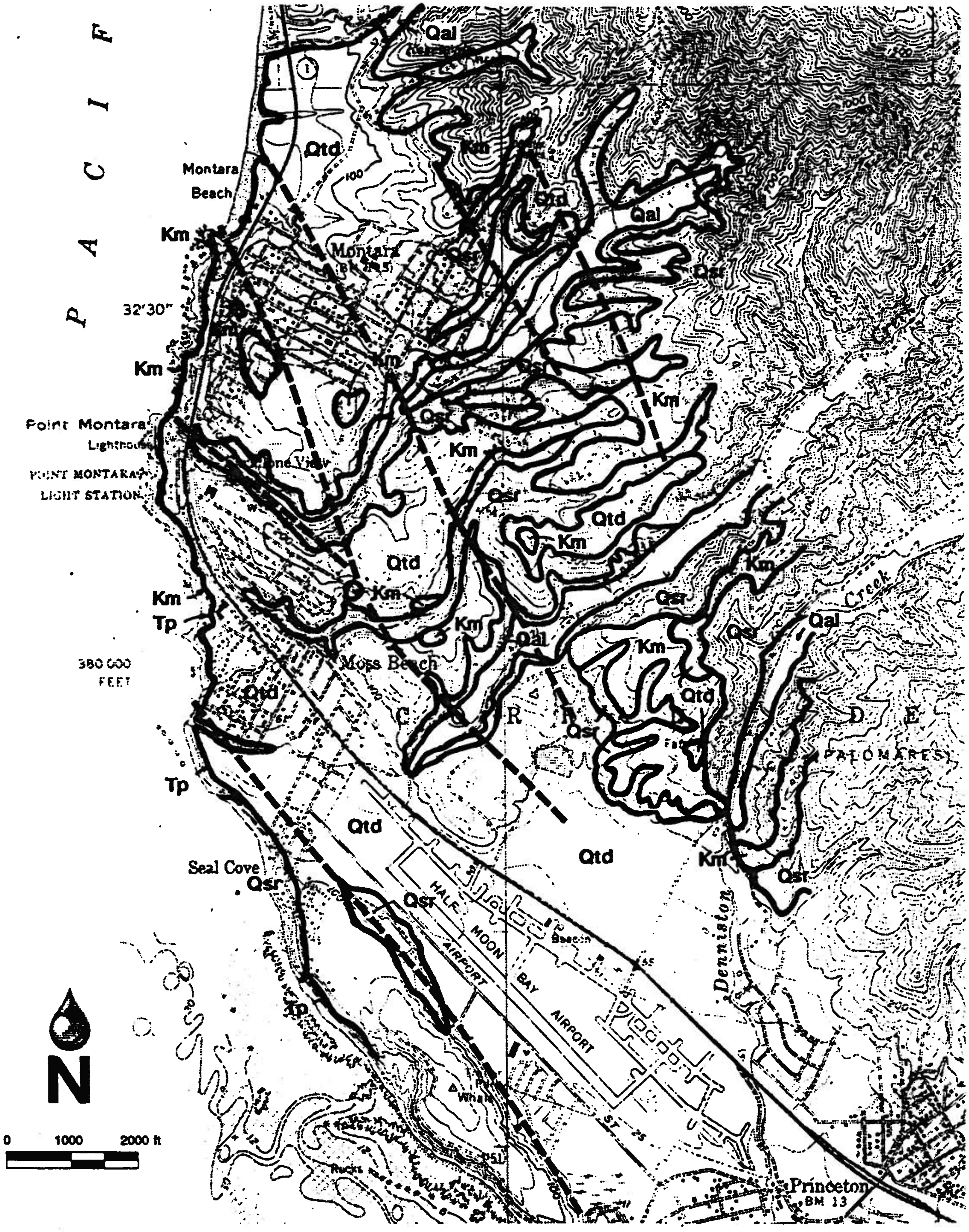


Figure 6. Geologic Map of Montara and Moss Beach Vicinity
See following page for legend.

Figure 6. Geologic Map of Montara and Moss Beach Vicinity

HOLOCENE	Qsr	**SLOPEWASH, RAVINE FILL, COLLUVIUM AND LANDSLIDES** - unconsolidated to moderately consolidated deposits of sand, silt, clay and detritus accumulated by the downslope movement of weathered rock debris and soil
	Qal	**ALLUVIUM** - unconsolidated deposits of gravel, sand, silt and clay
PLEISTOCENE	Qtd	**TERRACE DEPOSITS** - moderately consolidated marine deposits of sand, silt, gravel and clay
PLIOCENE	Tp	**PURISIMA FORMATION** - fractured, well-indurated, soft to hard mudstone, siltstone and sandstone
CRETACEOUS	Km	**MONTARA QUARTZ DIORITE** - pervasively fractured, medium to coarsely crystalline granitic rock; largely composed of quartz diorite but may grade locally to granite and granodiorite
	〜	Geologic Contact
	- - -	Fault - dashed where uncertain

Note: Surface Geology After Pampeyan, 1981

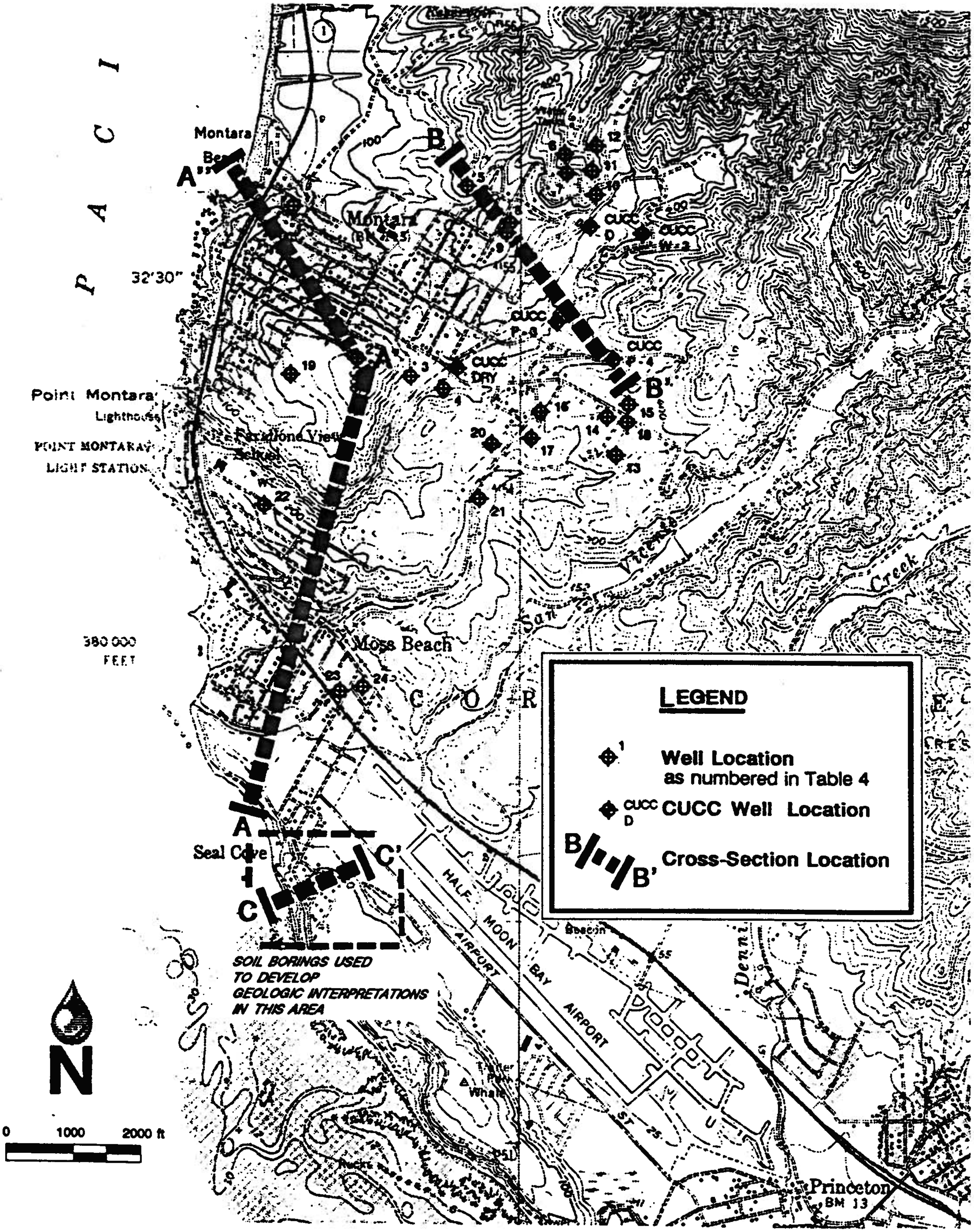


Figure 7. Locations of Wells and Cross-Sections

Quartz Diorite, which underlies most of the area, is composed of fractured, medium to coarsely-crystalline granitic rock, primarily of quartz diorite to granodiorite composition. The upper portions of the unit may be locally weathered, forming a porous, granitic sand-like material commonly referred to as decomposed granite. West of the Half Moon Bay airport, bedrock primarily consists of sandstone, siltstone, and mudstone of the Purisima Formation. In general, these rocks are well indurated and highly fractured.

The bedrock units are partially overlain by marine terrace deposits of Pleistocene age (~.04 - 0.25 million years). The terrace deposits consist of moderately consolidated layers of sand, silt, gravel and clay. These deposits form a relatively thin surface covering in the elevated areas adjacent to Montara Creek and reach a maximum thickness of 50 to 70 feet in the low-lying areas of Montara, Moss Beach and Seal Cove.

The terrace deposits and the bedrock units are locally overlain by deposits of slopewash, ravine fill and colluvium of Holocene age (<.01 million years). These deposits consist of unconsolidated to moderately consolidated sand, silt, clay and detritus accumulated by the slow downslope movement of weathered rock debris and soil. For the purpose of this study, landslides have also been included in this map unit on Figure 6.

Modern stream valleys within the study area generally contain deposits of young alluvium. The alluvium consists of unconsolidated deposits of gravel, sand, silt and clay on the order of a few tens of feet thick. Two notable exceptions are the upper portion of Montara Creek (Wagner Valley) where alluvial deposits may be 50 to 60 feet thick, and in northwestern Montara along the unnamed stream north of Kanoff Avenue, where available well logs indicate alluvial and marine terrace deposits may reach a thickness of at least 135 feet (Figures 8 and 9).

The marine terrace and alluvial deposits beneath the southern portion of Seal Cove can vary between 15 and 65 feet in thickness. As shown on Figure 10, this variable thickness is associated with erosion and deposition on a complex platform composed of granitic bedrock block in fault contact with the Purisima Formation along the Seal Cove fault zone.

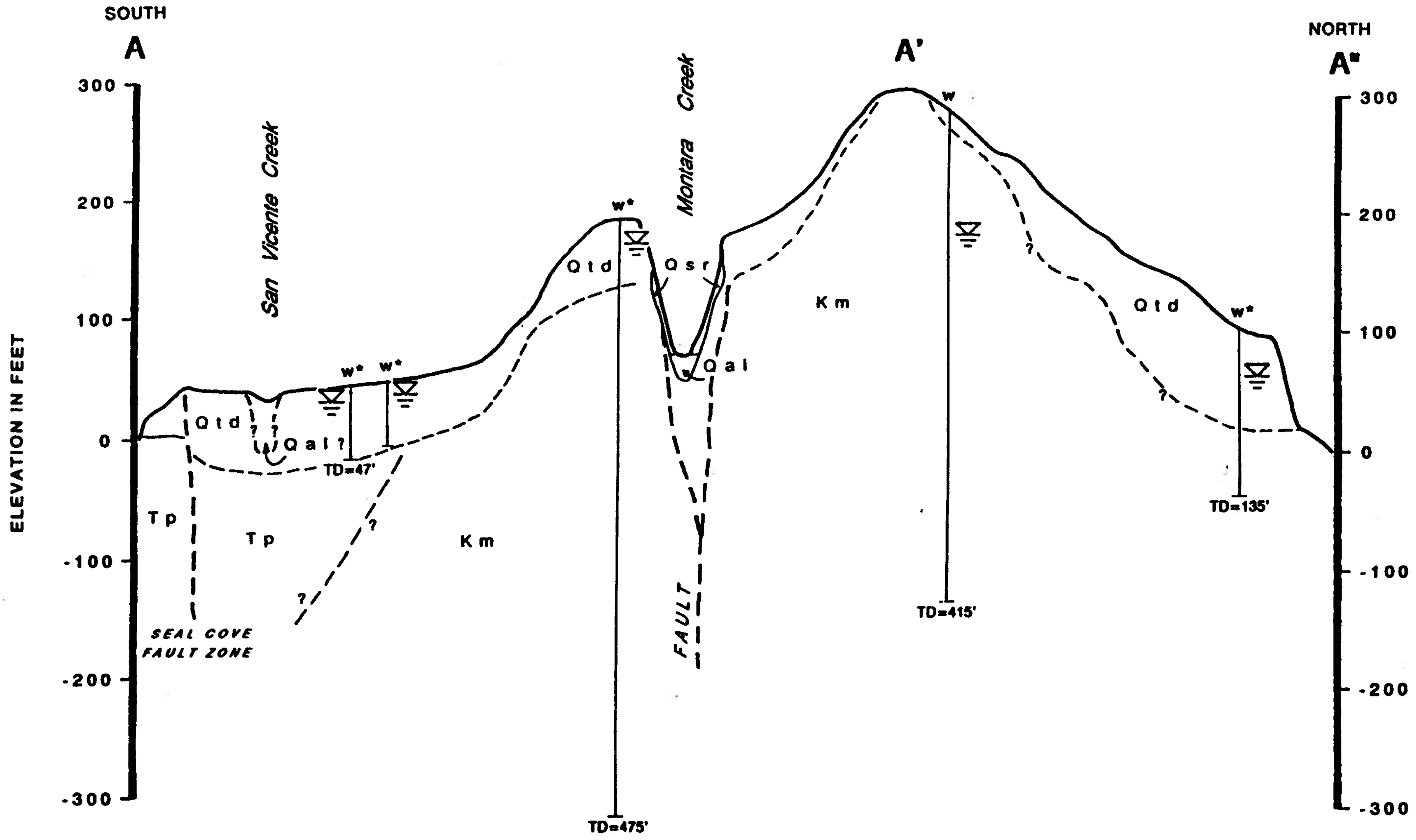
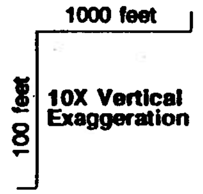


Figure 8. Hydrogeologic Section A - A' - A"; Moss Beach to Montara

Qsr	Slope and Ravine Deposits
Qal	Alluvium
Qtd	Marine Terrace Deposits
Tp	Purisima Formation
Km	Montara Quartz Diorite
▽	Static Water Level Recorded on Driller's Log

w = well; b = boring; * = projected onto section

See Figure 5 (Geologic Map) for detailed description of units.



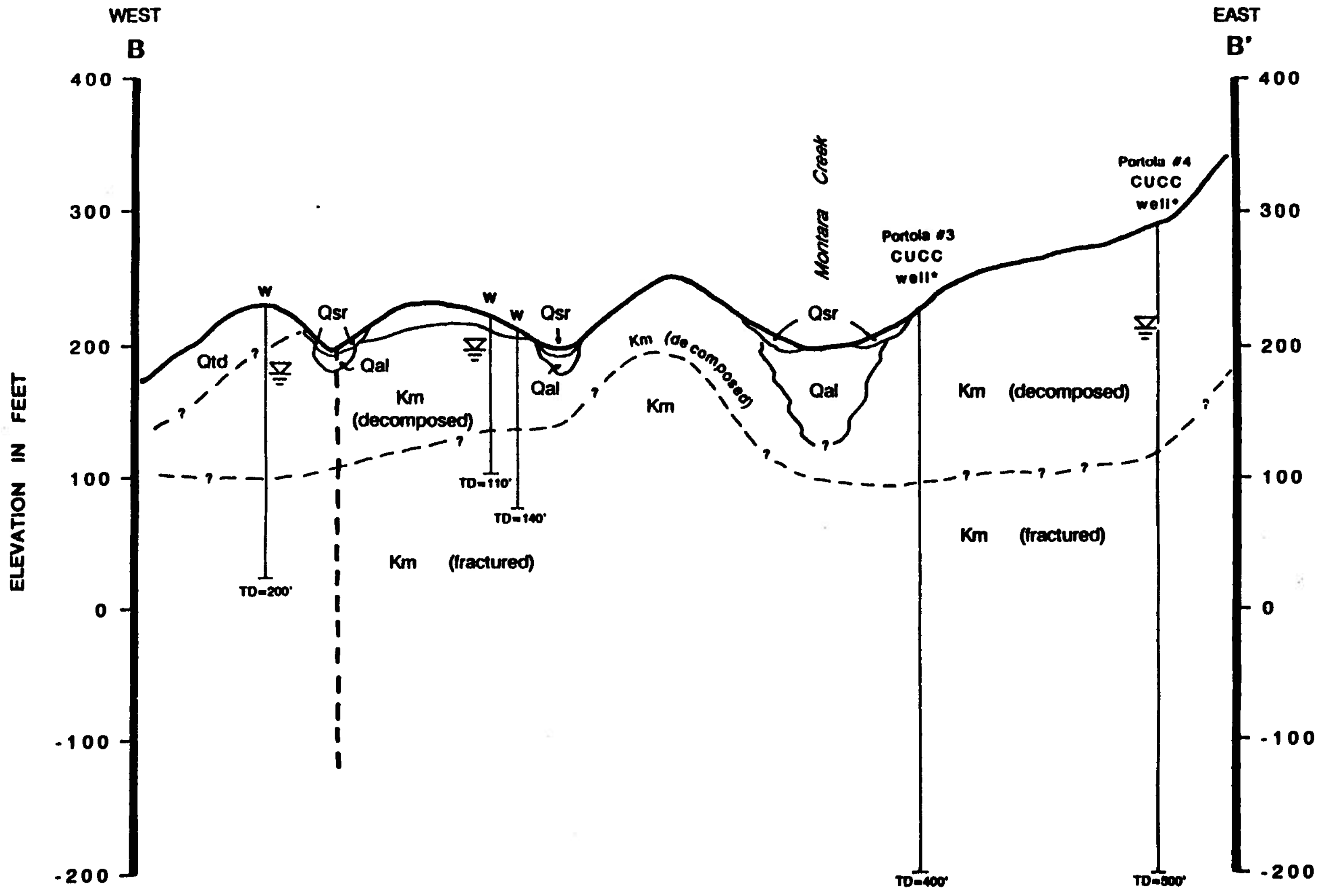


Figure 9. Hydrogeologic Section B - B'; Upper Montara

Qsr	Slope and Ravine Deposits
Qal	Alluvium
Qtd	Marine Terrace Deposits
Tp	Purisima Formation
Km	Montara Quartz Diorite
$\underline{\nabla}$	Static Water Level Recorded on Driller's Log
	w = well; b = boring; * = projected onto section

See Figure 5 (Geologic Map) for detailed description of units.

500 feet

100 feet

5X Vertical Exaggeration

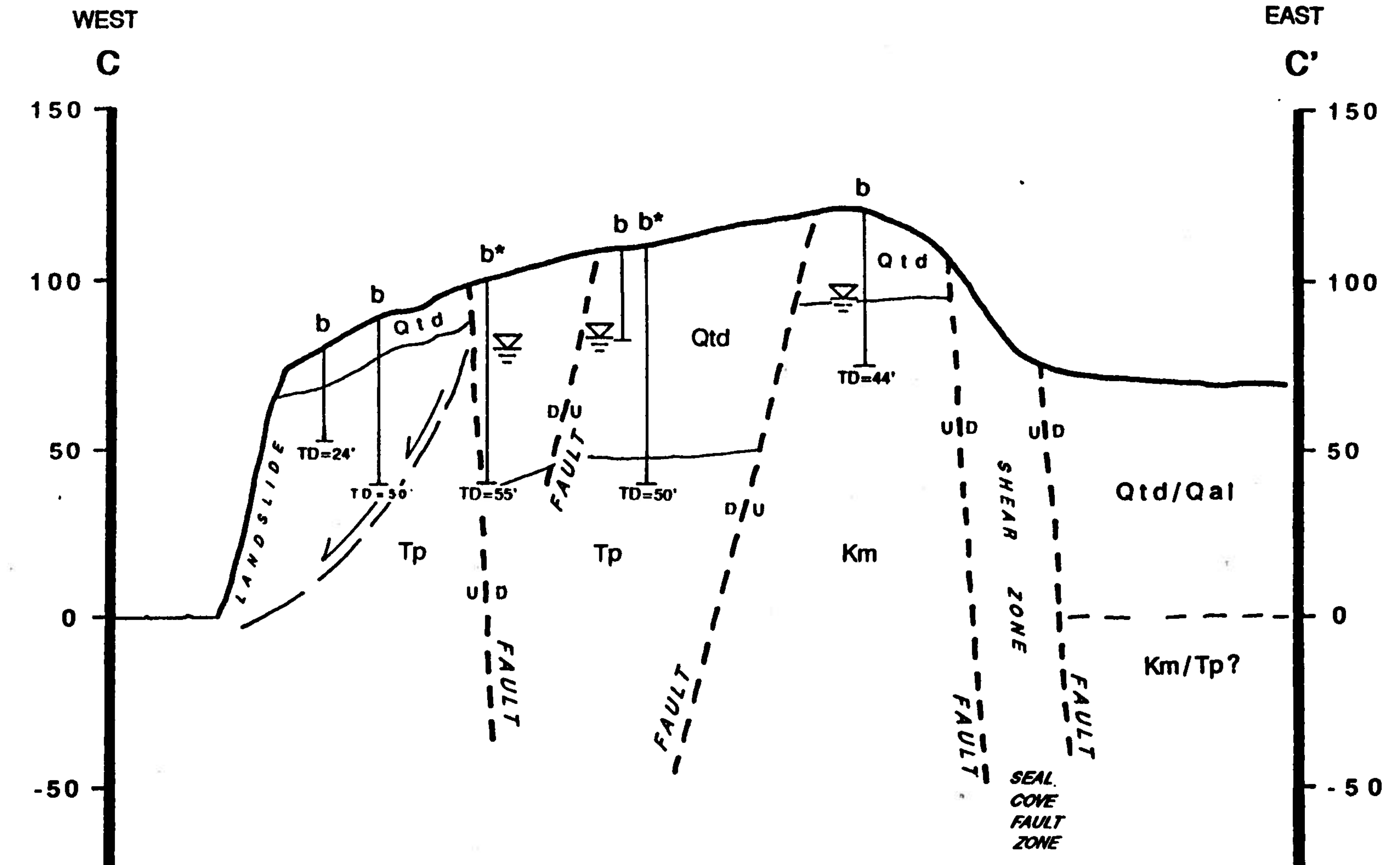


Figure 10. Hydrogeologic Section C - C'; Upper Seal Cove

Qsr	Slope and Ravine Deposits
Qal	Alluvium
Qtd	Marine Terrace Deposits
Tp	Purisima Formation
Km	Montara Quartz Diorite
⊽	Static Water Level Recorded on Driller's Log

w = well; b = boring; * = projected onto section

See Figure 5 (Geologic Map) for detailed description of units.

200 feet

50 feet

4X Vertical Exaggeration

The study area contains several northwest-trending fault zones. The locations of the faults as shown on Figure 6 are based on previous studies (Pampeyan, 1981; Leighton and Associates, 1971; Mr. Al Neufeld, personal communication) and should not be used for seismic zonation purposes. The faults are generally near-vertical, oriented approximately north 25 degrees west, and where exposed in the seacliff, offset the base of the marine terrace deposits. The Seal Cove fault zone in the southern portion of the study area is considered to be seismically active (movement within the last 10,000 years [Leighton Associates, 1971]) whereas the remaining faults are considered potentially active (movement within the last million years).

5.3.2 GEOMORPHOLOGY

The Montara-Moss Beach area represents a fairly typical California coastal geomorphic regime. The area is bordered on the east by steep hills that rise to form the northern extension of the Santa Cruz Mountains and on the west by seacliffs adjoining the Pacific Ocean. The central portion of the area is dominated by a highland area at Montara Heights from which the land slopes down to alluvial flat-lands north of Montara and southward to Moss Beach. The southern portion of Seal Cove exists as an isolated block uplifted along the Seal Cove fault.

Several drainages transect the area, with the most prominent being San Vicente Creek and Montara Creek. Other drainages include Dean Creek, which receives runoff from Sunshine Valley, and the unnamed stream north of Kanoff Avenue in Montara.

San Vicente Creek consists of an approximately 250 foot wide alluvial valley that forms a relatively shallow alluvial channel within the marine terrace surface through Moss Beach, whereas Montara Creek occupies a broad alluvial valley on the east that becomes a deeply incised ravine through Montara Heights. It is possible that Montara Creek may once have flowed more westerly to the ocean through the unnamed creek north of Kanoff Avenue in Montara and a more recent episode of stream capture has produced the present drainage configuration. This is suggested by general analysis of topography and the anomalously thick deposits of alluvial material encountered in a well on 2nd Street in Montara.

San Vicente and Montara Creeks emerge from the highland areas flowing in a southwesterly direction and subsequently are diverted northwestward prior to discharge to the ocean. This change in channel alignment may represent a long-term response to tilting and right-lateral offset along the Seal Cove fault and other faults crossing the area.

5.4 HYDROLOGY AND WATER QUALITY

5.4.1 AQUIFER PROPERTIES

An aquifer is a geologic unit capable of releasing usable volumes of ground water to a well. Within the Montara-Moss Beach area, ground water supplies are available from four distinguishable aquifer systems: granitic bedrock, sedimentary bedrock of the Purisima Formation, marine terrace deposits, and valley-fill alluvium. The aquifer distinctions are based on differences in composition of the aquifer materials and differences in their respective abilities to transmit water. Available records for approximately 32 existing wells in the area (Figure 7) have been used to provide estimates of the water-bearing properties of each of the aquifer systems (Table 3). Estimates of the specific hydrologic properties of each water-bearing unit are summarized in Table 4. The following sections detail the methods and assumptions used in estimating the hydraulic properties of the aquifer systems, followed by a discussion of the occurrence and movement of ground water within the Montara-Moss Beach area.

5.4.1.1 TERMS USED

The ability of an aquifer to transmit water can be defined by a variety of hydrologic parameters which include specific yield, hydraulic conductivity (or "permeability"), transmissivity, and specific capacity of wells. Specific yield is the amount of water released from a unit volume of saturated aquifer material when drained by gravity, generally expressed as a percentage of the unit volume. Hydraulic conductivity is a measure of the capacity of a rock unit to transmit water. It is generally expressed as the volume of water that will move in a unit time under a hydraulic gradient of one through a unit area. The term is usually expressed as feet per day, but has been converted for the sake of consistency in units to gallons per day per square-foot in this report. Transmissivity is a measure of the rate at which water will flow through a unit width of an aquifer under a unit hydraulic (water-level) gradient. In this report, transmissivity is measured in gallons per day per one-foot aquifer width, commonly referred to as gallons per day per foot (gpd/ft). The specific capacity of a well is defined as the yield in gallons per minute per foot of drawdown

TABLE 3

MONTARA-MOSS BEACH AREA WELL CONSTRUCTION AND PERFORMANCE

Well Location	Date Drilled	Aquifer Type(1)	Total Depth (feet)	Static Depth to Water(2) (feet)	Perforated Interval(2) (feet)	Sanitary Seal (feet)	Specific Capacity (gpm/ftdd)	Specific Conductance (umhos)
1	9-88	T	135	46	25-130	22	0.6	670
2	1-88	G	415	102	150-415	20	0.02	669
3	4-87	G	120	23	40-100	20	0.11	270
4	11-83	G	110	10	50-110	20	--	470
5	4-86	G,T	200	50	100-200	22	0.45	560
6	8-87	G	310	168	170-250	20	0.42	770
7	--	G	300	208	--	--	0.18	170
8	4-88	G	110	25	50-110	20	0.21	460
9	10-85	G	140	18	60-140	20	0.41	--
10	3-88	G	290	140	190-290	20	0.23	270
11	11-86	G	120	42	40-120	20	0.5	250
12	----	---	---	---	---	---	---	---
13	2-87	G	160	65	80-160	20	0.19	--
14	4-77	G	120	30	24-120	20	--	--
15	11-87	G	168	90	51-168	50	0.071	400
16	4-87	G	100	40	20-100	20	0.15	--
17	5-75	G	139	40	40-139	--	--	--
18	10-87	G	145	59	75-145	20	0.54	520
19	9-83	G	243	78	140-240	40	2.43	--
20	11-85	G	300	210	240-300	20	0.18	1700
21	6-87	G	180	15	--	20	0.56	
22	12-88	G	478	19	20-478	--	0.0079	640
23	2-88	T	47	8	22-42	20	1.5	801
24	5-8-86	T	50	12	20-40	20	4.0	675

TABLE 3 (continued)

MONTARA-MOSS BEACH AREA WELL CONSTRUCTION AND PERFORMANCE

Well Location	Date Drilled	Aquifer Type(1)	Total Depth (feet)	Static Depth to Water(2) (feet)	Perforated Interval(2) (feet)	Sanitary Seal (feet)	Specific Capacity (gpm/ftdd)	Specific Conductance (umhos)
25	--	--	--	--	--	--	--	--
26	--	--	--	--	--	--	--	--
Drake Well	6-76	T,G	194	36	20.5-162	21	0.5	370
Portola No.3	4-79	G	300	--	65-300[4]	65	1.1	600
Portola No.4	4-79	G	500	--	175-500[4]	176	--	590
Park Well	--	--	--	9.0	--	--	2.7	620
Wagner Well	2-72	G	145	58	72-144	50	2.88	320

1 Aquifer type defined as T or G where: T = terrace deposits, G = granite
2 Depth to water measured at time of drilling
3 Uppermost and lowermost perforations only
4 Open hole

TABLE 4

ESTIMATED RANGES OF HYDROGEOLOGIC PROPERTIES OF WATER-BEARING UNITS

Aquifer Type	Specific Yield[(1)]	b (ft)	Hydraulic Conductivity[(2)] (gpd/ft^2)	cm/s	Transmissivity[(3)] (gpd/ft)	Specific Capacity of Wells(4) (gpm/ftdd)
Granitic Bedrock	0.01	250	0.005-1.5	2.4×10^{-7} 7.1×10^{-5}	<100-450	0.0079-2.88
Purisima Formation	0.01 ?	250	0.005-0.33		<100-100	0.002-0.06
Marine Terrace Deposits	0.08	50-70	10-100	10^{-3}	450-4000 (1800)	0.5-4.0
Valley Fill (Alluvium)	0.10	~~50~~ 60	10-100	10^{-3}	450-10,000 (1800)	0.5-4.0

(1) Assumes an average specific yield throughout entire aquifer. This may be particularly misleading in areas with appreciable thicknesses of decomposed granite where specific yield may be significantly higher at relatively shallow depths and decreases dramatically with increasing depth.

(2) Refer to text for discussion of hydraulic conductivity estimates.

(3) Refer to text for discussion of transmissivity estimates. Values listed represent an expected range of transmissivity values for a given aquifer type. Where applicable, the most probable average value used in calculations is listed in parenthesis.

(4) Data from limited duration well tests contained in San Mateo County well record files.

(lowering of the water level in the well due to pumping) and denoted gpm/ftdd. These terms are used throughout in the following sections.

5.4.1.2 GRANITIC BEDROCK AQUIFER

The Montara Quartz Diorite is an intrusive igneous rock formed by the slow cooling of molten rock (magma) and is generally composed of interlocking mineral grains of quartz, feldspar and mica. Ground water moves within this unit through a series of joints or fractures (cracks) within the rock mass. In some areas the upper 100 feet or more may be highly weathered, forming a relatively porous sand-like material commonly referred to as decomposed granite. Both the degree of weathering, and the size and number of open fractures available to transmit water decrease markedly with depth below the surface. Well yields then depend on the thickness of decomposed granite encountered, and on the size, number and degree of connection of joints or fractures intersected by the well.

Records for approximately 22 local wells completed within the granitic bedrock indicate general well depths of 100 to 500 feet with an average depth of about 250 feet.(Specific capacities for the wells range from 0.0079 to 0.54 gpm/ftdd, with two wells reporting specific capacities of 2.43 and 2.88 gpm/ftdd respectively. The average specific capacity is 0.26 gpm/fdd, however, the higher end values are reported for wells located in the highland areas near Wagner Valley whereas the low end values are characteristic of wells in the elevated region of Moss Beach and Montara Heights. These latter areas are also the site of deeper wells in general. Specific yield of the granitic bedrock is estimated to be one percent (0.01) on average.

Transmissivity within the granitic bedrock may be estimated by two methods. One method utilizes empirical relationships between specific capacity of specific yield and transmissivity used by the California Department of Water Resources (1974, 1975) and a second method uses estimates of hydraulic conductivity in granitic and metamorphic bedrock developed by Bedinger and others (1986). While the first method was primarily developed for use in alluvial aquifers, its use here produces estimates of transmissivity of 14 to 1,000 gpd/ft, consistent with aquifer analyses conducted elsewhere in the Santa Cruz Mountains (Hecht, 1978). For the second method, measurements of hydraulic conductivity in fractured igneous and metamorphic rocks, similar to the Montara Quartz Diorite, from throughout the western United States are used in conjunction with an assumed saturated aquifer thickness. Measurements of hydraulic conductivity within one standard deviation on each side of the mean reported by Bedinger and others (1986) ranged from 0.005 to 1.5 gpd/ft^2. As transmissivity (T) equals hydraulic conductivity (K) times saturated thickness (b), here assumed to be 300 feet, transmissivity of the granitic bedrock is estimated at 1.5 to 450 gpd/ft. For this report, transmissivity is estimated to range from 100 to 450 gpd/ft on average, recognizing that for individual wells, T may be significantly higher or lower depending on specific fracture patterns in the rock.

The decomposed granitic rocks of Montara Mountain are the source of most of the sediments in the alluvial, beach, and terrace deposits of the Montara-Moss Beach area. The weathered granitic rocks share many hydrogeologic properties with the derivative sediments, but are neither quite as porous nor as permeable. Lombardi (1949) investigated this observed condition, noting that the material weathered in place on Montara Mountain was highly angular with a size distribution conforming with Rosin's law of crushed material, while the beach sediments were distinctly more rounded, of more uniform sizes, and were of the log-normal distribution typical of the more-permeable shallow marine sediments.

5.4.1.3 PURISIMA FORMATION AQUIFER

The Purisima Formation consists of well-indurated, highly-fractured sedimentary rocks, primarily sandstone, siltstone and shale, that generally underlie the marine terrace deposits west of Half Moon Bay airport. No wells are presently known draw solely from the Purisima Formation locally, however, estimates of aquifer properties can be made based on similarities to properties of the granitic bedrock reported for the El Granada area to the southeast (Kleinfelder, 1988).

Previous hydrologic analysis in the El Granada area indicates that no significant differences in specific capacities were observed for wells completed in the granitic bedrock and Purisima Formation. As in the granitic rock, movement of water within the Purisima Formation is controlled by fracture spacing, size and degree of connection. In addition, the Purisima Formation is widely known to produce wells of low yield in all but the most favorable areas. Hydrologic properties are estimated to be roughly equivalent to the lower-end values for the granitic bedrock. Specific capacity of wells is estimated to be approximately 0.06, and specific yield is estimated at 0.01. Transmissivity is estimated to be 100 gpd/ft and hydraulic conductivity is approximately 0.33 gpd/ft^2.

5.4.1.4 MARINE TERRACE DEPOSIT AQUIFER

Marine terrace deposits in the Montara-Moss Beach area are composed of alternating layers of sand, silt, and clay originally deposited in shallow marine waters, similar to the near-shore environment existing today. The sediments are generally deposited on wave-cut bedrock platforms of granite or Purisima Formation sedimentary rocks. Ground water in the terrace deposits is present in the pore space between individual grains in the more porous, sandy layers.

Wells completed in the terrace deposits in the Moss Beach-Montara area are generally 50 to 70 feet deep. Available records for four terrace deposit wells in the area indicate an average specific capacity 1.6 gpm/ftdd with a reported range of 0.45 to 4.0 gpm/ftdd. Results from limited duration aquifer tests on 44 similar wells in the El Granada area yield an average specific capacity of 0.93 gpm/ftdd (Kleinfelder, 1988). Given the larger number of analyses, average specific capacity measured for wells in the terrace deposits in the El Granada area are considered to be more representative of average field conditions. Specific yield of the terrace aquifer is estimated at 0.08, based on interpretation of drillers logs and observation of the terrace deposit strata exposed along the shoreline.

Using empirical relationships between transmissivity and specific yield or specific capacity, transmissivity of the Montara-Moss Beach area terrace deposits is estimated to be about 1800 gpd/ft. This value represents an average transmissivity used in later calculations of ground water storage and outflow. Based on this estimate, usual hydraulic conductivity of the marine terrace aquifer is estimated at 10 to 100 gpd/ft2, and most typically 20 to 50 gpd/ft2.

5.4.1.5 ALLUVIAL AQUIFERS

Deposits of alluvium occupy stream valleys and present drainage channels and are similar in composition to the marine terrace deposits. The alluvium consists of unconsolidated layers of sand, silt, and clay deposited by streams within the area. The alluvial deposits of significance in the Montara-Moss Beach area are located in upper Montara Creek (Wagner Valley), along San Vicente Creek, and in the lowland area north of Kanoff Avenue in Montara.

Specific records of wells completed in the alluvial deposits are not available. However, based on compositional similarities to the marine terrace deposits, hydrologic properties of the alluvium can be considered to be generally equivalent to those of the terrace deposits. Transmissivity is estimated at 1800 gpd/ft, and specific yield is estimated at 0.10, slightly higher than the terrace deposits due to an assumed lesser degree of consolidation. Hydraulic conductivity of the alluvium is estimated to average 20 to 50 gpd/ft2 although it may vary about this range more than is the case for the terrace deposits.

5.4.2 OCCURRENCE AND MOVEMENT OF GROUND WATER

The aquifer systems described in the preceding section are spatially restricted and divided across the Montara-Moss Beach area. That is, wells in certain areas will rely primarily on marine terrace or alluvial aquifers, whereas wells in other areas will depend wholly, or in part on production from the bedrock aquifers. In addition, ground water storage, outflow and recharge for each general area are controlled by topography and drainage patterns, requiring specific analysis of the occurrence and movement of ground water for each area. As such, the Montara-Moss Beach area can be divided for planning purposes into six hydrogeologic sub-units. The sub-units are defined on the basis of ground water recharge patterns and by the specific aquifer system from which the majority of wells in each area will draw. The six sub-units are shown on Figure 1 and are identified as: Montara Terrace, Montara Heights, Upper Montara Creek, Upper Moss Beach, Moss Beach Terrace, and Upper Seal Cove.

(*)
conclusion

This section provides a brief discussion of each sub-area. Estimated volumes of water in storage, and ground water outflow for each of the sub-areas are summarized on Table 5.

5.4.2.1 MONTARA TERRACE

The Montara Terrace sub-unit occupies approximately 165 acres roughly bounded by Acacia Street, 6th Street, Farallone Avenue and the unnamed stream north of Kanoff Avenue north of Montara (Figure 1). Approximately 80 percent of any wells drilled in this area can be expected to be completed in the marine terrace aquifer. As shown on Figure 8, the terrace deposits tend to be thicker in the downhill portions of the area indicating that wells drilled in the upper regions (Farallone Avenue, and south of 4th Street) may in part rely on the underlying granitic bedrock for production. It is estimated that wells encountering 50 feet of saturated aquifer materials should readily meet County yield

TABLE 5

ESTIMATED VOLUMES OF WATER IN STORAGE NORMAL, DRY, AND CRITICALLY DRY YEARS

Hydrogeologic Sub-unit	Normal Hydrologic Year (1984)	Dry Hydrologic Year (1981)	Critically Dry Hydrologic Year (1976 or 1977)
MONTARA TERRACE			
- storage	528	396	132-330
- outflow	140	105	35-88
MONTARA HEIGHTS			
- storage	330	297	265
- outflow	8	7	6
UPPER MONTARA CREEK			
- storage	1500	1320	1120
- outflow	123	97	70
UPPER MOSS BEACH			
- storage	210	190	168
- outflow	8	7	6
MOSS BEACH TERRACE			
- storage	700	546	234-468
- outflow	134	94	40-80
UPPER SEAL COVE			
(a) Terrace Deposits			
- storage	24	8	<1
- outflow	13	5	<1
(b) Bedrock			
- storage	40	34	28
- outflow	2	1.7	1.4

ac

145

300 N of [illegible]

TOTALS
3332 (S)
428 (O)

TOTALS
2971 (S)
316.7 (O)

TOTALS ↑
2380 (S)
252.4 (O)

All values reported in acre feet (one acre foot equals approximately 0.326 million gallons).

Volumes of water in storage are based on estimates of specific yield, saturated aquifer thickness, and area as discussed more fully in the text.

Ground water outflow is based on Darcian flow equations with assumed reductions in transmissivity based on expected declines in saturated aquifer thickness for varying hydrologic years.

requirements. Wells in the higher elevations that draw partially from the granitic bedrock can be expected to experience significant water-level declines during extended drought cycles.

No data describing seasonal or/year-to-year fluctuations in water levels are known from within the project area. Based on hydrograph records of wells located in the marine terrace and alluvial deposits near the Half Moon Bay Airport, water-level decline in the marine terrace aquifer during dry and very dry years are estimated to be approximately 10 and 15 to 30 feet, respectively. Estimated ground water in storage for the Montara Terrace sub-area for normal, dry and very dry years is 528, 396, and 132 to 330 acre feet, respectively. Estimated ground water outflow from the system for the same three hydrologic years is 140, 105, and 35 to 88 acre feet, respectively.

Given the relatively steep slope of the Montara Terrace sub-unit and the absence of a distinct upland recharge area, ground water can be expected to move through the system relatively rapidly. Standard ground water velocity calculations suggest that under normal conditions ground water may move downslope at a velocity of approximately 4 feet per day, suggesting that mean residence time for water in the system may be on the order of a few years. These calculations qualitatively indicate that during extended drought cycles, wells in the upper elevations of the sub-area may experience significant water-level declines forcing a greater dependence on the relatively low yielding granitic bedrock underlying the terrace deposits. One possible problem is that wells constructed during normal or wet years, when water availability may be much greater, may not be constructed to allow adequate withdrawal from the underlying granite, requiring new well installations or deepening of existing wells during dry years.

5.4.2.2 MONTARA HEIGHTS

The Montara Heights sub-area occupies the top of the hill bounded by Montara Creek, 6th Street and Farallone Avenue. Wells in the sub-area produce water exclusively from the granitic bedrock aquifer. Records for two wells completed in the sub-area suggest that water availability can vary widely depending on location of the well with respect to favorable fracture zones; significant thicknesses of decomposed granite are not expected to occur in the sub-area. Specific capacities reported for the two wells are 0.02 and 2.43 gpm/ftdd, respectively.

The volume of water in storage is estimated to be approximately 330 acre feet. The estimate is based on an assumed usable saturated thickness of 300 feet, specific yield at 0.01 and an area of 110 acres. Records are not available to indicate expected water level declines during dry and critically dry years, however, as the producing zones of the aquifer are somewhat far removed from precipitation recharge effects, these declines may be insignificant compared to the overall aquifer extent. Estimated ground water outflows during normal, dry, and very dry years are 8, 7, and 6 acre feet, respectively.

It should be noted that these estimates assume average conditions throughout the entire sub-unit. As the movement of ground water within the granite is controlled by secondary fracture porosity, increased well-interference effects may become a problem locally if closely spaced wells happen to draw primarily from the same set of fractures. The potential for such undesirable effects cannot be estimated with the information presently available.

5.4.2.3 UPPER MONTARA CREEK

The Upper Montara Creek sub-unit consists of approximately 385 acres of relatively steep upland area east of the Montara Terrace and Montara Heights sub-areas. This hydrologic unit consists primarily of portions of the Montara Creek drainage basin and includes the extensive alluvial deposits of Montara Creek in Wagner Valley. The depth of alluvium in the valley is unknown, but is estimated to be 50 to 70 feet thick.

Driller's logs and other data are available for approximately 20 wells located in and adjacent to the upper Montara Creek sub-area; all of which produce water from the granitic bedrock. At least one agricultural well is reported to draw from the alluvium, however, well data are not available. Specific capacities for domestic and agricultural wells in the area range from 0.071 to 2.43 gpm/ftdd, with an average of 0.45 gpm/ftdd, which is generally much higher than reported values for granitic bedrock in other areas. This appears to be due to the presence of a relatively thick section of decomposed granite and the saturated alluvial valley fill present in Wagner Valley which may tend to act as a recharge reservoir. Citizens Utilities Company of California maintains four commercial production wells within the Upper Montara Creek sub-area. Reported specific capacities for these wells have an average range of 0.5 to 2.88 gpm/ftdd (Luhdorff & Scalmanini, 1982). The estimated volume of water in storage for the sub-area (including both the granitic and alluvial aquifer systems) are 1500, 1320, and 1120 acre feet, respectively for normal, dry, and very dry years. Ground water outflow estimates for the varying climatic conditions are 123, 97, and 70 acre feet, respectively.

5.4.2.4 UPPER MOSS BEACH

The Upper Moss Beach sub-unit comprises the hillside region of Moss Beach between Stetson Street and Montara Creek (70 acres). The area consists of a surficial cover of marine terrace deposits (perhaps up to 40 feet thick) underlain by granitic bedrock. While limited quantities of water may be provided by the marine terrace deposits during normal or wet years, wells completed in the sub-unit will primarily draw from the granitic bedrock aquifer.

The specific capacity of a 475 foot-deep well recently completed in the area was reported at 0.0079 gpm/ftdd, translating roughly to a transmissivity of approximately 15 gpd/ft. As in the Montara Heights sub-unit, water availability and long-term reliability is dependent on encountering favorable fracture zones within the granitic bedrock. It is anticipated that wells in the sub-unit will be primarily of low yield and subject to significant water-level decline during extended drought years.

The estimated volume of water in storage is 210 acre feet. As in the Montara Heights sub-unit, expected water level declines during drier climatic cycles cannot be realistically estimated, but may not be significant relative to the overall aquifer extent. Ground water outflow from the system is estimated to be 8, 7, and 6 acre feet for normal, dry and very dry years, respectively.

5.4.2.5 MOSS BEACH TERRACE

The Moss Beach Terrace sub-unit occupies an area of 195 acres that includes Moss Beach south of Stetson Avenue to Orval Avenue in Seal Cove. The main aquifer in the area is composed of 50 to 70 feet of marine terrace deposits. The terrace deposits are underlain by granitic bedrock north of the vicinity of Highway 1, and the Purisima Formation south of Highway 1. However, it is anticipated that adequate ground water supplies will be encountered in the overlying marine terrace deposits and alluvial deposits adjacent to San Vicente Creek.

The specific capacity of two wells in the sub-area are reported at 1.5 and 4.0 gpm/ftdd. Estimated volumes of ground water in storage during normal, dry, and very dry years are 700, 546, and 234 to 468 acre feet, respectively. Estimated outflows to the ocean during normal, dry and very dry years are 134, 94, and 40 to 80 acre feet, respectively.

5.4.2.6 UPPER SEAL COVE

The Upper Seal Cove sub-unit represents an isolated 40 acre block uplifted along the Seal Cove fault zone. As shown on geologic cross-section C-C' (Figure 10), the area is underlain by faulted blocks of Purisima Formation and granitic bedrock overlain by a variable thickness of marine terrace deposits. No wells are known to exist in the area and estimates of water production potential are entirely speculative.

The eastern portion of the block consists of a thin terrace deposit cover underlain by granitic bedrock. Geotechnical borings by Leighton & Associates (1974) indicate that in this area, ground water is sometimes present as a perched zone at the terrace-granite contact. Future wells in this area will need to be completed in the granitic bedrock.

To the west, thicker deposits of marine terrace sediments are present, overlying the Purisima Formation. Estimating water production potential in this area is problematic for several reasons. First, recharge of ground water supplies in this area appears to be limited to rainfall infiltration. As an increasing number of wells draw from the same limited reservoir, available supplies may be rapidly depleted during extended drought cycles. Second, deepening wells to obtain additional supplies from the Purisima Formation may not be sufficient to support a relatively high-density clustering of wells, and may result in production of poor-quality water.

Ground water storage in the marine terrace sediments of the Upper Seal Cove area for normal, dry, and very dry years is estimated to be 35, 9, and 1 to 2 acre feet, respectively.

Estimated outflow of ground water from the terrace deposits is estimated to be 13, 5, and < 1 acre foot for normal, dry, and very dry years respectively.

Potential additional storage within the underlying bedrock zones is estimated at 40, 34, and 28 acre feet for normal, dry, and very dry years, respectively. Outflow from the bedrock may not be calculable using Darcian assumptions; if it were, outflow would be estimated at 2, 1.7, and 1.4 acre feet for the normal to very dry year cycle. Use of the bedrock waters may be partially constrained by water quality.

5.4.3 WATER BALANCE BY HYDROGEOLOGIC SUB-UNITS

5.4.3.1 OVERVIEW

In this section of the report, the movement of water through the soils, streams, aquifers, and plants of the Montara-Moss Beach area is described, and some of the factors affecting this movement are identified. The findings may be applied in several ways. First, the movement into and out of an aquifer during each season may be compared with the volume of water stored in each sub-unit (Sec. 5.4.2); the anticipated response of ground water levels in each hydrologic sub-unit to a series of dry years is explored in the next section, based on a critical comparison of ground water inflows to volumes in storage. Second, the effects of existing water use on hydrologic processes may be examined using water balances, so that proposed or projected development of each sub-unit's ground water resources may be anticipated. Finally, the water balances aid in identifying approaches suited to the small, dissected aquifers of the Montara-Moss Beach area which may allow future water development most compatible with the hydrologic and biologic values of the area.

Water balances serve as tools to explore these questions. They should be regarded as estimates, not as fact. In areas such as Moss Beach and Montara, where little existing information is available, the balances can guide the choice of data collection efforts to more effectively understand and develop the local resource. They also serve as an accounting framework within which the implications of new observations and information may be assessed.

It is usually helpful to set a lower level of quantification, below which it is not deemed useful to quantify minor inflows and outflows. The selection of this lower threshold depends upon the length and extent of the information available, the precision required in the analysis, and the degree to which the hydrologic system is understood and can be tested under local conditions (among other factors). Previous work in the San Mateo County Midcoast has used values of 3 to 5 percent of mean annual recharge as a level below which detailed analysis may not be merited, although such processes are often considered in subsequent discussion. This same level is utilized in the water-balance analyses of this report. However, available information is poorer for Montara and Moss Beach, and a false level of precision should not be assumed.

5.4.3.2 APPROACH AND METHODS

Water Balances as a Tool for Assessing Potential Ground Water Resources

A water balance is an accounting system which quantitatively estimates inflows to and outflows from a hydrologic system over time, typically on an annual basis. The accuracy of estimated values depends upon the nature and quality of data available, the definition of the hydrologic system, and the purpose(s) of the water balance.

In this study, water balances for aquifers in the Montara - Moss Beach area provide quantitative estimates of potential ground water supplies. Accuracy of estimates are limited by available data, sources for which are described below. Comparison of water balance estimates for the various aquifers identified in the study area also allows qualitative assessments of relative potential ground water effects. Such comparisons provide insights regarding management opportunities and limitations, supplementing other methods of inquiry utilized to evaluate the ground water resource.

Sources of Hydrographic and Hydrologic Data

Precipitation data for the study area were obtained from National Oceanic and Atmospheric Administration climatic records collected at the Half Moon Bay Airport over the period 1951-1985 (NOAA, 1986). These data were supplemented by a map of precipitation isohyets for coastal San Mateo County prepared by the California Department of Water Resources (1965).

Runoff data for watersheds in the study area are not available, except for brief periods of questionable accuracy. Hydrologic records from gaged streams elsewhere in the San Mateo County midcoast were used to estimate runoff from watersheds in the study area.

Annual evapotranspiration rates in the study area were estimated previously for the El Granada area (Kleinfelder, 1988) for use in a similar water balance. Data synthesized for the El Granada area were adapted to the Moss Beach - Montara study area. Climate, vegetation, and soils are similar in both areas.

The foregoing sources provided the basic data necessary for estimating water balances. The application of these data to specific aquifers in the study area required estimates regarding specific processes and rates. These estimates were made based on field observations and published data for similar environments. In circumstances where published data or field evidence was inconclusive, conservative estimates were adopted which it is believed would not result in overestimation of potential ground water resources.

Approach to Water Balances

The process by which the water balances were constructed involved three general steps:

1. identification of aquifer boundaries and contributing watersheds,
2. identification of inflows and outflows from aquifers, and
3. quantification of inflows and outflows over a range of climatic conditions.

Evaluating aquifer conditions over a range of climatic conditions, that is, during "normal", "dry", and "critically dry" water years, was intended to provide perspective regarding potential limitations on the development of potential ground water resources and the management strategies which may be appropriate to maximize the overall value of potential ground water resources.

The following estimates and assumptions were applied to all sub-units:

1. Relationship Between Precipitation and Runoff

   Watersheds in mid-coast San Mateo County produce runoff at an annual mean rate of 0.27 inches per inch of mean annual rainfall. This ratio has been applied where inflows to aquifer subunits include runoff from upland watersheds (i.e., Upper Montara Creek, Moss Beach, and Montara Terrace).

Runoff in a year of average rainfall is somewhat less than the computed mean annual runoff. During dry and critically dry years, measured runoff diminishes at a rate greater than the reduction in rainfall. To account for this tendency, estimated runoff during years of average rainfall was adjusted by a multiplier of 0.75. The multipliers for dry years and critically dry years were 0.50 and 0.15 respectively (Kleinfelder, 1988).

2. Elevation Adjustments to Annual Precipitation

Precipitation records at Half Moon Bay Airport were the basis for estimating precipitation on the sub-unit aquifers in the normal (representative year--average annual), dry (representative year--1981), and critically dry (representative years--1976 or 1977) years. Recorded precipitation at the airport in these years, respectively, was 25 inches, 19.2 inches, and 14.7 inches. For higher-elevation areas, estimated precipitation was increased over the airport record based on the isohyetal map of coastal San Mateo County constructed by the Department of Water Resources. When rainfall values used in specific water balances are adjusted for elevation, the value is specified in the description of that water balance.

3. Percolation Rates From Channels to Aquifers

An infiltration rate of 0.00001 cubic feet per second per square foot of wetted area was used to estimate quantity of water percolating from channels to aquifers through alluvial deposits. This rather high rate is justified by the lithology of the region. Highly weathered granitic rock generates a coarse-textured alluvium in channels and alluvial deposits. Therefore, where surface waters flow over alluvial deposits, a relatively high rate of percolation may be expected. The assumed rate of infiltration is actually at lower end of the range observed in other coastal streams such as the Pajaro, San Lorenzo, and Carmel River, and Corralitos, Brush, and lower Pilarcitos Creeks.

5.4.3.3. MONTARA TERRACE SUB-UNIT

The Montara Terrace aquifer sub-unit underlies the community of Montara. The Montara Heights sub-unit, which encompasses the upper portion of the hill south of Montara and north of Montara Creek, is treated as a separate sub-unit, as wells in this area will draw from bedrock sources, not from the terrace aquifers.

The hydrologic balance or water budget for the Montara Terrace sub-unit is summarized in Table 6.

Inflows

Inflows to the Montara terrace sub-unit include direct rainfall recharge infiltration from an extensive system of road-side drainage ditches, percolation from an unnamed intermittent stream channel on the northern edge of Montara and ground water inflows from shallow soils and terrace deposits of portions of the Montara Heights sub-unit. Each of these inflows is discussed below.

Direct infiltration of precipitation was estimated as for the Moss Beach sub-unit (Section 5.4.3.6), modified for a sub-unit area of 165 acres. Estimated inflow to the aquifer from infiltration of rainfall was 89 acre feet in normal hydrologic years, 41 acre feet in dry years, and 4 acre feet in critically dry years.

Infiltration from roadside ditches which occur on both shoulders of paved and unpaved streets in Montara was perceived to be a significant component of inflows to the terrace aquifer. We estimated 52,000 lined feet of these 1 foot wide ditches were present, providing a percolation surface of about 1.2 acres. We assumed that the percolation rate in these ditches was half the rate used for stream channels, based on the absence of

TABLE 6

WATER BUDGET: MONTARA TERRACE SUB-UNIT

	Normal Hydrological Year (1984		Dry Hydrological Year (1981)		Critically Dry Hydrological Year (1976 or 1977)	
	(afa)	(gpm)	(afa)	(gpm)	(afa)	(gpm)
Inflows to Montara Terrace Aquifer						
Direct Infiltration From Precipitation [a]	89	55	41	25	4	2
Infiltration from Road-side, Ditches [b]	23	14	16	10	5	3
Infiltration from Unnamed Intermittent Channel[c]	22	14	14	9	3	2
Ground Water Inflow From Montara Heights[d]	15	9	7	4	1	<1
Subtotal	**149**	**92**	**78**	**48**	**15**	**8**
Outflows from Aquifer						
Ground Water Outflow at Seacliff[e]	140	87	105	65	35-88	22-54
Subtotal	**140**	**87**	**105**	**65**	**35-88**	**22-54**
Estimated Surplus of Deficit in Aquifer	**9**	**5**	**-27**	**-17**	**-20to -73**	**-14 to -46**
Surface Outflows to Ocean						
Runoff from Direct Precipitation [f]	138	85	107	66	89	55
Channelized Runoff, Unnamed Stream[g]	8	5	2	1	0	0
Subtotal	**146**	**90**	**109**	**67**	**89**	**55**

TABLE 6 (continued)
WATER BUDGET: MONTARA TERRACE SUB-UNIT

General Notes

1. Values are computed arithmetically, in keeping with water-budget practice. Actual precision may be limited to 2 significant figures.
2. Values are expressed as acre feet per year (afa) or a gallons-per-minute (gpm) equivalent, assuming continuous pumping.

Specific Notes

a. Estimate based on total incident precipitation, less estimated runoff, less estimated evapotranspiration December through March.

b. Estimate based on parallel drainage ditches along roadways: approximately 1.2 acre of total percolation surface, percolation rate of 0.5×10^{-5} ft./sec. normal year flow duration of 45 days; 30 days dry year; 10 days critically dry year.

c. Estimate based on mean percolation rate of 1×10^{-5} ft/sec and 0.28 acre of channel area, (i.e., 0.24 ac-ft/day), normal year flow duration = 90 days; dry year=60 days; critically dry year=20 days. Assumed all flows infiltrating through the channel bottom enter the terrace aquifer.

d. Estimate based on direct infiltration from precipitation occurring over 27 acres of Montara Heights sub-area; infiltrated water assumed to percolate laterally to terrace aquifer in Montara sub-area.

e. Estimate based on hydrogeologic parameters.

f. Estimate based on runoff rate of 0.40 (Knott, 1973), less estimated infiltration through road-side ditches.

g. Estimate based on watershed runoff, less estimated infiltration through channel bottom.

unconsolidated alluvium and the greater degree of compaction of the subsoils in which the drainage ditches are excavated. A flow duration was assumed for normal, dry, and critically dry years; 45 days, 30 days, and 10 days respectively. These durations are half those assumed for intermittent channels in the study area. The resulting percolation estimates were 23 acre feet for normal hydrologic years, 16 acre-feet for dry years, and 5 acre feet for critically dry years.

Infiltration from roadside ditches which occur on both shoulders of paved and unpaved streets in Montara was perceived to be a significant component of inflows to the terrace aquifer. We estimated 52,000 lined feet of these 1 foot wide ditches were present, providing a percolation surface of about 1.2 acres. We assumed that the percolation rate in these ditches was half the rate used for stream channels, based on the absence of unconsolidated alluvium and the greater detree of compaction of the subsoils in which the drainage ditches are excavated. A flow duration was assumed for normal, dry, and critically dry years; 45 days, 30 days, and 10 days respectively. These durations are half those assumed for intermittent channels in the study area. The resulting percolation estimates were 23 acre feet for normal hydrologic years, 16 acre feet for dry years, and 5 acre feet for critically dry years.

Percolation from the unnamed intermittent stream north of Montara was estimated by the same method used for Dean Creek (Section 5.4.3.6). Parameters specific to the unnamed stream were a watershed area of 59 acres and a channel area estimated to be 0.28 acres. Estimated inflows to the aquifer from the unnamed stream were 22, 14 and 3 acre feet in normal, dry and critically dry years respectively. Only in the case of the critically dry year was estimated percolation (5 acre feet) greater than estimated runoff from the watershed (3 acre feet) in that case, it was assumed that all runoff percolated.

Ground-water inflows from shallow soils and terrace deposits of the Montara Heights sub-unit were estimated based on infiltration of precipitation over the portion of Montara Heights that drains toward the Montara sub-unit. It was assumed that ground water from the Montara Heights sub-unit flows laterally, and that percolation to the bedrock is negligible. Estimated inflows were 15 acre feet, 7 acre feet, and 1 acre feet in normal, dry, and critically dry years.

Surface Outflows to Ocean

Surface runoff to the ocean was estimated for two components: runoff from direct precipitation and channelized runoff from the unnamed stream. Runoff from direct precipitation was estimated by subtracting volumes of water infiltrated through road-side ditches from the runoff estimate (40 percent of precipitation) Estimated runoff in normal years was 115 acre feet; dry year and critically dry year runoff was 90 and 76 acre feet, respectively.

Channelized runoff from the unnamed stream was estimated by subtracting estimated percolation to the aquifer from estimated runoff from the watershed. Estimated channelized runoff was 8 acre feet in normal years, 2 acre feet in dry years, and 0 in critically dry years when infiltration capacity exceeded watershed runoff.

Aquifer Outflows

Hydrogeologic parameters were used to estimated ground water outflows at the seacliff. Decrease in outflow associated with dry hydrologic conditions were estimated in part on the basis of assumed decreases on hydraulic gradient in the aquifer. Estimated outflows for normal hydrologic years was 140 acre feet; dry year outflows were 105 acre feet.

5.4.3.4 MONTARA HEIGHTS SUB-UNIT

The Montara Heights sub-unit represents the bedrock aquifer located at depth underlying the upper slopes of the hill south of Montara, north of Montara Creek. The terrace quifer in this area is thin, and is hydrogeologically distinct from underlying granitic rock. The granitic rock constitutes the usable aquifer in this sub-unit.

Table 7 summarizes the water budget for this sub-unit.

TABLE 7

WATER BUDGET: MONTARA HEIGHTS SUB-UNIT

	Normal Hydrological Year (1984		Dry Hydrological Year (1981)		Critically Dry Hydrological Year (1976 or 1977)	
	(afa)	(gpm)	(afa)	(gpm)	(afa)	(gpm)
Inflows to Aquifer						
Direct Infiltration from Precipitation[a]	<1	<1	<1	<1	<1	<1
Throughflow in Weathered Bedrock[b]	8	5	7	4	6	4
Subtotal	**8**	**5**	**7**	**4**	**6**	**4**
Outflows from Aquifer						
Outflows from Weathered Bedrock[c]	8	5	7	4	6	4
Subtotal	**8**	**5**	**7**	**4**	**6**	**4**
Estimated Surplus or Deficit in Aquifer	0	0	0	0	0	0

General Notes

1. Values are computed arithmetically, in keeping with water-budget practice. Actual precision may be limited to 2 significant figures.
2. Values are expressed as acre feet per year (afa) or a gallons-per-minute (gpm) equivalent, assuming perpetual pumping.

Specific Notes:

a. Estimate reflects assumed negligible percolation to fractured bedrock from overlying soils and terrace deposits.
b. Estimate based on hydrogeologic parameters of weathered bedrock.
c. Estimated equivalence of ground water inflows and ground water outflows based on assumption that ground water on bedrock aquifer is isolated from shallow ground water, is weakly influenced by fluctuations in annual precipitation and has a roughly constant pieziometric gradient.

Inflows

Estimated hydrogeologic parameters for this sub-unit are identical to those of the Upper Moss Beach bedrock aquifer (Section 5.4.3.6, below). Inflows were estimated from these parameters, and were assumed to decline slightly in dry years, remaining relatively constant despite climatic variation. Inflows were estimated to be 8 acre feet, 7 acre feet, and 6 acre feet in normal, dry, and critically dry years, respectively.

Outflows

Outflows were assumed to be in balance with inflows, consistent with our conceptualization of the bedrock aquifer as a conduit for throughflow from the coastal mountains to the ocean.

Estimated Surplus or Deficit in Aquifer

Because outlflows were assumed to equal inflows, no net surplus was estimated. Nevertheless, small quantifies of utilizable ground water may be available in the bedrock aquifer.

5.4.3.5 UPPER MONTARA CREEK SUB-UNIT

The Montara Creek watershed above Sixth Street and Portola Avenue encompasses approximately 696 acres, of which the lower portion (385 acres) has been used for hydrologic budgeting (Table 8). The main stem of Montara Creek drains the north side of the ridge formed by Montara Knob and South Peak. Surface water is confined within a well-defined channel that extends the full length of Wagner Valley. The channel is shallow and is minimally incised. Given that the alluvium in this area is derived from sandy granitic soils, and given the geomorphologic character of the channel (minimal incision), it appears that this is a "losing" reach of Montara Creek. Water flowing through the channel tends to percolate into the alluvium.

TABLE 8

WATER BUDGET: UPPER MONTARA CREEK SUB-UNIT

	Normal Hydrologic Year (1984)		Dry Hydrologic Year (1981)		Critically Dry Hydrologic Year (1976 or 1977)	
	(afa)	(gpm)	(afa)	(gpm)	(afa)	(gpm)
Inflows to Aquifer						
Direct Infiltration From Precipitation [a/]	117	72	78	48	47	29
Infiltration From East and Southeast Tributary Watersheds[b/]	166	106	85	53	20	12
Infiltration from Channel of Montara Creek[c/]	88	54	88	54	21	13
Seepage from Weathered Bedrock[d/]	87	54	68	42	50	31
Subtotal	**458**	**286**	**319**	**197**	**138**	**85**
Aquifer Outflows, Well Yields, and Diversions by C.U.C.C.[e/]						
Montara Springs Diversion	89	55	34	21	29	18
Wagner #3 Well	115	71	112	69	104	64
Drake Well	44	27	34	21	37	23
Portola #3 and #4 Wells (combined)	50	31	92	57[f/]	--	--
Park Well	5	3	--	--	8	5
Outflow from Aquifer [g/]	123	76	97	60	70	43
Subtotal	**426**	**263**	**369**	**228**	**248**	**153**
Estimated Surplus or Deficit In Aquifer	**32**	**23**	**-50**	**-31**	**-110**	**-68**

TABLE 8 (continued)

WATER BUDGET: UPPER MONTARA CREEK SUB-UNIT

	Normal Hydrologic Year (1984)		Dry Hydrologic Year (1981)		Critically Dry Hydrologic Year (1976 or 1977)	
	(afa)	(gpm)	(afa)	(gpm)	(afa)	(gpm)
Surface Outflows to Lower Montara Creek						
Runoff from Valley Alluvium $^{h/}$	19	12	15	9	11	7
Runoff from "Non-channelized" $^{h/}$ Watersheds	18	11	9	6	2	1
Runoff from "Channelized" $^{i/}$ Watershed	86	52	1	1	0	0
Aquifer Outflow $^{g/}$	115	71	92	57	62	38
Subtotal	**238**	**146**	**117**	**73**	**75**	**46**

General Notes

1. Values are computed arithmetically, in keeping with water-budget practice. Actual precision may be limited to two significant figures.
2. Values expressed as acre feet per year (afa) or as gallons-per-minute (gpm) equivalent, assuming continuous pumping.
3. Critically dry year deficit may be under estimated because fewer wells were in operation during the representative years from which data were obtained.
4. Hydrogeologic parameters of weathered bedrock could vary substantially and are poorly constrained by available data; estimated surplus/deficit could therefore be subject to significant revision.

Specific Notes

a. Estimate based on 76 acre portion of valley fill and lower hillslopes; precipitation less runoff less estimated annual evapotranspiration.
b. Estimate based on 341 acre contributing area undissected by channels and 90% of runoff percolating to water table.
c. Estimate based on mean percolation rate of 10^{-5} ft/s and 0.28 acre of channel area percolation surface.
d. Estimate based on hydrogeologic parameters of weathered bedrock.
e. Data from Exhibit 22, Appendix A, Table 1, State Public Utilities Commission file #85-06-010.
f. Combined production rate is about double current production; high rate may be associated with initial operation of these wells.
g. Estimate based on hydrogeologic parameters of valley fill and weathered bedrock to a depth of 300 feet; also see Note 4.
h. Estimate based on direct precipitation less quantity estimated to infiltrate to water table.
i. Estimate based on channelized runoff less quantity estimated to percolate through channel bottom.

Inflows

Percolation from the channel to the aquifer is thought to occur throughout the stream reach within Wagner Valley, from approximately elevation 450 feet, where the channel crosses from the steep ravine of the upper watershed to the alluvium of Wagner Valley, and extends approximately to elevation 130 feet. This reach of Montara Creek is about 4,000 feet long. The wetted perimeter of the channel as it crosses Wagner Valley is about 3 feet, therefore, the surface area through which water may percolate to the aquifer is approximately 12,000 square feet, or 0.28 acres. Assuming 365 days flow duration, and rate of 0.00001 feet per second, annual percolation would be 88 acre feet.

To estimate inflows to the main stem of Montara Creek from the steep upper valley watershed (279 acres), the runoff factors described above were applied to elevation-adjusted precipitation of 37 inches, 28.5 inches, and 21.8 inches for normal, dry and critically dry years. Based on these values, dry year runoff is approximately equivalent to maximum percolation (88 acre feet). Critically dry year runoff supported substantially-reduced percolation of 21 acre feet.

Steeply-sloping areas of the Montara Creek watershed not drained by the main stem of Montara Creek are characterized by thin, coarse colluvial soils derived from granitic rock which thickens towards the upper edges of Wagner Valley. Numerous sub-watersheds are present, but surface runoff is only beginning to be concentrated in well-defined channels.

This geomorphology suggests that surface runoff from upper slopes dissipates and infiltrates into the thicker colluvium at the boundary of Wagner Valley.

Utilizing the standard runoff factors, and elevation-adjusted rainfall of 32.0, 24.6, and 18.9 inches for normal, dry, and critically dry years respectively, and assuming that 90 percent of watershed runoff infiltrates the colluvial wedges adjacent to Wagner Valley, estimated aquifer recharge was 166 acre feet, 85 acre feet, and 20 acre feet in normal, dry and critically dry years, respectively.

The estimate of direct infiltration of precipitation through the soil surface to the aquifer on the floor of Wagner Valley is based on an area of 76 acres, a runoff rate of 10 percent, and precipitation of 30 inches, 23.1 inches, and 17.7 inches in normal, dry and critically dry years. The low runoff rate is justified based on the coarse-textured soils and intensively-tilled agricultural use. Because evapotranspiration and soil moisture storage are directly estimated the watershed runoff factors (0.27; 0.75, 0.50 and 0.15) were not applied. Percolation was estimated by subtracting 10 percent of precipitation (i.e., runoff) from precipitation, and then subtracting 2.0 inches soil moisture storage and 6.5 inches evapotranspiration (December through March). The resulting difference represents estimated percolation; 117 acre feet, 78 acre feet, and 47 acre feet for normal, dry, and critically dry years respectively.

A fourth contribution to the Upper Montara aquifer is throughflow in the weathered bedrock of Montara Mountain, which occurs as a slow, relatively-constant drainage from fractures in the granite bedrock. Caltrans, for example expected substantial seepage in roadcuts in this area (Wisney 1983). The estimate of through-flow was based on conservative estimated values for hydrogeologic parameters. The resulting estimated inflows to the aquifer were 87 acre feet, 68 acre feet, and 50 acre feet in normal, dry, and critically dry years, respectively. The estimated decline in this inflow during dry years is consistent with the properties of fractured and deeply weathered bedrock.

Aquifer Outflows

Outflows from the Wagner Valley/Upper Montara Creek aquifer were estimated primarily from California Public Utility Commission records of pumpage from each of the public water-supply wells operated by the Citizens Utility Company of California (CUCC). The withdrawals from individual wells for the year 1984 were used to represent those occurring in years with normal rainfall. Pumping during water year 1981 represented dry year conditions; averages for the years 1976 and 1977 represent dry year conditions. Because there were fewer CUCC wells in operation during the critical dry years of 1976 and 1977 (Portola wells #3 and #4 were installed in 1981), probable pumping rates under current conditions during a critically dry year may be underestimated.

An additional aquifer outflow component is ground water outflow at the lower end of Wagner Valley. This outflow includes outflows estimated for both the alluvial valley fill and for the deeper weathered bedrock. Because of presumed changes in ground water gradients under different hydrologic conditions, this outflow component decreases under progressively drier hydrologic conditions (Table 4), totaling 123 acre feet, 97 acre feet and 70 acre feet in normal, dry, and critically dry years, respectively..

Surface Water Outflows

Outflows from the Upper Montara Creek watershed to Lower Montara Creek, conceptualized as streamflow, were based on the same runoff calculations used in the aquifer inflow estimates. Outflows include the runoff components that do not percolate to the aquifer. The bulk of these flows occurs as peak flows from storm runoff between November and May. The additional outflow as surface water is the ground water outflow to Lower Montara Creek, less the quantity estimated to percolate to the relatively unweathered, unfractured bedrock underlying the more porous fractured bedrock. Based on hydrogeologic parameters, approximately 8 acre feet percolates to the underlying, less porous bedrock in normal years.

Estimated Aquifer Surplus/Deficit

To estimate the volume of stored ground water in the aquifer, the estimated outflows are subtracted from estimated inflows. For normal rainfall and recharge years, we have estimated a net surplus of 32 acre feet. We have estimated a deficit of 50 acre feet in dry years (i.e. 1981). In the critically dry years of 1976 and 1977, the estimated deficit was 110 acre feet.

The estimated hydrologic surplus in the Upper Montara Creek sub-unit (Wagner Valley aquifer) may indicate that the aquifer contains additional utilizable water. Alternatively, the normal-year surplus may compensate for dry-year deficits, suggesting that development of additional wells could affect dry year performance of existing wells. In any event, the nearly continuous well operation lowers the water table, inducing percolation of surface water and shallow ground water to the deeper, weathered-granitic aquifer developed by the wells.

The water balance indicates that the aquifer would have a surplus of water ranging from about 235 acre feet in normal rainfall years to about 70 acre feet in critically dry years if no wells were in operation. This surplus would presumably support higher streamflows, greater aquifer storage, and perhaps greater evapotranspiration. As currently managed, much "surplus" ground water is harvested annually. The yield of the wells is approximately balanced by aquifer recharge in normal hydrologic years. In dry and critically dry years, pumping apparently exceeds the rate of replenishment. The extent to which the water budget reflects actual conditions cannot be easily determined without additional hydrologic data.

5.4.3.6 UPPER MOSS BEACH AND MOSS BEACH TERRACE SUB-UNITS

Moss Beach Terrace and Upper Moss Beach are adjoining and closely-related hydrologic sub-units. They differ primarily in that the primary aquifer in the former is the terrace deposits, whereas weathered and fractured granitic rock is the source of water supplied to wells in Upper Moss Beach. The terrace aquifer may also receive recharge from San Vicente and Dean Creeks. The granitic rocks of Upper Moss Beach may discharge to or be recharged from Montara Creek; without water-level data, the direction over the course of the year of flow cannot be readily determined, although the volume of flow is assumed to be small.

Although the aquifer properties and type of wells used in developing ground water in the two sub-units differ substantially, ground-water movement appears sufficiently linked such that a unified water budget is more useful for assessing the effects of the proposed project.

The two sub-units, when considered together, are referred to as the Moss Beach sub-unit. A water budget for the combined sub-units is presented in Table 9.

TABLE 9

WATER BUDGET: MOSS BEACH TERRACE AND UPPER MOSS BEACH SUB-UNITS

	Normal Hydrological Year (1984		Dry Hydrological Year (1981)		Critically Dry Hydrological Year (1976 or 1977)	
	(afa)	(gpm)	(afa)	(gpm)	(afa)	(gpm)
Inflows to Moss BeachTerrace Aquifer						
Direct Infiltration From Precipitation [a/]	144	89	66	41	7	4
Recharge From Channelized Flow, Dean Creek [b/]	22	14	14	9	5	3
Recharge From Upper Dean Creek Alluvium [c/]	6	4	6	4	6	4
Recharge From Channelized Flow, San Vicente Creek [d/]	66	41	66	41	33	20
	—	—	—	—	—	—
Subtotal	**238**	**148**	**152**	**95**	**51**	**31**
Estimated Surplus or Deficit in Terrace Aquifer	**104**	**65**	**58**	**37**	**9 to-29**	**6 6 to -18**
Outflows from Moss Beach Terrace Aquifer						
Terrace Groundwater Outflow[e/] at Seacliff	134	83	94	58	40-80	25-49
Subtotal	**134**	**83**	**94**	**58**	**40-80**	**25-49**

TABLE 9 (continued)

WATER BUDGET: MOSS BEACH TERRACE AND UPPER MOSS BEACH SUB-UNITS

Surface Outflows to Ocean						
Runoff From Direct Precipitation[f/]	203	125	156	96	120	74
Channelized Runoff, Dean Creek [g/]	64	40	30	19	5	3
Subtotal	**267**	**165**	**186**	**115**	**125**	**77**
Throughflow in Upper Moss Beach Bedrock Aquifer [e/]	8	5	7	4	6	4
Outflows from Upper Moss Beach Bedrock Aquifer [e/]	8	5	7	4	6	4
Estimated Surplus or Deficit in Bedrock Aquifer	0	0	0	0	0	0

General Notes

1. Values are computed arithmetically, in keeping with water-budget practice. Actual precision may be limited to 2 significant figures.
2. Values are expressed as acre feet per year (afa) or as gallons-per-minute (gpm) equivalent, assuming continuous pumping.

Specific Notes

a. Estimate based on total incident precipitation, less estimated runoff, less estimated evapotranspiration December through March; includes contribution from Upper Moss Beach sub-area, where soils and terrace deposits are assumed to have negligible hydrogeologic connection with bedrock aquifer.

b. Estimate based on mean percolation rate of 1 x 10^{-5} ft/sec and 0.28 ac. of channel area, (i.e., 0.24 ac-ft/day), normal year flow duration = 90 days, dry year = 60 days, critically dry year = 20 days. Assumed that all flows infiltrating through the channel bottom enter the terrace aquifer.

c. Estimate based on 5000 sq.ft. cross-section of saturated alluvium and k = 1.0 gpd/ft^2; assumed entire flow percolates from alluvium to terrace aquifer. Also assumed saturated thickness of alluvium is unchanged, regardless of annual rainfall.

d. Estimate based on assumed perennial flow conditions, mean percolation rate of 1 x 10^{-5} ft/sec and 0.21 ac of channel area. All flows assumed to ent the terrace aquifer following percolation to alluvium.

e. Estimate based on hydrogeologic parameters.

f. Estimate based on runoff factor of 0.4; value established for urbanized watershed in Colma, California (Knott, 1973).

g. Estimate based on estimated watershed runoff, less estimated infiltration through channel bottom.

Inflows

Water entering the Moss Beach terrace aquifer can be separated into four distinct components: direct infiltration from precipitation, net recharge from Dean Creek, net recharge from San Vicente Creek, and shallow ground water inflow from the alluvium of upper Dean Creek and other upgradient aquifers. Estimates of the magnitude of these components are discussed individually below.

Direct infiltration from precipitation to the Moss Beach terrace aquifer was conceptualized to occur over an area larger than the effective area of the aquifer. This concept was in part suggested by wells and boring logs which indicated that a distinct aquifer underlies Upper Moss Beach (located on the hill separating the community of Moss Beach from Montara Creek). The portion of Upper Moss Beach aquifer that is utilized for water supply wells is at depths of a few hundred feet in granitic rock. This hydrogeologic distinction and the thin wedge of terrace deposits overlying the Upper Moss Beach aquifer (which thickens under Moss Beach) indicated that infiltrating precipitation was more likely to be entering the Moss Beach terrace aquifer. Consequently, the watershed over which rainfall recharge was estimated included the area overlying the Upper Moss Beach aquifer; the bedrock aquifer was considered separately.

Recharge from rainfall was estimated as the difference between rainfall and runoff, and then subtracting estimated soil moisture storage (2.0 inches) plus estimated evapotranspiration during December through March (6.5 inches). In this semi-urban area, an appropriate runoff factor is 0.4 (Knott, 1973). The other components in the estimate have been described elsewhere. The resulting aquifer recharge from rainfall during a year of normal precipitation was 144 acre feet. Dry years and critically dry years provided computed recharge of 66 acre feet and 7 acre feet, respectively.

Recharge of the aquifer by percolation from Dean Creek was estimated by first estimating runoff from the watershed of Dean Creek upstream of the terrace aquifer, and then estimating percolation from the channel of Dean Creek as it crosses the terrace aquifer. The standard runoff coefficients (described above) were applied to the Dean Creek watershed (170 acres), upon which 30 inches of precipitation falls during normal hydrologic years, 23 inches during dry years, and 17.6 inches during critically dry years. Because Dean

Creek is an intermittent stream, it was necessary to assume flow duration under different hydrologic conditions. Normal year flow duration was estimated to be 90 days; dry year and critically dry year flow duration were estimated to be 60 days and 20 days, respectively. Applying these flow durations to an estimated channel area (percolation surface) of 0.28 acres and assuming a percolation rate of 0.00001 feet per second (same rate applied for Upper Montara Creek), the volume of water percolating to the aquifer during normal, dry and critically dry years was estimated to be 22, 14, and 5 acre feet, respectively. Recharge of the aquifer by percolation from San Vicente Creek was estimated by assuming perennial flow conditions, an estimated percolation rate of 0.00001 feet per second, and an estimated 0.21 acres of channel area. An estimate of runoff from the San Vicente Creek watershed under varying hydrologic conditions was not made because substantial unquantified diversions for agricultural use would confound attempts to estimate annual flow reaching the stream channel crossing the Moss Beach terrace aquifer. Instead, it was assumed that there would be adequate flow in normal and dry years to recharge the aquifer at the maximum percolation rate, resulting in inflows of 66 acre feet. In a critically dry year, it was assumed that the combination of increased agricultural diversions and diminished precipitation would reduce flows through the reach of San Vicente Creek which crosses the Moss Beach terrace aquifer, resulting in half as much percolation, 33 acre feet.

An additional small inflow to the Moss Beach terrace aquifer is percolation of shallow ground water in the alluvium of Dean Creek as its channel crosses onto the terrace deposits. The estimated annual inflow from this source was 6 acre feet, based on an estimated cross-sectional area of saturated alluvium of 5000 square feet and flow at the rate of 1 gallon per day per square foot. It was also assumed that this inflow did not fluctuate with hydrologic conditions; this appears reasonable because the reach of Dean Creek where this inflow would occur at the base of the watershed, is in a relatively entrenched valley, and would thus probably receive maximum inflows from upstream and from the weathered granitic bedrock which encompasses the valley.

Inflows to the bedrock aquifer were estimated from hydrogeologic parameters. These inflows may be considered as slow through-flows from the coastal mountains to the ocean. The estimated inflows were 8 acre feet, 7 acre feet, and 6 acre feet in normal, dry and critically dry years.

Outflows

Three outflow components were estimated -- surface water outflows and terrace ground water outflows, and bedrock ground water outflows. Surface outflows do not affect the estimated potential ground water resource under current conditions. Surface outflows are the sum of runoff from direct precipitation (40 percent of precipitation is runoff) and Dean Creek watershed runoff that did not percolate. San Vicente Creek flows reaching the ocean would also be added if an estimate of these flows had been made. Surface water outflows represent a potential source of additional aquifer recharge, if a satisfactory means of collection and percolation were available, and if adverse effects on biota were not anticipated.

Terrace ground water outflows were estimated by assuming Darcian flow conditions and using the hydrogeologic parameters given in Table 4. Ground water outflows from the terrace aquifer were presumed to occur at the base of the seacliff, and estimates for outflows under different hydrologic conditions were made based in part on the assumption that water table elevation, and thus ground water gradient, would decrease during dry and critically dry years. Outflows were estimated to be 134 acre feet in normal hydrologic years, 94 acre feet in dry years, and 40-80 acre feet in critically dry years.

Bedrock ground water outflows were assumed to be equal to bedrock ground water inflows, consistent with our conceptualization of these flows as relatively static throughflows.

Estimated Surplus or Deficit in Aquifer

The water balance indicates that during normal and dry years, there is a surplus in the terrace aquifer of 104 acre feet and 58 acre feet respectively. During critically dry years, the water balance indicates conditions ranging from an estimated surplus of 9 acre feet to a deficit of 29 acre feet. The bedrock aquifer was estimated to have no surplus (inflows assumed to a equal outflows), nevertheless, small quantities of utilizable water may be available from the bedrock aquifer.

5.4.3.7 UPPER SEAL COVE SUB-UNIT

This sub-unit of the terrace aquifer is located on a coastal bluff west of the Half Moon Bay Airport and south of San Vicente Creek, and is isolated from other hydrologic sub-units. Estimated inflows to the terrace aquifer in this sub-unit are limited largely to precipitation. The hydrologic balance for the Upper Seal Cove sub-unit is summarized in Table 10.

Inflows

Percolation to the aquifer from direct precipitation was estimated by subtracting runoff (40 percent of precipitation), and then subtracting estimated soil moisture storage and estimated evapotranspiration (December through March), with the resulting difference representing aquifer recharge. In this sub-unit, evapotranspiration was assumed to be 4.5 inches (rather than the 6.5 inches applied in all other sub-units) because of the relative absence of vegetation and the microclimate of this small coastal bluff where salt-spray and wind exposure tend to prevent establishment of large plants. Infiltration of precipitation to the Upper Seal Cove terrace aquifer was estimated to be 14 acre feet in normal hydrologic years, 8 acre feet on dry years, and 4 acre feet in critically dry years.

Outflows

Ground water outflows from the aquifer at the seacliff was estimated based on hydrogeologic properties of the terrace deposits only. The geologic complexity of this sub-unit and the lack of apparent sources for inflows to the bedrock forced us to apply the water balance only to the terrace deposits, for which reasonable assumption can be made. In normal hydrologic years, outflow was estimated to be 13 acre feet; in dry years and critically dry years, outflows were estimated to be 5 and <1 acre feet respectively.

Estimated Surplus or Deficit in Aquifer

Unlike other subunits, the water balance appears to indicate that little or no surplus water is available in the aquifer, that is, that inflows and outflows are in approximate balance. Aquifer outflows may be considered as annual throughflow sustained by annual rainfall, therefore, aquifer outflows may be considered as available ground water. Because the

TABLE 10

WATER BUDGET: UPPER SEAL COVE TERRACE SUB-AREA,

	Normal Hydrological Year (1984 (afa)	 (gpm)	Dry Hydrological Year (1981) (afa)	 (gpm)	Critically Dry Hydrological Year (1976 or 1977) (afa)	 (gpm)
Inflows to Aquifer						
Direct Infiltration from Precipitation [a/]	14	9	5	3	2	1
Subtotal	14	9	5	3	2	1
Outflows from Aquifer						
Ground Water Outflow at Seacliff [b/]	13	8	5	3	2	1
Subtotal	13	8	5	3	2	1
Estimated Surplus or Deficit in Aquifer	1	1	0	0	0	0

General Notes

1. Values are computed arithmetically, in keeping with water-budget practice. Actual precision may be limited to 2 significant figures.
2. Values are expressed as acre feet per year (afa) or a gallons-per-minute (gpm) equivalent, assuming continuous pumping.

Specific Notes:

a. Estimate based on total incident precipitation, less estimated runoff, less estimated evapotranspiration December through March less seasonal soil-moisture replenishment; about 30[illegible]ess evapotranspiration is assumed for this sub-area relative to other sub-units, as less vegetation is present in this sub-area than in others.

b. Estimate based on hydrogeologic parameters of terrace deposits; assumes that terrace deposits and bedrock have negligible hydrogeologic connections.

Upper Seal Cove sub-unit is small, and because storage capacity is thought to be small, the aquifer may be susceptible to depletion during dry and critically dry years. The water balance indicates that potential ground water resources in this sub-unit may be quite limited relative to other sub-units in the Montara - Moss Beach study area.

5.4.4 WATER QUALITY

Water quality is an obvious primary concern for the protection of public health. Secondary concerns include additional costs associated with treatment systems that may be necessary to provide water of adequate quality. Lastly, long-term water quality trends provide important data for aquifer management and are often primary indicators of progressive overdraft or ground water depletion.

Domestic water wells in coastal San Mateo County are tested for iron, manganese, chloride, nitrate and specific conductance prior to final certification by the San Mateo County Department of Health Services. Water quality data for 19 wells in the Montara-Moss Beach area were available for review for this study (Table 11). However, as the location of these wells is not evenly distributed across the area, only general inferences can be made regarding water quality on a regional basis.

5.4.4.1 IRON AND MANGANESE

State water quality limits for iron and manganese in drinking water are set at 0.3 and 0.05 milligrams per liter (mg/l), respectively. These limits are set for reasons other than protection of public health; primarily related to potential incrustation of pipes, staining of bathroom fixtures, and taste and odor. These constituents are moderately abundant in ground waters in the Montara-Moss Beach area due to the chemical composition of the terrace deposit sediments and the granitic bedrock from which the sediments are derived.

Approximately one-third of the existing wells for which water quality data were available exceed the drinking water standard for iron and/or manganese and probably require water treatment systems prior to domestic use. However, sufficient information is not available to allow analysis of the geographic distribution of these constituents. In any case, the occurrence of iron and manganese in ground waters is primarily of concern for commercial production due to associated treatment costs.

TABLE 11

REPORTED WATER QUALITY FOR WELLS MONTARA - MOSS BEACH AREA

Well[a]	Chloride (mg/l)	Specific Conductance (umhos/cm)	Iron (mg/l)	Manganese (mg/l)	Nitrate (mg/l NO3)	Coliform [b] (MPN/100ml)
1	100	520	0.1	0.05	12	45/<1
2	128	669	0.3	0.77	21	<2.2
3	66	270	0.4	0.02	<1	16/<2.2
4	110	470	0.2	0.05	8.2	6/<1
5	136	560	2.0	0.46	<.5	<1
6	163	770	0.3	0.66	<1	91/<1
7	--	--	--	--	--	--
8	50	460	0.1	0.05	<1	<2.2
9	--	--	--	--	--	--
10	40	270	0.1	0.03	<1	<2.2
11	44	250	0.35	0.12	2	16
12	--	--	--	--	--	--
13	--	--	--	--	--	--
14	--	--	--	--	--	--
15	49	406	0.33	0.03	26	<1
16	--	--	--	--	--	<2.2
17	--	--	--	--	--	--
18	100	520	0.1	0.05	12	<1
19	--	--	--	0.01	--	<1
20	360	1700	0.32	0.12	<1	<2.2
21	--	--	--	--	--	--
22	--	--	--	--	--	--
23	147	801	0.08	0.64	21	<2.2
24	130	505	0.3	0.03	3	<2.2

TABLE 11 (continued)

REPORTED WATER QUALITY FOR WELLS
MONTARA - MOSS BEACH AREA

Portola 3	97	600	0.1	0.02	<.5	--
Portola 4	96	590	0.1	0.02	<.5	
Park	100	620	1.9	0.48	1	--
Wagner 3	48	320	0.1	0.02	2.5	--
Drake	59	370	0.1	0.02	2.1	--

(a) Locations of wells shown in Figure 7
(b) Notation 45/<1 indicates initial test result of 45 and subsequent result of <1

5.4.4.2 CHLORIDE

Chloride concentrations reported for wells in the Montara-Moss Beach area are low to moderate. Reported levels range from approximately 45 milligrams per liter (mg/l) in the upland areas near Wagner Valley to 150 mg/l for wells in the Moss Beach Terrace area. The recommended long-term allowable maximum for chloride is 250 mg/l.

Chloride is often a diagnostic feature of ground water depletion or overdraft as salt content tends to increase during times of diminished recharge. Other studies (Kleinfelder, 1988). have suggested that chloride content in the San Mateo coastal area may in part be affected by upwelling of deeper waters within fault or fracture zones of the granitic bedrock, and as such may not be strictly an indication of sea water intrusion. Seawater intrusion is not considered to be a significant possibility as the majority of ground water withdrawals will occur from zones well above sea level.

5.4.4.3 NITRATE

Nitrate content in ground waters may be related to a variety of factors both naturally occurring and man made. These factors include natural organic material in sediments or rock type, soil chemistry or deep percolation of contaminated waters related to agriculture, livestock, broken sewer lines or septic system leachate. Water quality standards for nitrate as NO_3 are placed at 45 mg/l. Nitrate concentrations above this level may produce toxic effects in young infants (cyanosis, or "blue-baby syndrome"). These toxic effects are not reported in adults or older children.

All of the wells reviewed during this investigation were found to meet the California primary water-quality standards for nitrate. Levels of nitrate as high as 26 mg/l were reported for individual wells, but most were reported to be less than 5 mg/l. The reasons for isolated occurrences of elevated levels is unknown but may most probably be related to septic systems or livestock. It should be noted that much of the upper drainage of Dean Creek along Sunshine Valley Road passes through a large area developed as stables. As this drainage recharges the Moss Beach Terrace sub-area, it is possible that new wells installed in the vicinity of Etheldore and Vermont in Moss Beach may encounter elevated nitrate levels. For example, one existing well at Cypress Avenue near Highway 1 reports a nitrate level of 21 mg/l, indicating that this general area may be of particular concern with regard to nitrates.

5.4.4.4 SPECIFIC CONDUCTANCE

Specific conductance, or conductivity, is a measure of the ability of a fluid to transmit an electric current. This ability is closely related to the concentration of salts and other dissolved solids in the water. Pure water has a very low specific conductance; as ionic concentrations increase, specific conductance also increases, generally in a linear manner for the moderate levels observed in the Montara-Moss Beach area. Specific conductance is measured in micromhos per centimeter at 25° C. The recommended maximum for specific conductance in drinking water is 900 umhos/cm, although higher levels are allowed.

Average reported specific conductance for 18 of the wells in the Montara-Moss Beach area with available data is approximately 555 umhos/cm. Individual values ranged from 250 to 800 umhos/cm. One well (not included in the average) along Sunshine Valley Road near Hawthorne had a reported specific conductance of 1700 umhos/cm, exceeding the highest drinking-water maximum of 1600 umhos/cm. This well also exceeded the standards for iron and manganese, but contained less than 1 mg/l nitrate. The reason for the presence of high dissolved solids in this well is not known, but may be related to upwelling of deeper waters along a specific fracture zone or fault in the granitic bedrock.

5.4.4.5 DISCUSSION

Available data indicate generally fair water quality within the Montara-Moss Beach area although treatment is commonly required for iron and manganese. It is interesting to note that the drillers log for one well on 2nd Street in Montara indicated the presence of petroleum hydrocarbons in the terrace sediments at depth. These zones were sealed during well construction and may not have a detrimental effect on water quality from the well. However, it does indicate that constituents other than those routinely analyzed for in accordance with well certification processes may affect water quality. Of particular concern is the introduction of fuel or chemical solvents into the ground water supply via leaking underground storage tanks or other private or commercial disposal practices.

During our investigation, a moderate amount of debris including old ties, buckets and motor oil cans were observed in the bottom of Dean Creek in the western portion of Moss Beach. These disposal practices can have detrimental effects on quality of ground water recharge. Well permitting in areas of commercial development may additionally require review by the County's Hazardous Materials Specialists to assess potential for ground water chemical contamination related to underground fuel releases or other known sources of contamination.

5.5 SOILS, EROSION, AND SEDIMENTATION

Soils in the Moss Beach and Montara areas are thought to reflect three primary formative influences: development from granitic parent material, the maritime climate and local relief and geomorphic position.

The U.S.D.A. Soil Conservation Service investigated soils in Moss Beach and Montara and surrounding areas both during the early 1950s (USDA Soil Conservation Service, 1954) and during the late 1980s (USDA Soil Conservation Service, in prep.). Following established policy, the agency has not mapped within the communities, but has undertaken systematic work in adjacent unbuilt areas. The Miramar, Scarper, Farallone, Tierra, Elkhorn, and Dennison soil series are mapped immediately adjacent to the urban area in settings similar to those found within the towns. The first two are upland soils developed on bedrock, and the last three are soils of marine terraces and adjoining colluvial areas. The Farallone soils occur in alluvial settings.

All of the soils have a large sand component, low organic content, and low to moderate moisture-holding capacity, reflecting their granitic origin. All are erodible; in most cases, the soils are extremely erodible. Cation-exchange capacities in soils other than Dennison are very low, typically less than 10 millequivalents per 100 grams. Limitations for septic systems are designated by the agency as 'severe' for all soils which have been rated.

The sandy and friable character of the soils results in two groups of processes which contribute to erosion. First, virtually all disturbed surfaces are dissected by rills and gullies which form upon them during the first rains. Second, because natural rates of infiltration are high, activities resulting in soil compaction leads to disproportionate degrees of gully formation. Land-use activities which have graded or compacted the soil surface or which have channelized runoff have resulted in formation of long eroding channels, usually several feet deep, which have incised headward for the entire length of valley floors which were slow-draining grassy swales until 10 to 20 years ago. These effects are most evident in upper Dean Creek and in Wagner Valley. The processes and causes of channel incision and drainage-network formation are typical of the sandy soils of the central California Coast. The rates of erosion, and consequences for loss of recharge have been explored in considerable depth (Hecht, 1984; USDA Soil Conservation Service, 1984) in Santa Cruz, Monterey and San Luis Obispo Counties, where soils of granitic origin are more widespread than in San Mateo County.

5.6 BIOLOGY

5.6.1 BACKGROUND

In pre-settlement times, the land around the present day communities of Montara and Moss Beach in San Mateo County was a mosaic of coastal prairie grassland on the flat and gently rolling terraces; coastal scrub on the terraces and steeper hillsides; and riparian thickets and woodlands along the perennial and intermittent streamcourses. Except for the willows and alders growing in the riparian areas, the nearest trees would have been the Douglas fir and redwood trees along the mountain ridges and protected valleys to the east.

Pockets of freshwater wetland vegetation grew around the many seeps and minor springs that occur throughout the region, along sluggish portions of the coastal streams, and at the mouths of these streams where they reached the beach and sea. The most well-developed wetland in the area, the Pillar Point marsh, lies just south and east of this study area, where the Seal Cove fault enters Half Moon Bay.

The steep oceanfront bluff that overlooks the beaches all along the study area dominated the coastline in pre-settlement days as it does now. Since there were no well developed sand dunes along this stretch of coast, characteristic coastal strand vegetation occurred only in small pockets above high water. Localized patches of wetland vegetation along the actively eroding cliff faces marked the outcropping of water-bearing sediments. The beach and cliff face remain much the same today, although in recent years some riprap and concrete has been placed along the cliff face in the Moss Beach area in an attempt to control erosion.

While there are still a few examples of native, presettlement plant communities in the Montara-Moss Beach community, most of the present day vegetation reflects the cultural history and the current level of human activity in this residential coastside community.

Introduced Mediterranean annual grasses have become the most common and widespread grassland type in California. Throughout the state these annual grasses have replaced native perennial bunchgrasses, particularly where there is grazing or other periodic disturbance to the land. In the Montara-Moss Beach area, introduced annual grasses predominate, although in some places native bunchgrasses and other coastal terrace prairie species are becoming reestablished on open areas that are no longer used for grazing or agriculture.

The eucalyptus, Monterey cypress, and Monterey pine trees that now dominate the coastside landscape were first planted on a widespread basis as street trees and windbreaks in the early 1900's and have become naturalized throughout the area. Other introduced plants have escaped from cultivation and become established components of the coastside flora. Several of these plants, including pampas grass, French broom, Bermuda buttercup, and German ivy have become invasive pest species, forming aggressive stands that out compete more desirable native plants.

5.6.2 HABITAT TYPES

Individual parcels included in this study were visited and examined in detail sufficient to characterize the existing vegetation and wildlife habitat values; identify any sensitive resources or unusual features that might be present; and evaluate potential onsite and offsite impacts that might be associated with development of the parcel.

In addition to the field survey, other sources of information about the study area were reviewed, including air photos, San Mateo County sensitive features maps, and published environmental reports (particularly Mayfield and Shadle, 1983; Martz and Shadle, 1983, California Department of Transportation, 1986). Knowledgeable individuals from the U.S. Fish and Wildlife Service; California Department of Fish and Game; University of California, Davis; California Natural Diversity Data Base; and others were interviewed about specific resources of the study area.

The various types of vegetation and wildlife habitat encountered on the specific study parcels have been grouped into the following classifications, described below: riparian; coastal grassland; wetland; aquatic; ruderal; residential; eucalyptus stand; conifer stand; and developed. Site-specific information for each individual parcel is presented in Appendix B. Explanatory notes and maps provide further information on parcels with sensitive resources. A more complete list of plants identified in the study area, including scientific names, is presented in Appendix E.

Because the descriptions below summarize existing habitat on the specific study area parcels only, not all habitat types in the study area are included. For example, northern coastal scrub covers many acres in the study area vicinity and has been described in some detail by others (Mayfield and Shadle, 2983; Holland, 1986). While this habitat type is widespread in the region, it grows mainly outside the urban limits and essentially no stands of coastal scrub occur on the individual parcels surveyed for this report.

5.6.2.1 RIPARIAN

Well-developed native streamside or riparian vegetation grows along a number of the watercourses in Montara and Moss Beach. Characteristic species include arroyo willow, Coulter's willow, red alder, flowering current, stinging nettle, poison oak, and creek dogwood. The most well-developed, continuous stands of native riparian habitat in the study area occur along Montara Creek in the ravine between Montara and Moss Beach; on the upper reaches of this same creek, on the flat alluvial lands east of Elm Street in Montara; and along portions of Dean and San Vicente Creeks in Moss Beach. The riparian habitat along lower Montara Creek is one of the most significant natural resources in the study area. Specific parcels containing riparian vegetation which meets the LCP definition as a sensitive habitat (Sections 7.7 through 7.13 of the LCP; see also discussion below in this report) are so designated in Appendix B.

Damaged or modified riparian habitat occurs where native vegetation has been removed and/or replaced with introduced plant material. Examples of modified or damaged riparian habitat exist throughout the study area. One obvious example is along Montara Creek where it parallels Montara Boulevard; native riparian vegetation in this section has been replaced almost completely by Monterey pines and ruderal vegetation. German ivy has become locally invasive in some of the riparian areas on the coastside where it blankets the understory vegetation. An obvious example of German ivy infestation occurs along Dear Creek adjacent to Sunshine Valley Road in Moss Beach. Some damaged riparian areas are indicated on the San Mateo County Sensitive Features Map.

Riparian habitat provides exceptionally valuable wildlife habitat to both resident and migratory birds and other animals. The presence of year-round or seasonal moisture in riparian areas increases the biological productivity of these areas, particularly in contrast to the summer-dry surrounding habitats. Insects and other detritus feeders are more common in the damp streamside areas; in addition to facilitating the return of organic material to the environment, these invertebrates provide food for larger animals. Riparian vegetation stabilizes banks, minimizing turbidity, and moderates streamwater temperatures, creating more optimal conditions for many aquatic organisms.

Bands of riparian vegetation form linear corridors of protective cover. Resident birds and mammals use these corridors during daily hunting and territorial travel; migratory birds use riparian corridors as resting and feeding habitat as well. In an exposed grassland or coastal prairie setting, the structural diversity provided by a strip of trees, scrubs, and herbaceous vegetation is very attractive to wildlife. In the study area, riparian vegetation may occupy the relatively deep ravines or barrancas formed by coastal streams, or form a more prominent stand along streams in flat, alluvial lands.

The communities of Montara and Moss Beach are located along the coastal portion of the Pacific flyway, the migratory route used by North American waterfowl and shorebird populations. Large numbers of land birds use this flyway as well. As migratory birds pass through the study area, shorebirds and waterbirds find suitable resting and feeding habitat along the coastal strand and offshore waters. While land birds do use the trees and shrubs of the residential forest to some extent, the riparian areas provide the greatest diversity of feeding and resting opportunities. Most of the animals in the coastal prairie and coastal scrub habitat use the riparian areas as well.

Wildlife habitat values of riparian corridors are most significant where the linear strip of vegetation is uninterrupted or undisturbed, and where the corridor is adjacent to undeveloped lands, although patches of riparian vegetation can be important on a local level.

5.6.2.2 COASTAL GRASSLAND

Well-developed examples of native coastal terrace grassland are found just outside the study area on the slopes of Montara Mountain. These grasslands are dominated by native perennial bunchgrasses, and occupy hillsides and terraces where soil depth and moisture are apparently insufficient to support coastal scrub. Coastal terrace grasslands are considered by the California Natural Diversity Data Base to be a significant natural community (Holland, 1986).

Smaller patches of coastal grassland are becoming reestablished within the study area on sites that have been free from grazing, agriculture, or other disruptive uses for some period of time. In the Montara-Moss Beach area, the native perennial grasses **Danthonia californica** and **Stipa pulchra** begin to reappear in fallow fields within two or three years after cultivation or grazing is discontinued, and form well-established stands in ten years' time. These native grasses typically grow with a mosaic of native and introduced species, including blue-eyed grass, beach strawberry, pacific grindelia, checkerbloom, California poppy, prostrate coyote brush, hairy cat's ear, narrow-leafed plantain, wild radish, pampas grass, and introduced annual grasses, primarily wild oats, ripgut broom, Italian ryegrass, and soft chess. Juncus effusus, bog rush, is a frequent component of coastal grasslands, marking small seeps and other spots where water is available at shallow soil depths.

Coastal grassland areas are distinguished from ruderal lands (see below) and annual grasslands by the percent cover of native perennial grasses and other native plants. For the purposes of this report, a site with less than 10% native plant cover is considered to be ruderal or annual grassland; 10% to 20% cover, coastal grassland; 20% or greater cover, coastal terrace prairie, following the definition of Holland (1986). Percent cover estimates were made by visual approximation during the field inventory.

Frequently coyote brush, coffeeberry, and yellow bush lupine occur with the herbaceous coastal grassland plants. Over time it is likely that many of these coastal prairie areas will develop into coastal scrub. At this time, however, there is essentially no mature coastal scrub on any of the specific study parcels.

One parcel examined for this study contains several acres of unique coastal grassland. Located immediately above the ocean bluff in Moss Beach, this native grassland is composed almost entirely of June grass (Koeleria cristata), growing in association with Armeria maritima and Erynglium armatum. Although June grass is not a rare species along the coast, particularly inland on the ridges and hillsides, this solid stand of June grass next to the ocean is botanically unique in the study area. Vernally wet depressions throughout this coastal grassland add to the diversity and interest of the site.

California strawberry, **Fragaria chiloensis**, is a unique native plant protected by provisions of the San Mateo County LCP (see further discussion below under Sensitive Features). California strawberry grows in coastal grasslands; its range extends inland only as far as the dense fog belt. On the specific study parcels, strawberries are found in open grassland, on road cuts and embankments, around the more shaded margins of bushes and trees in grassland areas, and in some ruderal habitats. Strawberries are found in other habitats as well, but primary habitat for the species is in coastal grasslands.

Coastal grassland areas provide the same wildlife habitat values as do other grassland areas, including abundant foraging opportunities for seed- and stem-eating small rodents and birds and unobstructed hunting territory for raptorial birds that rely on visual discrimination for prey capture. Animals that commonly hunt or inhabit coastal prairie include California vole, Botta's pocket gopher, coyote, western meadowlark, American kestrel, red-tailed hawk, and great horned owl. Since coastal prairie typically occurs in a mosaic with coastal scrub, animals resident in that shrubby habitat frequently hunt or feed in prairie grassland, and include black-tailed deer, grey fox, and weasel.

In the largely residential study area, actual wildlife use of any given parcel depends on its proximity to undeveloped lands or other valuable wildlife habitat.

5.6.2.3 WETLAND

Wetland habitat is defined in Section 7.14 of the LCP. Wetlands are characterized by high primary production and valuable wildlife habitat. In addition, wetlands store surface water, facilitating ground water recharge and providing natural flood control. Wetlands also act as biological filters, removing some contaminants from the ground water.

Only one small wetland was identified during the specific parcel inventory, immediately adjacent to several parcels in Montara (see Appendix B).

5.6.2.4 AQUATIC

Four streams mapped by the U.S. Geological Survey cross the study area: Montara Creek and San Vicente Creek are permanent streams, and North Montara Creek and Dean Creek flow intermittently. None of these streams have been systematically surveyed for aquatic life and there are no data on them in the CDFG files (Ulmer, pers. comm.). Barriers across the mouths of all four exclude steelhead, although there may be native fish in these watercourses (Benthin, per. comm.).

5.6.2.5 RUDERAL

Ruderal habitats are the most common habitat type on the specific study area parcels. They are characterized by a wide variety of weedy and commonly introduced plants growing where the native vegetational cover has been disturbed or removed. Ruderal vegetation is commonly found along roads, in and around agricultural fields, and on undeveloped residential lots. Dominant plants vary from site to site but typically include introduced Mediterranean annual grasses, wild radish, sow thistle, ice plant, sweet alyssum, poison hemlock, plantain, cheeseweed, and mustard.

Ornamental plants that have escaped from cultivation and become naturalized often are a conspicuous element of ruderal habitats in the study area and include nasturtium, periwinkle, calla lily, red-hot pokers, **Echium**, and pincushion flower. Several introduced plants commonly found in ruderal habitats are unusually aggressive and fast growing. Pampas grass, Bermuda buttercup, ice plant, and German ivy are the most problematic species in the study area, forming solid monotypic stands that choke out native vegetation and exclude essentially all other species as well. French broom is a serious pest species in other areas, but while present in the study area has not yet become as serious a problem as the four plants mentioned above.

While native plants, particularly shrubs like coyote brush and California blackberry, may occur in ruderal areas, in general they are a minor component of the overall vegetational cover. Ruderal habitats are usually predominantly herbaceous, but most include some shrubs and occasionally trees. In addition to coyote brush and California blackberry, other common ruderal shrubs are cotoneaster, **Pittosporum**, and tree mallow. California blackberry occasionally forms almost pure stands on sites that have apparently been cleared or otherwise disturbed. Because of their disturbed nature, these sites are considered to be ruderal. Trees most commonly found in ruderal habitats include a variety of acacias, large **Pittosporums**, Monterey cypress, Monterey pine, and blue gum eucalyptus.

Wildlife values of ruderal habitat varies widely. In general, sites with more diversity of plant species and some variety of growth form provide a greater opportunity for wildlife to find attractive cover and food than sites dominated by only one or a few kinds of plants. Adjacent habitat and land use can modify site-specific habitat values as well. Native plant associations in general provide more valuable wildlife habitat than introduced or naturalized vegetation.

5.6.2.6 EUCALYPTUS STAND

Blue gum eucalyptus, introduced from Australia, have become a prominent part of the California landscape. These trees grow rapidly, spread readily, and sprout abundantly from roods and stumps. In the study area, blue gum eucalyptus frequently form dense stands, with deep accumulations of peeling bark and leaf litter on the ground that inhibit the growth of other plants. Understory vegetation is sparse, consisting primarily of poison oak and California blackberry, with an occasional Monterey cypress or Monterey pine sapling, but little else. The shaded grassy margins of eucalyptus stands are typically excellent habitat for one of the wild strawberries, **Fragaria vesca californica**, which in these locations frequently grows in association with California strawberry (**F. chiloensis**). Blue gum eucalyptus seedlings are listed as a weedy, undesirable plant species in the San Mateo County LCP (Section 7.51).

The wildlife habitat value of eucalyptus stands is limited by the lack of food and protective cover there. The very slow decay of understory litter keeps nutrients locked up in the dead material, where it is unavailable to insects and other lower trophic level invertebrates. Sparse understory provides few nesting or feeding spots and little protective cover. However, hummingbirds and honeybees do make use of eucalyptus nectar, and raptorial birds, particularly red-tailed hawks, nest in the upper branches and use the tall treetops as hunting and roosting perches. No evidence of hawk nests was seen in eucalyptus stands on the specific study parcels, however.

If sufficiently dense and adequately protected from the wind, eucalyptus stands in the study area may provide habitat for overwintering monarch butterflies (see Section 5.6.3.1, Plant and Animal Species of Concern).

5.6.2.7 CONIFER STAND

Monterey pine and Monterey cypress naturalize easily and have become widespread since their introduction by early settlers. Monterey cypress in particular can form dense stands, with a heavily shaded, quite sparse understory, and essentially no ground cover aside from dead limbs and needle litter. Monterey pine stands are usually less dense, with a somewhat more diverse understory. Most conifer stands in the study area contain both pine and cypress.

When these conifers grow in close proximity to each other, they compete for crown and root space and are more subject to disease and windthrow than are open-grown trees. Monterey cypress 60 to 80 years and older, that have grown in crowded conditions, and that have not been pruned or maintained as they developed are most susceptible to disease and increased limb breakage (California Department of Forestry, 1980; Smith, pers. comm.)

Wildlife habitat value of conifer stands is limited by the sparse understory, although the foliage provides nesting, roosting, and feeding habitat for a variety of birds, and the high crowns are used by hawks, ravens, and other birds as lookout and hunting perches. If sufficiently dense and protected from the wind, conifer stands near the coast may provide habitat for overwintering monarch butterflies (see Section 5.6.3.1, Plant and Animal Species of Concern).

5.6.2.8 RESIDENTIAL

A number of parcels in the study area are being used by existing adjacent residences as extended lawns, play areas, gardens, parking lots, and storage areas, and are classified as residential. Most of these parcels are mowed or receive apparently frequent use. Vegetation of residential habitat is essentially the same as that found around homes in the study area, and ranges from mowed weeds and grasses to well-maintained lawn and garden areas. Because of the proximity of human activity and the frequency of disturbance, wildlife values of these habitats are generally low.

Parcels that already have a building on them or are in the process of being developed are designated. Wildlife habitat values of these parcels varies, depending on existing vegetation and surrounding habitat type, but is usually minimal.

5.6.3 UNIQUE FEATURES

Information on plant and animal species of concern in the study area vicinity was obtained by reviewing San Mateo County records; relevant published material (Mayfield and Shadle, 1983; Martz and Shadle, 1983); and current California Department of Fish and Game Natural Diversity Data Base records (CNDDB, 1988). In addition, persons with specific knowledge of study area resources were interviewed for the most current information.

5.6.3.1 PLANT AND ANIMAL SPECIES OF CONCERN

Two insects listed on the Federal Endangered Species List as endangered and three vertebrates listed on both the state and federal lists as endangered are reported from the project area vicinity: the San Bruno elfin butterfly, the Mission blue butterfly, the San Francisco garter snake, the brown pelican, and the American peregrine falcon (USFWS, 1973; CDFG, 1983; CNDDB, 1988; Martz and Shadle, 1983). Suitable habitat for the two butterflies occurs on hillsides north of the study area and would not be affected by the current project. No suitable habitat occurs in the immediate study area vicinity.

Peregrine falcons (**Falco peregrinus anatum**) are occasional visitors and migrants along the study area coastline, preferring tall trees and exposed crags for resting and hunting perches, and remote, protected cliffside aeries for nesting. Common prey species are small- to medium-sized birds, usually taken in flight. Although falcons are observed in this area, there is no evidence that they nest here (Martz and Shadle, 1983), and it is unlikely that they occur with any regularity in the largely residential study area. Brown pelicans (**Pelacanus occidentalis californicus**) are seasonal migrants along the San Mateo County coastline, fishing the offshore waters and roosting on rocky promontories and protected stretches of coastline (CDFG, 1983; Martz and Shadle, 1983). No suitable pelican habitat was identified on the study area parcels, although the birds pass quite close by parcels on the immediate oceanfront.

San Francisco garter snake (**Thamnophis sirtalis tetrataenia**) prefer habitat that includes a shallow, freshwater pond with emergent vegetation and a good supply of tree frogs (**Hyla regilla**) and red-legged frogs (**Rana aurora**) (CDFG, 1983; Brode, pers. comm., McGinnis, pers. comm.). Ephemeral ponds may provide adequate habitat if they support spring frog populations (McGinnis, pers. comm.). In addition to aquatic habitat, San Francisco garter snakes require upland areas with small mammal burrows, which they use for aestivation and birthing cover (Ulmer, pers. comm.; McGinnis, pers. comm.). Snakes have been known to travel several hundred yards into upland habitat, and to move from one drainage area to another (McGinnis, pers. comm.).

Documented occurrences of San Francisco garter snake in the study area vicinity include historic sightings at Pillar Point Marsh; ponds adjacent to the Half Moon Bay airport; and records dating from 1975 along Denniston Creek (CNDDB, 1988; Ulmer, pers. comm.). Surveys done in 1988 confirmed the existence of populations at Sharp Park in Pacifica and along Pilarcitos Creek in Half Moon Bay (McGinnis, pers. comm.). Apparently suitable habitat for the snake still exists at the historic site adjacent to the airport. Although no sightings have been made there in recent years, no trapping or other focused survey efforts have been made there that would rule out the continued existence of the snake at this location (McGinnis, pers. comm.; Brode, pers. comm.).

In addition to the officially listed animal species there are seven additional plants and animals in the study area vicinity that are classified as Category 2 candidates for federal listing: existing information suggests these taxa may warrant formal listing, but additional information is needed. Four of these occur at specific locations outside the study area, or on habitats not found within the study area, and most likely would not be affected by the proposed project: Montara manzanita (**Arctostaphylos montaraensis**); San Francisco owl's clover (**Orthocarpus floribundus**); white-rayed pentachaeta (**Pentachaeta bellidiflora**); and San Francisco campion (**Silene verecunda verecunda**). One candidate bird, the salt marsh yellowthroat (**Geothlypis trichas sinuosa**), occurs in the willows and emergent wetland vegetation at the Princeton Marsh, just south of the study area.

Two candidate plants have been found in the immediate vicinity of the specific study parcels. San Francisco gumplant, **Grindelia maritima**, grows on ocean bluffs in the San Francisco vicinity, and has been found on the bluffs in Montara. Hickman's cinquefoil, **Potentilla hickmanii**, has been found in damp grassy habitat in Moss Beach. The population of record has not been seen since 1933, however, and it is believed that the cinquefoil has been extirpated from that specific site (York, pers. comm.; Gankin, pers. comm.).

Additional suitable habitat for both plant species does occur within the project area, and there is the potential that unreported occurrences of one or both species may be found there. Habitats that appeared to be suitable on the specific study parcels were superficially examined for both the cinquefoil and the gumplant during the field reconnaissance but neither species was identified. Hickman's cinquefoil blooms from April to August; San Francisco gumplant from August to September (Munz, 1973). Plants are most readily observed and identified during flowering.

5.6.3.2 SENSITIVE HABITATS

The San Mateo County LCP defines sensitive habitats as areas where plant or animal life or their habitats are rare or especially valuable, and designates a number of specific habitats to be protected (Section 7, LCP; see also Figure 11). Protected sensitive habitats found on or in the immediate vicinity of the specific study site parcels include riparian corridors and wetlands.

In addition to the sensitive habitats defined and protected by LCP policy, the CNDDB has compiled a listing of natural communities that contribute to the biotic diversity of California. Two such communities, northern coastal salt marsh and northern maritime chaparral, are represented in the CNDDB data files and mapped as occurring in the study area vicinity, at Princeton Marsh and near the peak of Montara Mountain (CNDDB, 1988; Holland, 1986). A third natural community of interest to CNDDB, coastal terrace prairie, was identified at a number of locations in the study area during the specific parcel inventory, but not mapped by CNDDB since locational information was not present in their files at that time (Holland, pers. comm.).

CNDDB Natural Communities are indicated on the Sensitive Features map (Figure 11).

5.6.3.3 CALIFORNIA WILD STRAWBERRIES

Although California wild strawberries (**Fragaria chiloensis**) appear to be locally common, they in fact inhabit a fairly narrow band of suitable habitat, growing only in the zone of dense summer fogs. **Fragaria chiloensis** has been an important source of genetic material for commercial strawberry breeders, and is used as a parent plant for most of the commercially important strawberry varieties grown in California today (Bringhurst, pers. comm). Strawberries are recognized as an important natural resource and are extended protection under LCP Section 7.49.

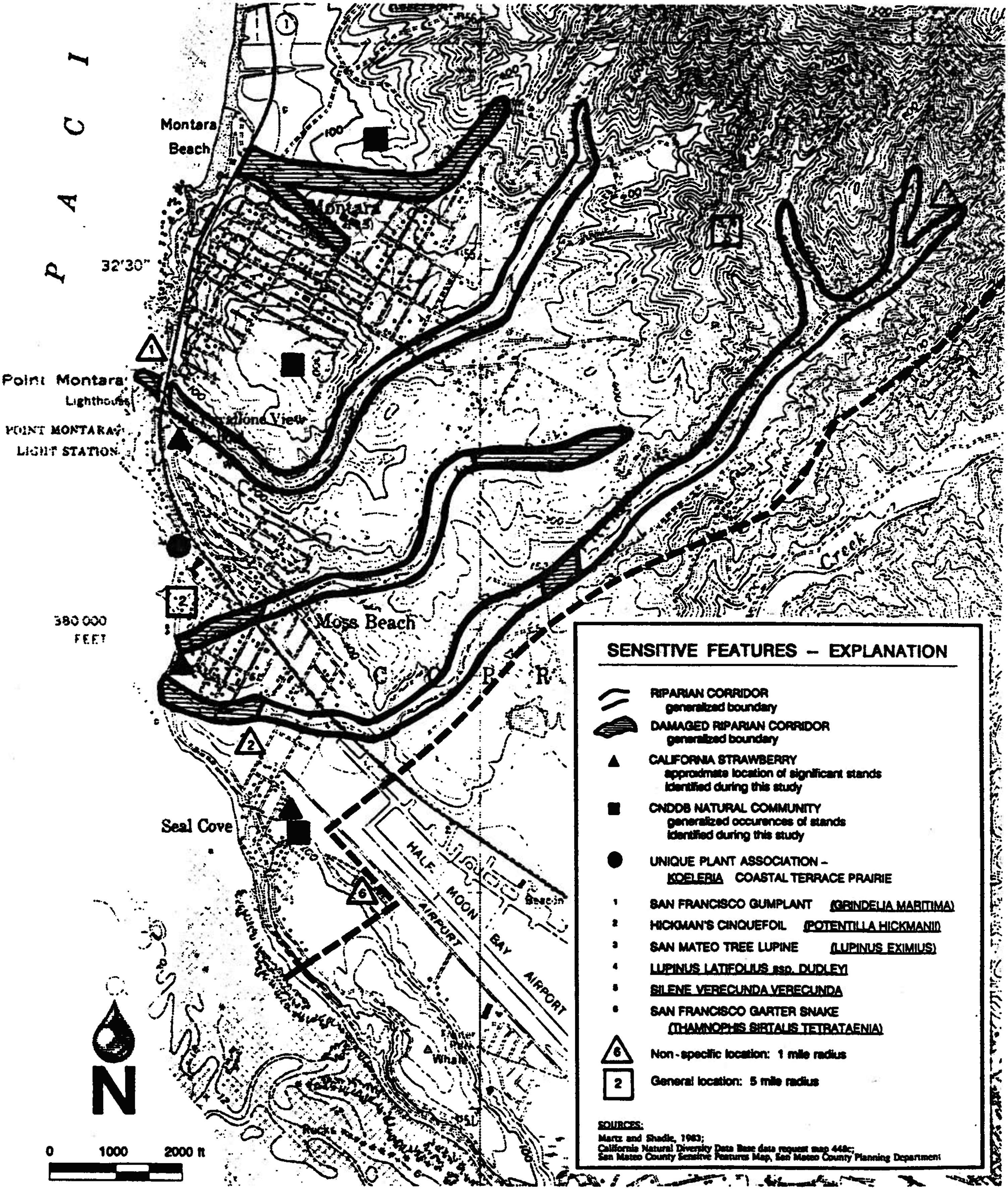


Figure 11. Sensitive Features Map

There is considerable variation between local populations of wild strawberries, and individual populations can contribute unique qualities useful to commercial breeders, including increased tolerance to heat, cold, salt, shade, and so on. **Fragaria chiloensis** occasionally hybridizes with the other native strawberry, **F. vesca californica**, producing interesting intermediate stands (Bringhurst, pers. comm).

Strawberries are widespread on the specific study parcels, occurring in a variety of microhabitats. Several unusual stands were identified during the field reconnaissance, as noted in Appendix B.

5.6.3.4 WEEDY, UNDESIRABLE PLANTS

Certain plants introduced into San Mateo County and elsewhere in California are weedy, aggressive, and difficult to control. Where these plants grow in agricultural lands, range and pasture lands, and natural communities they disrupt the desired cover type and cause loss of productivity and diversity; destroy valuable wildlife and native plant habitat; decrease economic return from the land; and add the cost of control and eradication.

The San Mateo County LCP identifies pampas grass; Scotch, French, and other brooms; blue gum seedlings; and weedy thistle as problem species in this area and encourages landowners to help control their spread by removing these plants. On the specific study parcels pampas grass and blue gum are widespread. French broom is present on a few parcels but has not yet become as invasive in the area as the two previous species. Observations made during the field reconnaissance suggest that two more plant species should be added to the list of undesirables: German ivy (**Senecio mikanoides**) and Bermuda buttercup (**Oxalis pes-caprae**). German ivy is becoming a serious invader of riparian corridors in particular; Bermuda buttercup is increasingly ubiquitous in grasslands and agricultural lands. Both German ivy and Bermuda buttercup are present on many of the specific study parcels.

5.6.3.5 MONARCH BUTTERFLY

Monarch butterflies are conspicuous and familiar insects that migrate annually from all over North America to mild overwintering localities in coastal California and Mexico. Preferred overwintering habitat along the central California coast is typically within one mile of the immediate coastline, under 500 feet elevation, and in a dense grove of trees (Lane, pers. comm.).

Important microclimatic conditions are freedom from freezing and protection from wind. Tree species are not as important as the density of the grove, which is usually 100 feet square or larger at permanent overwintering sites.

Overwintering sites are sensitive to tree removal, which may expose resident butterfly colonies to excessive winds and cooler temperatures (Lane, pers. comm.)

No monarch butterfly overwintering sites have been documented to date in the study area, but this area has not been comprehensively surveyed by a competent observer. Suitable habitat appears to exist throughout the Montara-moss Beach area, and individual parcels with suitable habitat have been so designated in Appendix B.

5.7 TRAFFIC AND CIRCULATION

The main arterial in the area is Cabrillo Highway (State Route 1). This highway runs north/south along the west side of San Mateo County and along the shore of the Pacific Ocean. The highway connects the Half Moon Bay area with San Francisco to the north and with the Santa Cruz area to the south.

Cabrillo Highway is a two-lane highway with separate left turn lanes at the major intersections.

The local streets which serve the areas of Moss Beach, Montara, and Seal Beach, are a mixture of paved, partially paved, and unpaved streets. There are several streets which function as main collector streets, others that function as minor collecter streets. The remaining streets function as local streets providing access to the adjacent residential, commercial, and industrial parcels.

5.7.1 EXISTING TRAFFIC VOLUMES

The traffic volumes in the area are generally quite low except during the 1) Pumpkin Festival; 2) summer season; and 3) Christmas tree season. During the summer, recreation such as surfing, fishing, and boating attract a great deal of tourist traffic, and there is a great demand placed on the main highway network and the main collector streets. During the Pumpkin Festival which lasts several weeks in October, many tourists are attracted to the arts and crafts, local restaurants, and local pumpkin patches placing a great demand on the local highway network. During the Christmas tree season, a significant amount of traffic is generated by the local Christmas tree farms which attract tourists and local residents alike.

Table 12 summarizes traffic volumes and levels of service during peak afternoon hours at times of the year without special events.

5.7.2 PROJECT GENERATED TRAFFIC VOLUMES AND DISTRIBUTION

The project generated traffic represents the development of single family residential units scattered throughout the Moss Beach, Montara, and Seal Cove areas. The traffic

TABLE 12

EXISTING TRAFFIC VOLUMES AND LEVELS OF SERVICE,
Montara and Moss Beach Areas
Weekday PM Peak Hour

			EB	WB	NB	SB
1.	Second Street at	Left	--	21 E	--	84 B
	Cabrillo Highway	Thru	--	--	741 A	1036 C
		Right	--	21 B	84 A	--
			EB	WB	NB	SB
2.	Fourth Street at	Left	--	26 E	--	104 B
	Cabrillo Highway	Thru	--	--	799 A	953 B
		Right	--	26 B	104 A	--
			EB	WB	NB	SB
3.	California Street at	Left	6 E	60 E	24 B	15 A
	Cabrillo Highway	Thru	-- E	-- E	837 A	940 B
		Right	5 C	60 C	15 A	24 A
			EB	WB	NB	SB
4.	Cypress Avenue at	Left	16 E	3 E	63 B	10 A
	at Cabrillo Highway	Thru	-- E	-- E	857 A	933 B
		Right	16 C	3 B	10 A	63 A
			EB	WB	NB	SB
5.	Etheldore Street at					
	Cabrillo Highway	Left	--	7 E	--	--
		Thru	--	--	923 B	948 B
		Right	--	7 B	50 A	4 A
			EB	WB	NB	AB
6.	Capistrano Road at	Left	20 E	--	2 A	--
	Cabrillo Highway*	Thru	--	--	953 B	920 B
		Right	25C	--	--	35 A

Key to Notation:

EB,WB,NB,SB - eastbound westbound, northbound, southbound
12 - indicates traffic volume
A - indicates Level of Service

Source: Extrapolated from 1988 24 hour counts
*Source: Goodrich Traffic Group 1988 turn counts

generated will be about 580 one-way trips per day, based on data compiled by the Institute of Transportation Engineers (I.T.E.). The peak hour traffic generated by the 58 residential units will be approximately 58 one-way trips per hour during the morning and afternoon peak hours, based on I.T.E. data.

The project traffic is expected to distribute itself in approximately the same pattern as the existing traffic. The distribution will add from 10 to 60 additional one way trips per day onto the streets listed below. The project traffic distribution will add from 2 to 10 one-way trips during the peak hour onto these streets. These project one-way trips will be distributed 80/20 exiting to entering during the morning peak hour and 20/80 exiting to entering during the afternoon peak hour. The increased traffic is considered environmentally insignificant, but may be noticeable at the street intersections. For the purposes of this analysis, the project traffic is considered to be distributed equially to the six intersections along the Cabrillo Highway at:

1. Second Street
2. Fourth Street
3. California Street
4. Etheldore Street
5. Capistrano Road

Table 13 summarizes traffic volumes and levels of service with the proposed project added to existing levels.

5.7.3 CUMULATIVE TRAFFIC

The cumulative traffic in the area includes traffic from approved identifiable projects which will be completed within five to ten years.

TABLE 13

EXISTING PLUS PROJECTED TRAFFIC VOLUMES AND LEVELS OF SERVICE

Montara and Moss Beach Areas
Weekday PM Peak Hour

			EB	WB	NB	SB
1.	Second Street at	Left	--	22 E	--	88 B
	Cabrillo Highway	Thru	--	----	746 A	1056 C
		Right	--	22 B	88 A	--
			EB	WB	NB	SB
2.	Fourth Street at	Left	--	27 E	--	108 B
	Cabrillo Highway	Thru	--	----	807 A	970 B
		Right	--	27 B	108 A	--
			EB	WB	NB	SB
3.	California Street	Left	7 E	61 E	26 B	26 A
	at Cabrillo Highway	Thru	-- E	--E	848 A	954 B
		Right	6 C	60 C	17 A	17 A
			EB	WB	NB	SB
4.	Cypress Avenue at	Left	17 E	3 E	65 B	12 A
	at Cabrillo Highway	Thru	-- E	-- E	871 A	944 B
		Right	16 C	4 B	12 A	65 A
			EB	WB	NB	SB
5.	Etheldore Street at	Left	--	8 E	--	--
	Cabrillo Highway	Thru	--	--	940 B	956 B
		Right	--	8 B	54 A	8 B
			EB	WB	NB	SB
6.	Capistrano Road at	Left	21 E	--	6 A	--
	Cabrillo Highway *	Thru	--	--	973 B	925 B
		Right	26 C	--	--	39 A

Key to Notation:

EB,WB,NB,SB - eastbound westbound, northbound, southbound
12 - indicates traffic volume
A - indicates Level of Service

Source: Extrapolated from 1988 24 hour counts
*Source: Goodrich Traffic Group 1988 turn counts

The cumulative projects considered in this report are:

1. Bluegate Candle Factory
2. Princeton Rezoning
3. Pillar Point Harbor Fishing Village

The cumulative traffic, outlined in Table 14, may occur gradually or at an accelerated pace depending on market conditions and the availability of construction financing.

TABLE 14
CUMULATIVE TRAFFIC
Highway 1 Corridor
Weekday PM Peak Hour

No.	Project	Use	Size	Location	ADT	In/Out Weekday PM Peak
1.	El Granada	SFR	400 DU	El Granada	4025	253/149
2.	Fishing Village	Hotel	152 RMB	Capistrano	1323	54/57
		Apts.	24 DU		146	11/5
		Retail	72 KSF		6019	258/268

Key to Notation:

ADT	Average daily trips
DU	Dwelling units
KSF	1000 square feet
SFR	Single-family residential

6 IMPACTS OF THE PROPOSED PROJECT

The impacts of the proposed project may best be assessed using two scenarios. In the first scenario, wells will be constructed at each of the sites which have been awarded a sewer connection. The second scenario assumes that additional lots might be developed in Montara and Moss Beach if concurrent use of wells and septic systems (or other onsite waste disposal systems) were to be permitted. Since the use of such onsite systems is now prohibited, and no new sewer connections are allowed, removal of the prohibition on waste systems would conceivably lead to additional lots being developed.

6.1 DEVELOPMENT SCENARIOS

The scenario of water-well construction, alone, is considered initially, followed by the scenario in which wells and septic systems would be concurrently utilized.

6.1.1 WATER-WELL CONSTRUCTION, LIMITED TO 58 PARCELS AWARDED SEWER CONNECTIONS

1. Amount of Growth. The proposed project is to grant fifty-eight sewer connection permits to parcel owners who it is assumed would subsequently install private wells for water service. Granting well permits would potentially result in the development of fifty-eight parcels throughout the Montara/Moss Beach area. In order to provide a conservative analysis of impacts (i.e. "worst-case"), it is assumed that the fifty-eight wells would be successfully drilled and that all of the parcels served by the wells would be developed. Those parcels which were not developed for one reason or another would be replaced by waiting list parcels.

2. Zoning and Type of Development Expected. Ninety percent of the 159 parcels entered into the lottery for sewer connections are zoned for single-family residential use. Fifty-two of the fifty-eight parcels on the awarded list are in R-1 zoning, single family residential. Two parcels are zoned C-1, neighborhood business district, and

four parcels are zoned RM, resource management. Of the 101 parcels on the waiting list, two parcels are zoned C-1, six are zoned RM, and one parcel is zoned PAD, planned agricultural district. The remaining parcels are zoned R-1.

The residential designation R-1 allows for single family residences and in some cases second rental units. Other uses include parks, farming, and, with a use permit, public services, country clubs, and nurseries.

Parcels zoned C-1 would require a use permit for development and could be developed with a variety of uses including hospitals, hotels, residential uses, and retail businesses.

The RM zoning allows development which will conserve natural features and scenic values, make limited use of hazardous areas and which is consistent with levels of service which can be reasonably provided. The allowed uses for parcels with RM zoning include agricultural, residential, public services, recreation, oil and gas production, and, with a use permit, wineries.

The parcel zoned PAD is by far the largest of the parcels at roughly 160,000 square feet. Uses permitted in a PAD zone are agriculture and development considered accessory to agriculture. Additional uses are permitted subject to a Planned Agricultural Permit. For prime agricultural land these uses include single family residences, public recreation and onshore oil and gas exploration; for non-prime agricultural lands the permitted uses include multi-family affordable housing, public services, wineries, and agricultural processing plants.

The density of development on each parcel is dependent on specific zoning designations and type of development in the R-1 districts and on site characteristics in the RM district. Since most of the parcels are small (66% are under 7,000 square feet), it is expected that most of the development would include one residence per parcel.

6.1.2 CONSTRUCTION OF WELLS AND CONCURRENT USE OF SEPTIC SYSTEMS

1. Estimated Number of Parcels Which Can Use Septic Systems

Montara Sanitary District has approved draft amendments to Ordinance 66, Article III which would allow septic systems to be installed within the urban/rural boundary of the District dependent on several conditions being met. Included in these conditions is a requirement that the applicant will enter into a binding agreement with the District to connect to the public sewer system within 30 days after notice by the District to do so, or within 90 days if a sewer extension is required. This applies to all habitable buildings within the urban/rural boundary abutting on any street on which there is now or may in the future be located a public sewer.

These draft amendments would allow septic system use within the urban side of the District as a temporary measure subject to revocation at an undetermined time in the future. With the issuance of the 58 permits, the District will not have sufficient treatment capacity to require a septic system user to connect to the sewer system until the wastewater treatment plant is expanded.

Placement of septic systems and wells are regulated by the San Mateo County Environmental Health Office. The minimum setbacks for wells, measured horizontally from the well, are listed in Section 4712 of Chapter 5, Part Two, Division IV of the San Mateo County Ordinance Code and are summarized below:

New Well Distance from:	Feet Distant
another well	50
any septic tank	50
a septic tank leachfield	100
a seepage pit	100
a sewer line or lateral	50
a property line (sewered area)	50
a property line (unsewered area)	100
an exterior wall of a building foundation	5
a boundary line of any easement dedicated to or reserved for sanitary sewers or wastewater facilities	50

Minimum setbacks for septic drainfields or seepage pits are listed below (Section 8205, Chapter 6, Division VII, San Mateo County Ordinance Code):

New Septic Distance from:	Feet Distant
an exterior wall of a building foundation	10
a property line	10
a well	100
top of the bank of a stream	100
a ditch, cut bank or slope over 50%	50
a swimming pool	25
a reservoir	100

The County Environmental Health Office has not set a minimum lot size for parcels applying for both septic and wells. However, the above setback requirements limit the minimum size. For areas in which septic tanks are allowed, a minimum lot size for a parcel containing both a well and septic system is roughly 100 feet by 160 feet or 16,000 square feet. The required lot size varies depending on the configuration of the parcel, soil type and percolation rate, slope, septic setbacks from surface water, and size and placement of buildings and pavement.

Preliminary minimum lot size requirements for parcels were determined by Thomas Reid Associates based on minimum setbacks from septic drainfields, wells and property lines. Since septic systems are allowed within the Montara Sanitary District service area the setback from property lines for unsewered areas (100 feet) was used for wells. Each of the parcels was compared to the minimum dimensions necessary, 100 feet by 160 feet for a rectangular site or 131 feet by 131 feet for a square site, to determine which parcels might qualify (Appendix A).

Of the 159 parcels which have submitted applications for connection to the sewer system, six parcels meet the preliminary size requirements for a septic system and well onsite. These six parcels are not part of the fifty-eight parcels with presently accepted sewer connections. Parcels meeting these preliminary requirements would be subjected to further tests to determine placement of septic tank and drainfield. The size of the drainfield would depend on soil type and size of the structure. Parcels meeting preliminary requirements may eventually not qualify for septic based on more detailed information and could prove undevelopable under certain circumstances.

Septic system use would also require approval by the County Planning Commission. The Commission's current policy is to discourage the use of septic on the urban side of the Urban/Rural Boundary.

The six parcels of adequate size to possibly accommodate both a well and a septic system are variously zoned. Four of the six parcels are zoned R-1, single family residential; one site is zoned C-1, neighborhood business, and the largest parcel is zoned PAD, Planned Agricultural District. The type of growth permitted in each of these zoning designations has been described previously.

6.1.3 TIMING OF DEVELOPMENT

The approval of private wells on the Midcoast would accelerate growth under the LCP, since the water district is under a moratorium on new connections and the inability to obtain water service is currently growth limiting. The development of these 58-64 parcels could theoretically occur in a single year, since the LCP limits building permits on the Mid-Coast to 125 per year unless otherwise mandated by the County Board of Supervisors (LCP Policy 1.22). However, it is more likely that the development would be staggered over a two-three year period because of delays in project design, application processing, ability to develop an adequate well, and demand for development in other portions of the Mid-Coast, particularly El Granada.

Of the 159 parcels entered into the lottery, up to half (80) may be exempt from having to obtain a Coastal Development Permit because they are 5,000 square feet or more in size, they are within the Urban/Rural Boundary, they probably require no variances, and they are not near sensitive habitats. Parcels which are exempt from a Coastal Development Permit may be developed more quickly than those requiring a Coastal Development Permit because of time-savings in obtaining approvals. Of the 58 parcels awarded sewer connections, 26 are within the exempted area.

6.2 IMPACTS ON COMMUNITY SERVICES

6.2.1 SCHOOLS

The development of 58 residences would result in an estimated 81 school-aged children, based on 1.4 school-aged children per dwelling unit (Rau, 1980). The impact on the schools may be broken down in the following manner.

Elementary school (K-5)	41 new students
Intermediate school (6-8)	17 new students
High school (9-12)	23 new students
Total	81 new students

The estimates are based on the following student per dwelling unit ratios for each age group: 0.7 kindergarten through fifth grade students per dwelling unit, 0.3 sixth to eighth grade students, and 0.4 ninth to twelfth grade students per dwelling unit.

The development of the six parcels which may accommodate septic systems could add another ten students to the school system. Approximately four of these students would be in the K-5 age group, two would be intermediate school students, and three would be high school students.

Farallone View Elementary School is considered to be at capacity now due to lack of available classrooms. Up to 98 new students could be accommodated, however, by expanding class size to the maximum allowed by teacher contracts. The maximum class sizes are 30 students for K-3rd grades and 34 for 4th-5th grades. Currently the average class size at Farallone View is 25.5 students for K-3rd and 26.0 students for 4th-5th.

The addition of 41-45 students at Farallone View Elementary School would result in an 8.8 - 9.7% increase in current enrollment. The increase could be accommodated within current programming and number of classrooms, but class sizes would be placed very near maximum capacity. Expansion is planned at the elementary school level which will reduce the current class size and allow for growth to be accommodated more easily. Although the school expansion is not due to this project, it would serve to alleviate larger elementary school class sizes which would result from the project.

Cunha Intermediate School would experience a 2.6 - 2.9% increase in enrollment due to the project. Half Moon Bay High School would experience a 2.9 - 3.3% increase in enrollment. The small increase of students due to the project at the intermediate and high school levels would not cause these schools to reach capacity nor significantly affect class size.

Successful development of all fifty-eight parcels has been assumed to produce a conservative estimate of the impacts to public services which may occur. If any of the parcels are not developed, or if some of the parcels are not developed into residential use, then the impacts on the schools would be delayed until one of the parcels on the waiting list is developed. In addition, development of the parcels awarded a sewer permit is likely to occur over a minimum of 1-2 years. The staggered entry of the students into the school system would allow some school expansion to occur before all of the parcels are developed and occupied.

6.2.2 WATER PURVEYOR

Citizens Utility Company of California has a moratorium on new connections. Owners of parcels developed before the moratorium is lifted would be required to provide their own water, via a well, at their own expense.

Citizens provides the water for fire hydrants located within its service area. This service is provided free of charge to all buildings within the service area. No charge is levied to well users for using Citizens supplied fire hydrant water for fire suppression. Water suppliers are permitted by the Public Utilities Commission to charge for fire flow provided to non-customers. If Citizens found supplying the fire flow to non-customers to be a burden, they could charge for this service. Any new hydrants which might be required by development of the parcels would not be subject to the water moratorium because they do not constitute a new connection (J. Bentley, CUCC, pers. comm.).

Effects on water supply from the existing community wells are expected to be insignificant.

6.2.3 FIRE PROTECTION

Development of the 58-64 parcels would result in a small addition of homes to the Montara Fire Protection District's service area. Because development of the parcels represents infilling within the Urban/Rural Boundary it is unlikely that there would be a need for significant extensions in the hydrant network.

The District has inadequate water flows to fight fires in some areas and limited water storage for fire protection. As noted above, the water district (Citizen's Utility) is planning expansions to the water facilities which will help to alleviate this problem. Since the parcels proposed to be developed under this project would be connected to private wells rather than to the water district's service, the development would not directly interfere with the fire flow levels provided by Citizen's.

The Point Montara Fire Protection District requires buildings to be no more than 900 feet from a fire hydrant or for the developer to install a hydrant within the required distance at the developer's expense, or for the developer to provide a minimum of 10,000 gallons of water in a storage tank (District Ordinance No. 1977-2). Larger developments may be subject to further requirements including minimum fire flows, more than one hydrant, and sprinklers, depending on the size and type of development. An onsite storage tank for sprinkler systems also is required for commercial buildings.

No financial impact or increase of firefighters due to the project is anticipated (Chief Rolf Loeffler, pers. comm.). No fees are assessed by the district on new development.

6.2.4 POLICE

The Sheriff's Department's concerns regarding any proposed development relate to potential traffic problems, attraction of high volumes of people, and activity of the people. Since the development is not concentrated but scattered on lots throughout Montara and Moss Beach, the above concerns are not likely to be a problem with the development of the lots. No financial impact or increase in manpower is anticipated by the Sheriff's office (Capt. Richard Platt, pers. comm.).

6.2.5 SOLID WASTE

No extension of refuse pick-up services would be required by this development, and the amount of development would not significantly affect available capacity at Ox Mountain or the proposed Apanolio Canyon landfills.

6.2.6 WASTEWATER TREATMENT

As described under Environmental Setting, the Montara Sanitary District is nearing its allotted non-priority treatment capacity at the Sewer Authority Mid-Coastside wastewater treatment plant. Once the 58 sewer connections are completed, the District will need to implement a moratorium on all other new sewer connections for non-priority land uses until the wastewater treatment plant has been expanded.

6.3 HYDROLOGIC IMPACTS

6.3.1 IMPACTS ON GROUND WATER STORAGE

The 58 parcels on which water wells may be constructed will exert a total supplemental water demand of approximately 17.4 acre feet per year. This projected impact is based on gross usage of 0.302 acre feet per year per parcel, computed from the observed average water use for the two communities of 270 gallons per day per unit.

The supplemental water demand is equivalent to 0.5 percent of the ground water in available storage during normal years, or about one percent of the volume available during critically-dry years (Table 2).

Notwithstanding the small average impact of the proposed project, individual wells may exert larger localized effects, particularly if pumped at higher rates. Also, the additional gross use as a proportion of storage during normal years exceeds 5 percent in the Upper Seal Cove hydrologic sub-unit, a high value warranting considerable caution prior to approval of use, given the highly variable ground-water system.

6.3.2 IMPACTS ON GROUND WATER OUTFLOW

The 58 parcels will draw upon the outflow of ground water in an amount equal to about 4.7 percent of the estimated annual outflow during normal years. This proportion is well below the threshold of 40 percent of normal-year outflow considered to be a prudent development goal for larger coastal aquifer systems developed with wells serving individual homes (i.e., Kleinfelder, 1988). During dry and critically dry years, respectively, anticipated withdrawals amount to approximately 7 and 11 percent.

Anticipated use as a proportion of outflow varies by hydrologic sub-unit. For most sub-units, pumpage expected as a result of the proposed project is substantially below 40 percent of estimated outflow during normal years, generally less than 10 percent. Three important exceptions should be noted, however:

1. Upper Seal Cove has both a very low rate of annual recharge and outflow, plus a relatively high proportion of the parcels awarded sewer connections. Anticipated new pumpage is less then 40 percent of estimated outflow in normal years, but approaches and exceeds 100 percent in dry and critically-dry years, respectively. Additionally, because of the complex faulted geology underlying this area, yields are expected to be highly variable -- both over time and spatially. A low rate of successful ground water development may be expected in this area; both insufficient yield and insufficient reliability of yield are to be expected.

2. Upper Moss Beach is an area of apparently limited recharge and discharge, where the few existing wells draw from granitic aquifers with typically low hydraulic conductivity. The few existing wells are about 500 feet deep. Anticipated pumpage is about 15 percent of the estimated yield during years of normal rainfall and recharge.

3. Montara Terrace is an area which seems similar to upper Moss Beach. Anticipated withdrawals from the new wells is likely to be about 22 percent of the normal-year estimated outflow.

Upper Seal Cove is a sub-unit where anticipated ground-water use will exceed prudent levels. Upper Moss Beach and Montara Terrace are sub-units where the safe yield during both normal and dry periods is likely to be approached, but not exceeded, and where ground-water development may proceed with observation and caution.

6.3.3 EFFECTS ON BASEFLOW

Ground water pumpage is expected to deplete the amount of water available to riparian and other sensitive habitats during dry periods by less than 5 percent, the lower limit at which depletion is deemed discernible and at which it might be considered significant.

The impact of the project on baseflow is small for several reasons. First, the volume of water to be pumped is small relative to storage and to recharge or outflow. Second, the likely well sites are widely dispersed. Third, only one of the sub-units (Wagner Valley or Upper Montara) is directly linked to an alluvial system; most of the hydrologic sub-units discharge either to the ocean or to minor unnamed drainages with limited habitat value. Finally, the individual parcels tend to be far removed from the sensitive habitat areas, in most cases.

An exception is the wet area surrounding the ponds east of Upper Seal Cove. These ponds, the one location in the study area where the San Francisco Garter Snake has been observed in the past, are an area of high-water table likely sustained in part by outflow from Upper Seal Cove. Because anticipated water withdrawals in Upper Seal Cove will be large relative to estimated outflow, baseflow in this sensitive habitat area could be significantly depleted.

6.4 IMPACTS UPON WATER QUALITY

Potential impacts on water quality are those associated with depleted water volumes, and those related to past and future uses of septic systems or other means of onsite waste disposal.

The effects of the anticipated pumping on quality of ground water or in the local intermittent streams are expected to be nondiscernible, primarily due to the small proportionate impact on water in storage or in movement.

Effects of septic-system usage are potentially very significant, however, and are expected to be greater than in most areas of San Mateo County. Three intrinsic hydrogeologic factors are responsible. First, the aquifers are small, elevated, isolated units, often with radial or complex patterns of drainage. Undesirable concentrations of any constituent which may be introduced through septic systems can preclude use of large proportion of the aquifer in each sub-unit, as other potential users cannot easily develop ground water near a known pocket of contamination, especially one whose direction of movement is not clear. Second, the sandy soils of this area have less ability to renovate leachate than do soils with greater organic and clay content, cation-exchange capacity, moisture storage, or alkalinity. As one example, extensive field investigations in diverse soil types of the San Lorenzo Valley showed nitrogen and bacteria loadings 10 to 100 times higher in sandy granitic soils than in clays and loams developed from sedimentary parent material (Johnson and others, 1983). Third, the granitic aquifers underlying several of the hydrologic sub-units are highly fractured, able to convey effluent to wells with only limited attenuative contact with the soil and substratum.

While ground water quality is generally suitable for domestic use in the two communities, it merits note that approximately one third of the wells for which one-time water-quality data are available (Table 11) contained elevated levels of either nitrates or bacteria, two constituents often associated with waste effluent in coastal-area ground water systems. One possible and partial source may be existing or abandoned septic systems; County staff have identified 49 such systems (L. Chew, personal comm.). Additional septic-system discharges to ground water could result in appreciably-higher levels of these and other constituents of leachate.

6.5 EROSION AND SEDIMENTATION IMPACTS

To the extent that the proposed project accelerates build-out of growth already projected for the area, it will have a limited direct effect upon erosion and sedimentation. Over the long term, the effects are expected to be negligible.

We note, however, that sound erosion-control measures are usually consistent with water-conservation practices which promote recharge. This parallel set of practices offers several significant opportunities to reduce direct and indirect erosion and to promote recharge, discussed in Chapter 7.

6.6 BIOTIC IMPACTS

Biological impacts associated with residential development of the specific study parcels fall into two general categories: direct impacts, associated with site preparation and construction of new homes; and indirect impacts, associated with increased withdrawal of ground water and increased runoff from impervious surfaces. Assuming development projects will be of the same general type at all parcels, impacts will vary most depending on existing habitat type at each site. This section addresses general impacts associated with residential development at various habitat types and impacts that might affect sensitive features. Appendix B presents site-specific information about each parcel in this study; indicates impacts expected to occur on that site; and provides some brief information on mitigation. Explanatory notes following Appendix B discuss specific impacts in more detail and provide site-specific mapping of certain sensitive features.

6.6.1 RIPARIAN: DIRECT IMPACTS

6.6.1.1 Site preparation (grading, filling, well drilling) and construction could remove or damage riparian vegetation, diminishing the wildlife habitat at the project site and interrupting the linear continuity of the riparian vegetation, adversely affecting wildlife use of the entire corridor.

6.6.1.2 Increased runoff and erosion from land adjacent to the riparian corridor cleared during construction may result in increased runoff, erosion, and sedimentation in the riparian area. Increased turbidity in the stream itself would adversely affect aquatic organisms there, although a lack of data on these resources makes it difficult to evaluate the extent and significance of this impact. If uncontrolled, erosion of streambanks would remove or endanger riparian vegetation; decreased channel capacity from sedimentation could increase the flooding potential of the stream.

6.6.1.3 Increased human activity in the riparian area will result from occupation of new homes adjacent to these habitats. Although the various wildlife species that use riparian areas have varying tolerances to disturbance, increased human presence in the riparian habitat will incrementally but cumulatively diminish its wildlife habitat value.

6.6.1.4 Domestic and feral cats and dogs are significant predators of wildlife and typically accompany human habitation of an area. Increasing the cat and dog populations in riparian areas will incrementally decrease the wildlife habitat value.

6.6.2 RIPARIAN: INDIRECT IMPACTS

6.6.2.1 Accelerated drawdown of ground water could deplete subsurface flows along streams on coastal seeps, possibly causing water stress on existing riparian vegetation. Significance of this impact would depend on the number of wells drilled; on the production levels of these wells; and on the capacity of affected ground water basins. While it is believed that the proposed project is unlikely to have an adverse indirect impact on riparian vegetation, this impact is incremental and cumulative, and could become significant at a future, more intensive level of development. Aquatic habitat would likely be affected before riparian habitat.

6.6.3 COASTAL GRASSLAND: DIRECT IMPACTS

6.6.3.1 Site preparation and construction will remove native bunchgrasses and other native plants, adversely affecting wildlife habitat and diminishing the botanical diversity of the area.

6.6.3.2 On almost all the specific study parcels with coastal grassland habitat, development will destroy California strawberry plants.

6.6.3.3 Conversion of coastal grassland to residences will incrementally and cumulatively eliminate feeding territory for resident and migrating raptorial birds.

6.6.3.4 Increased human activity and domestic animals that accompany new residential development will incrementally and cumulatively diminish wildlife habitat values of grasslands.

6.6.3.5 Landscaping and maintenance can introduce exotic plants into grasslands, further diminishing their value to wildlife.

6.6.4 WETLAND: DIRECT IMPACTS

6.6.4.1 Site preparation (clearing, grading, filling), home construction, and construction of access roads could remove or damage wetland vegetation, adversely affecting the wildlife habitat and the flood control and recharge capacities of the wetland.

6.6.4.2 Increased human activity and domestic animals that accompany new residential development will incrementally and cumulatively diminish wildlife habitat values in wetland areas.

6.6.5 WETLAND; INDIRECT IMPACTS

6.6.5.1 Ground water withdrawal could remove subsurface water from wetlands. As discussed above under Riparian, this impact is thought not to be significant at the proposed level of development.

6.6.6 AQUATIC: DIRECT IMPACTS

6.6.6.1 Site preparation and construction could increase sediment discharge into streams, degrading water quality and increasing turbidity. Lack of data on aquatic biota in the study area streams make it impossible to assess the significance of this impact.

6.6.6.2 Increased runoff from construction areas could erode stream banks, removing riparian vegetation which moderates stream temperatures. Lack of any data describing the aquatic resource make it impossible to determine the significance of this impact.

6.6.7 Aquatic: Indirect Impacts

6.6.7.1 Accelerated ground water withdrawal could eventually deplete subsurface flows, adversely affecting the area streams, although the effects of this project appear to be small. Again, a lack of baseline information makes it difficult to assess the magnitude of this impact on aquatic biota.

6.6.7.2 Construction of new homes as part of this project will increase the impervious surface area of the study communities (paved areas, roofs), increasing the amount and velocity of runoff. Concomitant erosion could damage stream banks, remove riparian vegetation, increase turbidity, and increase siltation in the study area streams. This project may be large enough to have a noticeable effect on aquatic habitat if uncontrolled and not mitigated by site-specific efforts, although lack of specific data regarding aquatic biota make the significance of the impact difficult to assess.

6.6.8 RUDERAL: DIRECT IMPACTS

6.6.8.1 Site preparation and construction will remove ruderal vegetation which has some value as wildlife habitat. On most sites, this impact will not be significant.

6.6.8.2 Increased human activity and domestic animals which typically accompany new residential development will have an incremental and cumulative impact on remaining open space areas.

6.6.9 EUCALYPTUS STAND: DIRECT IMPACTS

6.6.9.1 Removal of tall trees will have some adverse effect but probably not significant on raptorial birds, which use them as hunting and lookout perches. If trees are intensively used by overwintering monarch butterflies, losses could be locally and regionally significant.

6.6.9.2 Site preparation and construction may damage California wild strawberries which grow in the grassy margins of many eucalyptus stands.

6.6.10 CONIFER STAND: DIRECT IMPACTS

6.6.10.1 Removal of trees will have some adverse effect on local and migratory bird populations, which use them as resting and lookout perches; feeding habitat; and nesting habitat. If trees are used by overwintering monarch butterflies, loss could be locally or regionally significant.

6.6.11 RESIDENTIAL: DIRECT IMPACTS

6.6.11.1 No impacts are anticipated, as long as site preparation and construction does not affect adjacent parcels or resources.

6.6.12 DEVELOPED: DIRECT IMPACTS

6.6.12.1 No impacts are anticipated, unless remodeling or new construction affects adjacent parcels or resources.

6.6.13 PLANT AND ANIMAL SPECIES OF CONCERN: DIRECT IMPACTS

6.6.13.1 Potential habitat for the San Francisco gumplant and Hickman's cinquefoil if not extirpated could be damaged or destroyed during site preparation and construction.

6.6.13.2 Development of parcels in the southeast part of Seal Cove may remove upland habitat of value to the San Francisco garter snake. No recent observations have been made of the snake at this locality, and existing information is inadequate to determine if the snake is actually present and what value, if any, surrounding upland may have. If, however, there are adverse impacts on this endangered species, they would be significant.

6.6.13.3 If trees are cut adjacent to or within a grove that is used by overwintering monarch butterflies, the local microclimate may be changed, adversely affecting the suitability of the overwintering site.

6.6.14 Plant and Animal Species of Concern: Indirect Impacts

6.6.14.1 Accelerated drawdown of ground water in the Seal Cove area could diminish the amount of water in the potential garter snake ponds, reducing or eliminating suitable habitat for this endangered species. At this time it is not clear that wells on the western side of the Seal Cove Fault would tap the same ground water supply that underlies the pond. In addition, lack of current information on the status of the garter snake at this site makes it difficult to evaluate the magnitude of this impact, although impacts on the snake could be significant.

6.6.15 COASTAL TERRACE PRAIRIE: DIRECT IMPACTS

6.6.15.1 Site preparation and construction on coastal terrace prairie would have impacts similar to those described for Coastal Grassland habitat. Because coastal terrace prairies contain a higher proportion of native plants, the magnitude of the impacts would be proportionally greater. Development on the June grass (**Koeleria cristata**) coastal prairie in Moss Beach would impact a natural community of regional interest and significance.

6.6.16 CALIFORNIA WILD STRAWBERRIES: DIRECT IMPACTS

6.6.16.1 Site preparation and construction on parcels where there are wild California strawberries could damage or destroy genetic material of potential but unknown value.

6.7 IMPACTS ON TRAFFIC AND CIRCULATION

6.7.1 PROJECT TRAFFIC IMPACTS

The project traffic impacts are expected to be quite small on any particular street or at any particular intersection. At each of the six intersections being analyzed, the project will add ten one way trips during the morning or afternoon peak. These trips will be eight out and two in during the morning or afternoon peak hour and two out and eight in during the afternoon peak hour. Since the afternoon peak hour volumes are higher than the morning peak hour volumes, only the afternoon peak hour has been analyzed.

The existing plus project levels of service are identical to the existing levels of service, as would be expected from the very low traffic generated from the project. The change in total traffic entering the intersections is in the order of 1:1200. There will be no environmentally significant change in traffic conditions due to the project.

6.7.2 GENERAL TRAFFIC GROWTH

The general traffic growth in the area is that traffic which is not part of an identifiable project. This includes developments in accordance with existing or proposed zoning requirements throughout the northern Mid-Coast area. The area bounded by Broadway Avenue, Stanford and California Streets was studied for general growth. Based on existing zoning, the area generates about 1600 trips per day. If the area were to be rezoned to permit restaurants, shops, and a hotel, the area could generate about 7700 trips per day. If the area were fully built out to levels allowed by existing zoning, it would generate about 3150 trips per day. Development of this area will have a significant impact on the street network serving the Half Moon Bay area, (see Table 13: General Traffic Growth).

7 MITIGATIVE MEASURES

Mitigative measures may be considered for a number of the impacts upon community services and functions, hydrology, and biology.

7.1 PUBLIC SERVICES

7.1.1 SCHOOLS.

Cabrillo Unified School District assesses school impact fees on new residential development at the building permit stage of development. The assessment is $1.50 per square foot of livable space. In addition, a portion of the assessed property taxes go to fund the school system.

7.1.2 FIRE PROTECTION.

Under Point Montara Fire Protection District Ordinance No. 1977-2, the developers of the 58-64 lots must provide water to their parcels for fire-fighting purposes. This would be accomplished either through extension of hydrant lines or installation of a 10,000 gallon water storage tank.

7.2 HYDROLOGICAL MITIGATION

Specific mitigative measures are discussed below. Chapter 10 identifies the importance of monitoring as mitigation in this area with no hydrologic history.

7.2.1 GROUND WATER DEMAND

We have computed the estimated demand on ground water based on the averaging existing usage within the Montara and Moss Beach areas of approximately 270 gallons per parcel. This mean rate of water use, equivalent to about 90 gallons per person per day, is typical of urban areas on the Mid-Coast. Reduced water use -- and hence mitigated ground water pumpage -- is feasible with a concerted water-conservation program. Recommended measures include requiring metering of the wells, installation of water-conservation plumbing within the home, encouraging drought-tolerant and/or California native-plant landscaping, and other steps identified in the LCP and General Plan.

Based on water-use rates obtained in other coastal-terrace areas where stringent conservation measures have been self-imposed, reductions of 20 to 25 percent in water use may be achieved, to approximately 70 gallons per person per day. Further reductions would be difficult to sustain; we note that the mean dry-weather sewage duty for the Montara Sanitation District is 55 gallons per person per day.

7.2.2 WATER QUALITY

Use of septic systems and other onsite waste-disposal systems should be strongly discouraged within urban areas in Montara and Moss Beach, due to the potential adverse effects on water quality described in Section 6.4.

7.2.3 RELIABILITY OF YIELD

The Montara Heights, Upper Moss Beach, and Upper Seal Cove hydrologic sub-units are areas where difficult well drilling, low yields, and low reliability of yields can be expected. Both the unfavorable hydrogeologic conditions and the relatively large proposed withdrawals should be matters of public concern. Wells constructed in these areas may go dry in areas of deficient recharge, and homes lacking water during dry periods are likely to require supplemental public services.

Other coastal counties with similar difficult hydrogeologic environments have designated water-shortage areas in which well yields must be established to County specifications during the dry time of year. Sonoma County, as one example, requires demonstration of water between August 1 and the first major rains of the year. Implementing a policy of this type (perhaps with alternate provisions for other times of year) is one established means of reducing risks of supply interruption, should the County wish to pursue this goal. No means of implementing a policy of this type are presently in effect.

7.2.4 EROSION, SEDIMENTATION, AND RECHARGE PROTECTION

Erosional impacts at development sites may be mitigated with a concerted effort to use best-management practices of erosion control. For especially difficult sites, a plan developed by a Certified Professional Soil Erosion and Sediment Control Specialist can be prepared.

Erosional impacts in the form of downstream gully and channel incision -- demonstrably a major ongoing process in the area -- should be considered on a valley-by-valley basis, and mitigated using approaches which also encourage water conservation and recharge. For example, installing detention basins, grade-control structures, and turfed swales promote recharge and minimize water loss to storm runoff. Bank protection for the evolving channels and gullies, while possibly useful in reducing erosion at the site being protected, is not as sound an approach in the sandy soils prevailing throughout the area, unless it is applied in combination with water-holding strategies. Mechanisms for promoting recharge and water conservation on a valley-wide basis are not currently in effect; successful programs of this type presently call for neighborhood volunteerism and cooperation.

7.3 BIOLOGICAL MITIGATION

In addition to the monitoring strategies identified in Chapter 10, the following measures are suggested.

7.3.1 RIPARIAN: DIRECT

7.3.1.1 To mitigate impact 6.6.1.1., riparian damage,adhere to LCP-specified performance standards minimizing vegetation removal, erosion control, revegetation, and related practices (LCP Section 7.10); establish appropriate buffers to protect the riparian corridor (LCP Section 7.11); replace damaged riparian with indigenous native species to the maximum extent possible.

During construction and site preparation, clearly mark the limit of the riparian corridor and the buffer. Prohibit the entry of construction machinery or other vehicles into the riparian zone, and limit access to the buffer as appropriate to minimize damage; do not use riparian zone as a storage or staging area.

7.3.1.2 To mitigate impact 6.6.1.2., adhere to LCP performance standards regarding erosion and exposed soil surfaces (LCP Sections 7.10, 7.11); if necessary, use additional erosion control measures, including sedimentation basins, water bars, and so on, as specified in Section 7.2.4, to catch eroding soil and control flow of runoff, minimizing stream turbidity and bank erosion.

7.3.1.3 No practical mitigation for increased human activity (Impact 6.6.1.3) is available.

7.3.1.4 No practical mitigation on increased predation by domestic and feral animals (Impact 6.6.1.4) is available.

7.3.2 RIPARIAN: INDIRECT

7.3.2.1 To alleviate potential impacts associated with any ground-water depletion (Impact 6.6.2.1) biomonitoring of selected seeps, springs, and other wet areas is recommended to detect early indications of localized ground water depletion (see Chapter 10).

7.3.3 COASTAL GRASSLAND: DIRECT

7.3.3.1 On larger parcels, it may be possible to locate buildings, paved areas, and other structures to avoid impacting native grasses and other plants (Impact 6.6.3.1). Most parcels are too small to allow alternative siting, however. Removal of native plant material by a volunteer salvage team may be an effective way of preserving some of these native plants and minimizing genetic loss. It is recommended that San Mateo County coordinate such a volunteer team. Landowners should contact the San Mateo County Planning Department before disturbing the native plant cover to arrange for plant salvage.

7.3.3.2 For this impact affecting California Wild Strawberry, it is recommended that San Mateo County coordinate or encourage such a volunteer team.

7.3.3.3 On a parcel by parcel basis, no practical mitigation for loss of grassland habitat (Impacts 6.6.3.3 and 6.6.3.5) is available; from a regional perspective, acquisition of grassland for public open space or establishment of conservation easements on coastal terrace prairie areas would prevent complete loss of valuable grassland habitat. Habitat enhancement through native grassland restoration on public lands would offset in part incremental and cumulative habitat losses as well.

7.3.3.4 Wildlife sensitivities to disturbance in grassland areas varies (Impact 6.6.3.4); no practical mitigation is available.

7.3.3.5 To mitigate impacts associated with the introduction of undesirable week plants (Impace 6.6.3.5), remove existing pest plants from the site, reducing the source of seeds and propagules. Bermuda buttercup spreads vegetatively by tiny bulblets that are easily transported in soil and can be inadvertently introduced into a new area by plowing, discing, grading, dumping, and even by pocket gopher activity. Care should be taken not to spread the plants further when eliminating them from the development site. Pampas grass requires exposed soil for germination; any bare areas remaining after construction should be kept free of pampas grass. Lawn trimmings and discarded garden material are a common source of introduced exotics, and should not be dumped on adjacent coastal grassland areas.

7.3.4 WETLAND: DIRECT

7.3.4.1 Since the exact location of the wetland boundary and buffer zone is not known at this time, the wetland should be inventoried and the wetland boundary and buffer zone determined, and marked, if appropriate. To mitigate potential development impacts (Impact 6.6.4.1), only permitted uses should be allowed in the wetland, as set forth in the LCP, Section 7.16. LCP performance standards (LCP Section 7.17) should be observed for all construction in the wetland vicinity. Erosion and sedimentation that might affect the wetland should be controlled using effective measures.

7.3.4.2 No practical mitigation for increased human activity (Impact 6.6.4.2) is available.

7.3.5 WETLAND: INDIRECT

7.3.5.1 To preclude unexpected potential impacts associated with acelerated ground-water depletion (Impact 6.6.5.1), biomonitoring of selected seeps, springs, etc. is recommended to detect early signs of excessive drawdown.

7.3.6 AQUATIC: DIRECT

7.3.6.1 To mitigate impacts resulting from construction (Impact 6.6.6.1), follow mitigations for erosion and sedimentation control recommended above under Mitigations 7.3.1, 7.3.2, and 7.3.11. In addition, it is recommended that San Mateo County arrange for a biological inventory of the study area streams to establish some baseline information.

7.3.6.2 Follow mitigations recommended above under Riparian (Mitigations 7.3.1, 7.3.2) for minimizing bank erosion (Impact 6.6.6.2). Where the linear strip of vegetation has been damaged or interrupted, use local native plant material to restore it.

7.3.7 AQUATIC: INDIRECT

7.3.7.1 To mitigate impacts that may be caused by accelerated ground water depletion (Impact 6.6.7.1), biomonitoring of selected seeps, springs, etc. is recommended to detect early signs of excessive drawdown.

7.3.7.2 Community-wide sedimentation and runoff control, using sediment basins, energy dissipaters, and grass-lined channels to slow down and de-silt runoff may be effective and appropriate mitigation measures (Yam, pers. comm) to offset Impact 6.6.7.2.

7.3.8 RUDERAL: DIRECT

7.3.8.1 Landscaping with natives and other plants known to be attractive to wildlife may offset the loss of ruderal habitat to a large extent (Impact 6.6.8.1).

No practical mitigation is available for increased disturbance from humans and domestic and feral animals (Impact 6.6.8.2).

7.3.9 EUCALYPTUS STAND: DIRECT

7.3.9.1 No practical mitigation is available to offset loss of raptorial habitat (Impact 6.6.9.1). Seedlings should be removed, as specified in the LCP (Section 7.51). Retention of mature trees in a residential setting may not be appropriate if trees are subject to breakage or are diseased. Landscaping with natives or plants of known wildlife value will offset at least some of the habitat loss.

7.3.9.2 Individual populations of California wild strawberries (Impact 6.6.9.2) should be evaluated and transplanted if appropiate (see Mitigation 7.3.2.7 below).

7.3.10 CONIFER STAND: DIRECT

7.3.10.1 Retention of overmature conifer trees in a residential setting may not be appropriate if trees are diseased or subject to breakage. Landscaping with natives or plants with known wildlife habitat value will offset at least some of the habitat loss (Impact 6.6.10.1).

7.3.11 PLANT AND ANIMAL SPECIES OF CONCERN: DIRECT

7.3.11.1 To avoid construction impacts (Impact 6.6.13.1), sites with potential habitat for San Francisco gumplant or Hickman's cinquefoil should be surveyed by a qualified individual during the optimum blooming period of the plants. If plants are found, mitigation recommendations reflecting the site-specific conditions should be made and followed.

7.3.11.2 To determine the current status of the San Francisco garter snake in the study area, it is recommended that San Mateo County arrange for a qualified professional to conuct a preliminary survey of suitable habitat in the Montara-Moss Beach area. Such a survey should include the irrigation ponds at the north end of the airport in the Seal Cove area, surrounding upland habitat, and other potential snake habitat in the study area identified by the expert. The survey should be conducted ideally during the early spring through the summer, and use traps, drift fences, and other appropriate field techniques to evaluate the presence of San Francisco garter snake populations. Upland habitat should be surveyed, evaluating available small animal burrows and other relevant habitat parameters, to determine overall suitability. Recommendations for protecting the snake and its habitat should be made, if appropriate.

If San Francisco garter snakes are found, and/or if specific potential habitat areas are identified, a more detailed analysis should be done at these sites. Additional detailed surveys should be done in conjunction with specific construction projects that may affect the resource.

7.3.11.3 San Mateo County should arrange for a preliminary survey of suitable monarch butterfly overwintering habitat in the study area to determine if there are any active overwintering colonies there. Such a survey should be conducted by a qualified observer, should ideally be done between September 15th and November 1st, and include all suitable groves within one mile of the coastline below elevation

350 feet. If any butterfly overwintering areas are discovered, they should be periodically monitored to describe and document actual use. Any activity (tree cutting, clearing, construction, etc.) that might affect the microclimate of the overwintering areas (particularly temperature and wind exposure) should be carefully evaluated by a qualified expert.

7.3.12 PLANT AND ANIMAL SPECIES OF CONCERN: INDIRECT

7.3.12.1 Additional information on the status of the garter snake and the groundwater dynamics in the Seal Cove area is needed. See 7.3.11.13 and Section 10.3 for mitigation recommendations to fill this data gap.

7.3.13 COASTAL TERRACE PRAIRIE: DIRECT

7.3.13.1 To minimize impacts on Coastal Terrace Prairie habitat (Impact 6.6.28), mitigations recommended above for Coastal Grassland (Mitigation 7.3.6 through 7.3.10) should be followed. In addition, special consideration should be given to further evaluating the June grass prairie in Moss Beach. Development on this site would be restricted by ocean bluff setbacks (LCP Section 9.8c), and placement of new structures so as to avoid disturbing the native prairie may be difficult. Acquisition of this site for the public benefit, protection through a conservation easement, or other means of preservation may be appropriate.

7.3.14 CALIFORNIA WILD STRAWBERRIES: DIRECT

7.3.14.1 As specified in the LCP (Section 7.49), strawberry stands should be evaluated by a qualified strawberry geneticist to determine their potential commercial breeding value (Impact 6.6.16.1). Strawberries are ideally examined during spring flowering. Since there are many individual parcels with strawberries, a limited time period for survey scheduling, and a limited number of qualifies geneticists, it is recommended that San Mateo County coordinate a survey of potential sites (see Appendix B) rather than requiring individual property owners to make their own arrangements. A survey of all the sites at one time by a qualified expert would be the most effective and least expensive approach. Strawberries should be transplanted to specified locations, or made available for plant salvage, based on the findings of this evaluation.

7.4 TRAFFIC AND CIRCULATION

No mitigation is recommended in light of minimal impacts.

8 ALTERNATIVES TO THE PROPOSED PROJECT

The proposed project represents a decision to allow individual owners to develop the ground water resources beneath their lots. In essence, the individual owners would be drawing upon a common resource which the community has thus far chosen to leave largely undeveloped. The 58 owners and any subsequent well owners would be making decisions regarding how much and when water would be withdrawn from the aquifer.

Three alternatives to the proposed project may be reasonably considered:

1. Deferring aquifer development by individuals by taking no action or postponing the well construction ("No Action Alternative")
2. Developing additional ground-water sources of community water supply, either within or beyond the urban/rural boundary ("Supplemental Community Wells Alternative")
3. Engaging in concerted water harvesting on agricultural or open-space parcels adjoining the Montara and Moss Beach communities, perhaps in conjunction with concerted efforts to achieve improved water-quality, open-space protection, habitat restoration or other **bona fide** watershed-management goals of the LCP. ("Watershed-Management Alternative").

The alternatives are described and evaluated in the following paragraphs.

8.1 DEFERRED DEVELOPMENT OR NO ACTION

One potential alternative would be to defer construction of the individual water supplies until further information regarding the long-term availability of suitable-quality water were better demonstrated in each of the hydrologic sub-units; or alternatively, to prohibit development of individual water sources within the boundaries of a community water district or company. Other coastal communities, among them the City of Santa Cruz, have implemented regulations discouraging or preventing development of individual water supplies within organized service-area boundaries, with the intention of controlling water costs by spreading fixed charges over a broader base, and providing a higher and more uniform quality of water. Diversification of ground water development, individual flexibility of action, and improved knowledge of the ground water resource within the service boundaries are associated with this alternative. A decision to pursue a no-action or deferred-action alternative would also represent a choice to minimize the community and individual exposures to less-reliable water supplies during dry periods at the cost of not using a developable resource during most years.

The No Action alternative would defer growth in the Montara-Moss Beach area until water becomes available from the water district. The unavailability of water is currently the most limiting factor to growth in the Montara-Moss Beach area. Once water is available, the capacity for wastewater treatment would limit growth until the wastewater treatment plant is expanded. Impacts to public services and sensitive resources would also be deferred until the availability of water again makes growth under the LCP feasible.

8.2 SUPPLEMENTAL COMMUNITY WELLS ALTERNATIVE

Citizens Utilities Company of California (CUCC) is attempting to develop additional water supplies of relatively high reliability with a ground water exploration program in the airport area. It is the opinion of CUCC staff, and agency professionals at the California Public Utilities Commission and many knowledgeable local observers with whom the project team spoke that additional well yields could be used to meet the needs of the individual owners participating in the lottery. Additional community wells would also serve to diminish the duration of pumping in the existing community wells, which now operate nearly full time, rather than the 60 to 70 percent of time more typical of municipal water-supply wells in the region. Siting of additional community wells outside of Wagner Valley would also diversify the aquifers developed for community supply.

Elsewhere in coastal California, development of new aquifers or pioneering of new water sources is often accomplished by small- to mid-sized mutual water companies or service districts. Districts of this type are not feasible in the Montara-Moss Beach area due to existing service areas, absence of a small-district tradition in the mid-coast, and other sound reasons. An active program of developing new, dispersed community wells would serve this pioneering function, while retaining the advantages of the existing water-distribution systems. A program of this type could be implemented by the existing purveyors or by other local-government entities.

Supplemental community wells would improve the ability of the purveyer or other entity to provide water within the service area. Growth on the Mid-Coast is currently restricted by both water supply and wastewater treatment capacity. At present the Montara Sanitary District has offered fifty-eight new connections against their allotted capacity at the wastewater treatment plant. These connections were offered by lottery since the demand for connections now exceeds the supply; a total of 159 parcels was entered into the lottery. Additional sewer connections would not be available until the plant is expanded in the early 1990's.

The 58 proposed wells would provide water to the 58 new sewer connections. Growth beyond the 58 parcels would be limited until additional water and wastewater service capacity both become available. At that time the rate and amount of growth would be controlled under the LCP.

8.3 WATERSHED MANAGEMENT ALTERNATIVE

Both the natural hydrologic properties and the pattern of land use in Montara and Moss Beach are conducive to a program of deliberately managing areas immediately outside of the communities for water development. Numerous areas just beyond the urban/rural boundary could potentially provide supplemental supplies of appropriate reliability and quality if managed for their water yields in coordination with other agricultural and open-space programs. These opportunities are generally of two types:

1. Suitable sites for additional community wells north and east of the towns, at locations where suitable hydrogeologic conditions may exist and where the contributing areas are presently in open-space uses. This dual approach protects yields and can also serve to sustain the communities' confidence in future water quality.
2. Potential use of the flat-floored valley areas north and south of the communities for active recharge of alluvial aquifers in winter and spring months, coupled with extraction wells. A program of this type would emulate the existing situation in Wagner Valley, where infiltration of surface runoff is promoted as a means of developing water supplies of suitable reliability and

> quality. The largest of the potential induced-recharge areas is the valley floor of San Vicente Creek, east of Moss Beach, although other candidate areas also exist. A program of this type must recognize existing water uses and should be based upon detailed feasibility assessments.

In both cases, water would be harvested from areas managed in part for other open-space uses consistent with public policy. Among such approved uses in the LCP are agriculture and animal husbandry, habitat protection, special management areas, and open space. Water harvested from such sites might serve as a means of supporting other land uses and activities valued by the communities. The non-urban uses of these areas, if properly carried out, can be important vehicles for providing water quality protection for the water ultimately developed.

Similar to the alternative of supplemental community wells, the effects of this alternative on services would likely be to expand the purveyor's service ability beyond the 58 proposed lots. Additional growth would then be limited by wastewater treatment capacity until the treatment plant is expanded. Once both services are available, growth in the area will continue under the limits imposed by the LCP.

9 STATUTORY FINDINGS

9.1 GROWTH-INDUCING IMPACTS

The approval of private well use on the 58 parcels with sewer connections would induce growth in the Montara/Moss Beach area within the limits of the LCP. The growth would constitute infilling within the urban/rural boundary in practical terms, although the new residences would not be connected to the water service utility. Similarly, the approval of an additional six septic systems would encourage development of another six parcels. This development would also be within the urban/rural boundary and in practical terms would be infilling.

The development of the 58 lots would nearly constitute buildout of non-priority land uses in the Montara Sanitary District under Phase I of wastewater treatment capacity. Additional development of non-priority uses could not occur until the wastewater treatment plant is expanded.

The impacts of the maximum growth encouraged by this project are described in Chapter 6.

9.2 CUMULATIVE IMPACTS

The proposed project is limited to 58 parcels which are likely to be sites for drilling of individual water wells. An additional 157 sites for drilling of wells have been identified in the process of the sewer-connection lottery or other self-selection mechanisms.

If all 217 sites were in fact developed with individual water wells, the cumulative demand would approach the overall threshold of 40 percent of normal-year area-wide outflow which we consider a prudent safe yield for coastal aquifers. Individual hydrologic sub-units, notably Upper Seal Cove and, to a lesser extent, Montara Heights and Upper Moss Beach, could exceed this threshold at a lesser degree of development. Progressive increased risk of well failure, with concommittant burden upon other public sources, and of potential impacts upon sensitive-area biota can be expected if the safe-yield threshold is exceeded.

9.3 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

Optimal long-term hydrologic productivity may involve developing an alternative community supply, at a site where yields and quality can be better protected. (To the extent that construction of the individual wells may defer or preclude adoption of an alternative community supply, the wells may marginally depress long-term productivity.) The wells can provide an immediate diversification of water-supply sources, which may be considered a contribution to long-term productivity. If effectively monitored, the individual wells can provide the data needed to develop a usable understanding of the local ground water resource, indirectly a significant enhancement of long-term productivity.

9.4 IRREVERSIBLE COMMITMENT OF RESOURCES

No irreversible commitment of public resources is intrinsic to the proposed project. It may be that the parcels could be served more efficiently from the existing community system, although the environmental effects of additional pumping of existing wells may be greater than those associated with dispersed ground water development. The community water system, however, is not accepting additional connections at this time, nor is there any guarantee of significant additions to the community supply in the near future. Individual owners who are unsuccessful in developing a well on their parcels will suffer from an irreversible commitment of resources. Given that 58 wells may be attempted as a result of this project, a certain number of unsuccessful wells unable to meet the County's quantity or quality standards may be anticipated.

9.5 SIGNIFICANT UNAVOIDABLE IMPACTS

The only significant unavoidable impact which may be envisioned as a result of the project is the possibility of proliferating onsite waste-disposal systems, presently precluded by County policy. Use of such systems in the soils typical of this area would not be prudent in conjunction with development of the ground-water resource by individual wells.

9.6 EFFECTS FOUND TO BE NOT SIGNIFICANT

The proposed development of individual water wells is not expected to significantly deplete the available ground water outflow or storage, considered on a sub-unit or regional basis. Further ground water development by this means could, as discussed in 9.2, result in withdrawals approaching or exceeding prudent safe yields; however, further development of wells without additional information which can address this question is not suggested, and is counterindicated.

With the exception of potential overcrowding at the grammar school, the proposed project will not have a significant impact on local government or community services, provided that use of onsite waste-disposal systems continues to be precluded within the urban/rural boundary. Effects on biotic values are considered mitigable if identified parcels receive site-specific attention when application for development is made.

Other environmental effects which were initially considered potentially significant proved to be either insignificant or subject to mitigation: cultural resources, water quality within developable aquifers, flows in local streams, air quality, cultural resources, public safety and traffic.

10 MONITORING AND MITIGATION: RECOMMENDED STRATEGIES AND PRACTICES

As the project team prepared the EIR, it became evident that much of the information sought by commenting agencies, or data which would address County policies presented in the General Plan or LCP were not available. The information most needed is that describing:

1. Ground water levels, as they vary seasonally and from year to year, in the six hydrologic sub-units
2. Ground water quality
3. Health and sensitive habitat areas
4. Aquatic habitat
5. Special-status plants and San Francisco Garter

The proposed project, with sites distributed throughout the Montara-Moss Beach community, provides a significant, realizable opportunity to acquire some of the basic data needed to outline the primary hydrologic variables (Policy 2.32), to meet the LCP call for monitoring of wells to provide information for development review (Policy 5.28), and to assess performance of development near sensitive habitats (Policy 7.10).

10.1 HYDROLOGIC MONITORING

The primary constraint to assessment of the hydrologic system of the Montara-Moss Beach area is the lack of any continuous record of ground-water levels. Records on the seasonal and year-to-year fluctuations in ground water levels are crucial in describing how the hydrogeologic system functions. Such records permit quantifying the amount of rainfall which eventually recharges the water table, the time required for recharge, and the eventual fate of the water which has been recharged. Records of this type also allow the effects of existing ground-water withdrawals to be measured.

One example of such data is the record developed by the California Department of Water Resources for well 5S/6W-10J1, in the Airport Terrace aquifer, about one mile to the south (Figure 12). The record reflects a seasonal cycle of recharge and discharge during most years, with the aquifer filling to about the same level in years with normal or greater-than-normal precipitation. Recharge is demonstrably insufficient to fill available storage during drier years, or during sequences of consecutive dry years. With data of this type, estimates of hydrogeologic properties and processes can be tested and calibrated.

Absence of such data is particularly unfortunate in Montara and Moss Beach, due to the small size and isolated character of many of the developable water-bearing units.

Records of water-level fluctuations for the individual hydrologic sub-units are essential to verifying the projections made regarding the properties of the aquifers, the boundaries of the sub-units, and the rates of seasonal inflow and outflow. In addition, records of seasonal and annual variations in the specific conductance ('conductivity') of key wells can be highly useful in inferring the locations where water enters and leaves the individual aquifer systems (e.g., Johnson and Hecht, 1987; Kleinfelder, 1988).

Systematic monitoring of water levels and specific conductance in the new water wells could prove to be a highly-effective means of both:

1. Observing the effects of pumping on ground-water levels and quality at points scattered through the six hydrologic sub-units.
2. Providing a technical basis for assessing where other opportunities and constraints for environmentally-satisfactory ground-water development may be within the Montara and Moss Beach areas.

To meet these goals, a recommended program includes mixing extensive and intensive monitoring:

1. The extensive monitoring, recording the variations in water levels throughout the area, would be based on bimonthly monitoring water levels in as many of the 58 wells as possible, for a period of two years.
2. The intensive monitoring might include a continuous water-level recorder installed in each of the three major hydrogeologic environments:
   a. Terrace deposits

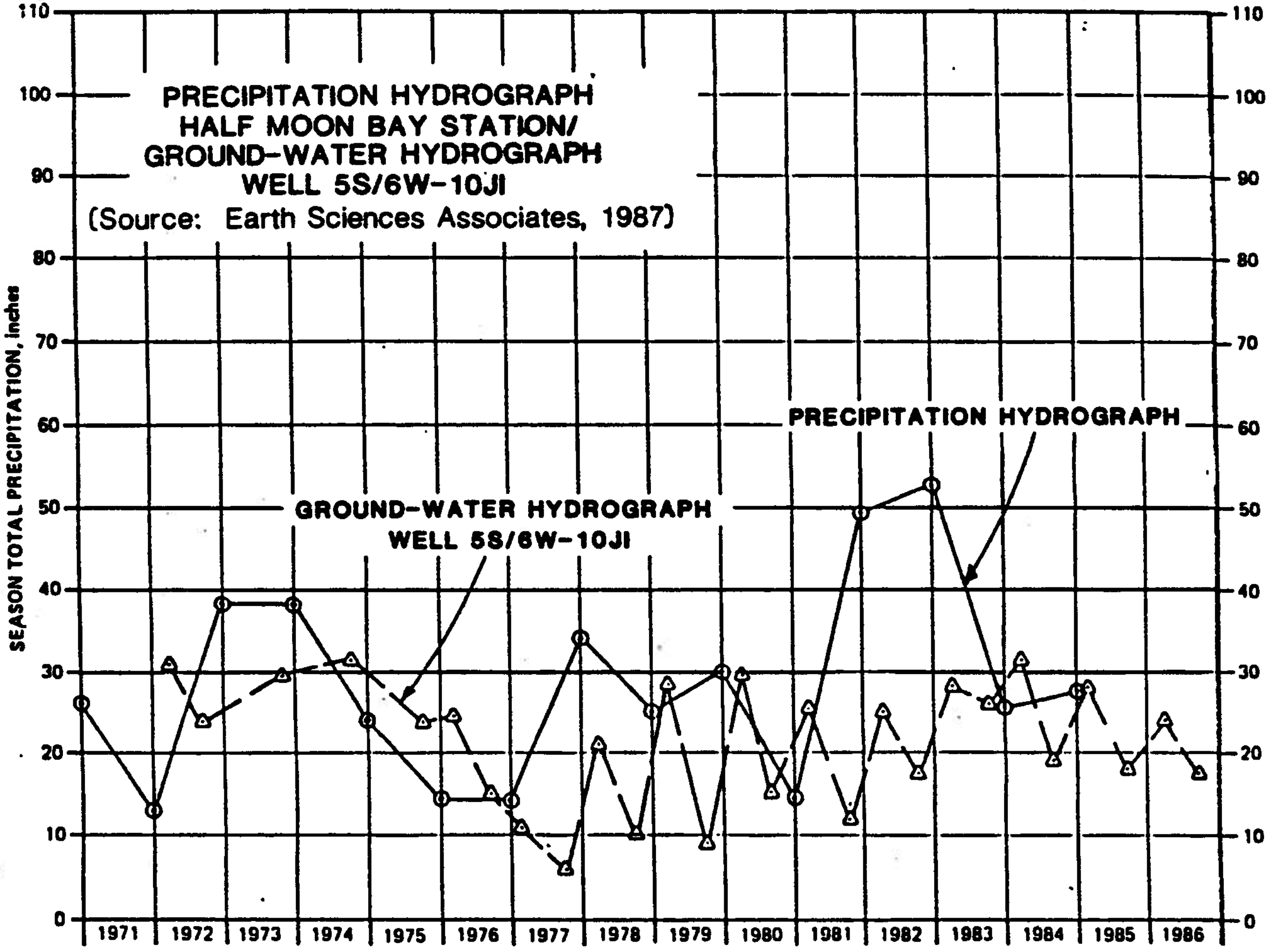


Figure 12. Seasonal Precipitation and Ground-water Levels, Airport Aquifer Area

    b. Crystalline bedrock
    c. Lower Wagner Valley alluvium

3. At the end of two years, eight to ten of the wells (or other wells) should be chosen for ongoing bimonthly measurements, and monitored in conjunction with the long-term continuous records.

Measurements would be made by County staff. The wells should be constructed with an observation port, for ease of monitoring by staff. The apparent capital costs for purchase and installation of the equipment would be approximately $9,000 to $10,000. The annual operational expenses would be approximately $3,000. Existing wells should be used if at all possible, to avoid the expense of installing a well.

A monitoring program of this type should be based upon careful records of well construction, initial ground water conditions at the time of drilling, subsequent changes in level and quality, and the intensities with which the well is used. Records, including sketches of reference points and observation points used in monitoring, should be maintained by a knowledgeable professional with at least one copy of the records on permanent file at the County of San Mateo.

10.2 BIOMONITORING

Given the existing water resources in the study area and the relative magnitude of the project under consideration, lowering of the existing local water table levels is expected to be small. However, established wells in the Montara - Moss Beach area already remove water, affecting pre-development baseline levels to an unknown extent. In addition, urbanization has increased the impervious surface in the study area, altering drainage patterns; decreasing ground water recharge; increasing runoff volume and velocity; increasing erosion and sedimentation; and degrading water quality. While vegetation in general is adaptable to fluctuation in water supply and ground water levels, all plants have a minimum water requirement. At present it is not possible to predict when small, incremental increases in ground water withdrawal might exceed a minimum threshold of tolerance for vegetation in the study area. Should ground water withdrawal continue past a point where vegetation is adversely affected, domestic ground water supplies would also be seriously affected. Loss of vegetation accelerates discharge rates, increases erosion, decreases soil water retention, and decreases ground water recharge.

Different plants have widely varying water requirements. Wetland and riparian species grow in generally wet soils and can be expected to be particularly sensitive to changes in soil saturation levels. In addition to the riparian vegetation that grows along streams, three types of wetland occur in the Montara - Moss Beach area: seeps and springs on the ground surface, marked by characteristic wetland vegetation; seeps and springs along the oceanfront bluffs, formed where the cliff faces intersect water-bearing strata; and wetlands formed where surface flows are slowed or impounded, at the mouths of creeks, along stream meanders, and around reservoirs. Monitoring of riparian and wetland vegetation in areas where ground water reduction is expected would serve as a gauge of withdrawal levels, and help determine if and when corrective or restrictive measures should be instituted to maintain a functional and adequate water supply.

Since the distribution and flow of ground water in the study area includes a number of small watersheds, monitoring would need to include a variety of sites that reflect the considerable variation from basin to basin. Natural fluctuation in the hydrologic regime can be accounted for by monitoring similar control sites not affected by ground water withdrawal. By establishing sampling transects across selected seeps, springs, wetlands, and riparian corridors, vegetation changes over time can be evaluated.

During the field work done for this project, a number of potential biomonitoring stations were identified in the study area at large, briefly listed below, and indicated on Figure 13.

Montara

- Several seeps and springs in the grasslands north of North Montara Creek;
- Small wetland on North Montara Creek at Highway 1;
- Small wetland between Cedar and Elm Streets;
- Riparian strip along Montara Creek, in the immediate vicinity of the existing Citizen's Utilities wells;
- Seep in grassland, just north and west of major bend in Montara Creek;
- Riparian strip along the lower 4000 feet of Montara Creek;
- Along beachfront cliffs where water-bearing strata intersect, on Montara Beach and below Point Montara lighthouse.

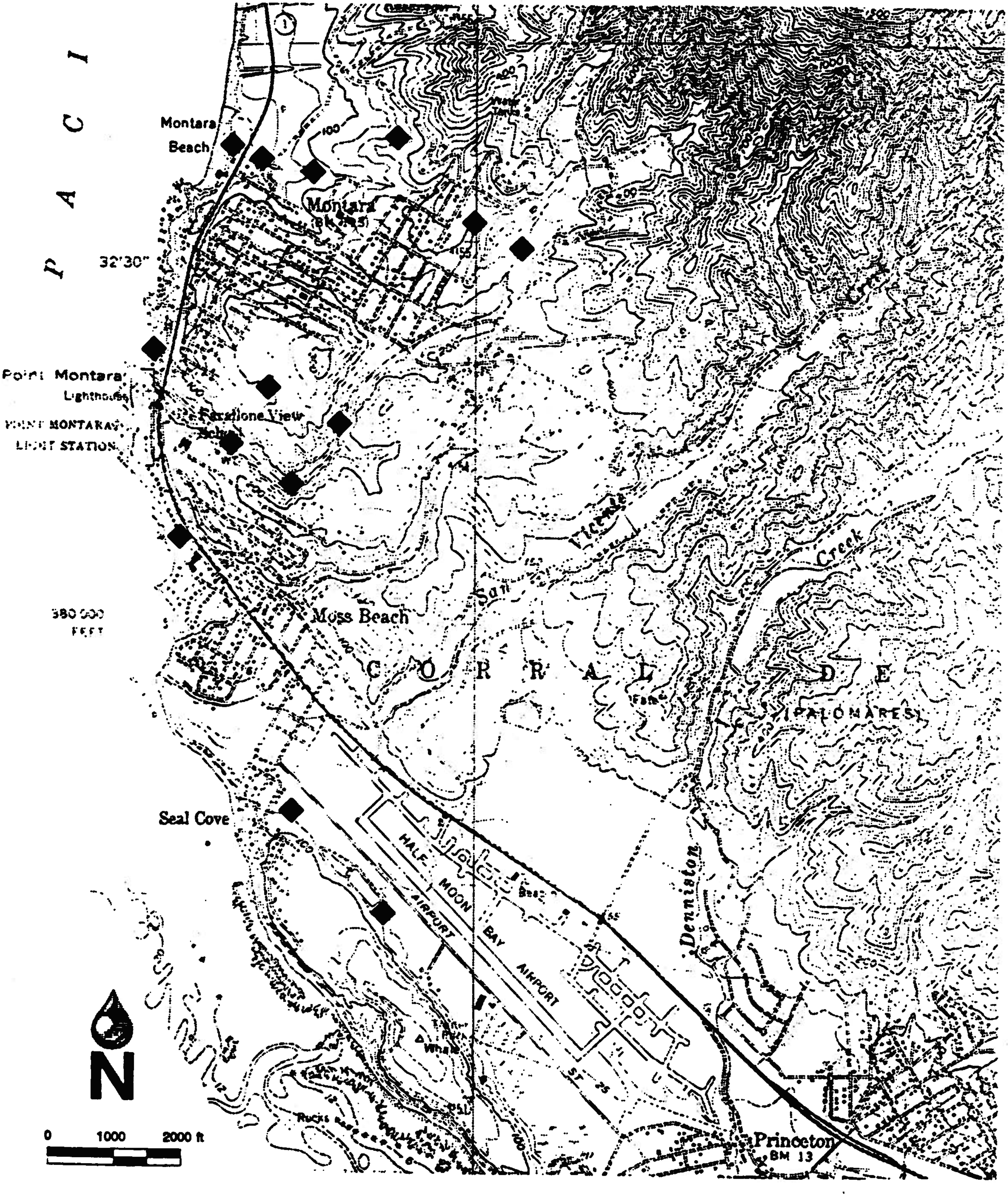


Figure 13. Potential Biomonitoring Stations

Moss Beach

- Vernal wetland/seep in Koeleria grassland;
- Cliff front seeps, where vegetated and accessible;
- Juncus/seep areas in Seal Cove.

Biomonitoring should be done in close coordination with hydrologic monitoring of rainfall, runoff, streamflow, and water quality. To be most effective, and provide the most useful information, biomonitoring should begin before any additional anticipated ground water withdrawal begins, to establish project baseline conditions. Monitoring should continue at least through project buildout. Significant long-term effects may be subtle and require continued monitoring after project buildout, however. While site-specific circumstances might dictate additional monitoring needs, wetlands and riparian zones are relatively dynamic systems, and in those cases requiring longer term investigation a monitoring program extending five years beyond full project completion would most likely be adequate to detect significant changes.

10.3 ADDITIONAL DATA NEEDS

10.3.1 AQUATIC RESOURCES

Aquatic resources will be most immediately affected by increased ground water removal, yet there are essentially no data on the aquatic biota in the Montara - Moss Beach area. Potential impacts cannot be predicted or evaluated without some basic baseline information. At the minimum, a basic inventory of fin fish and other aquatic organisms should be made of these streams as soon as possible. It is recommended that San Mateo County arrange for California Department of Fish and Game or a private consultant to conduct a preliminary stream survey of fin fish and aquatic organisms to determine if a significant aquatic resource is present. This survey should be done before ground water extraction associated with this project begins. If a significant resource is present, then periodic monitoring is recommended to detect any changes that might signal excessive ground-water drawdown.

10.3.2 SAN FRANCISCO GARTER SNAKE

Historic habitat for this snake exists in the Seal Cove area, but the current status of the population at the site is unknown. This area should be surveyed by qualified field biologists, using traps, drift nets, and other standard techniques, at an optimal season (mid-March to June), (McGinnis, pers. comm.) to establish with some reasonable certainty the presence or absence of the snake.

Most of the Montara - Moss Beach area has never been surveyed for the snake (McGinnis, pers. comm.). While the permanent and seasonal creeks of the study area do not appear to meet the definition of classic San Francisco garter snake habitat, these creeks have many similarities with other coastside creeks in which these garter snakes have been documented, and may provide secondary or marginal habitat for the snake. Secondary and marginal habitats may be unoccupied by the snake during much of the year, yet provide critical resources from time to time.

Not enough information is available at this time to recommend specific site surveys on individual parcels. A preliminary survey funded by the Department of Fish and Game by a qualified biologist should be done to identify and evaluate any suitable habitat in the study area, using traps, drift nets, and other appropriate survey techniques (see Mitigations, 7.3.2.4).

This survey should provide specific recommendations for protecting San Francisco garter snake populations and/or potential habitat that may be identified. Any construction or other activity in the vicinity of identified habitat should be carefully evaluated to avoid adverse impacts on the snake and its habitat. Adiitional surveys that may be required should be done in conjunction with proposed development projects.

10.3.3 SAN FRANCISCO GUMPLANT

Grindelia maritima typically grows in dry, stony grassland areas, and has been reported from the oceanfront bluffs in Montara. A spot-check of the recorded collection locality in 1985 did not include any other appropriate habitat areas (Sigg, pers. comm.). Apparently suitable habitat for the gumplant was identified during this project field reconnaissance on two parcels (037-086-170; 037-112-040/070), and site-specific surveys are recommended for those lots.

An area-wide survey for San Francisco gumplant has a number of advantages over a site-by-site approach, however. It is likely that additional suitable habitat exists in unsurveyed portions of the Montara - Moss Beach area, and any San Francisco gumplant that may exist in these habitats will continue to be vulnerable to development impacts until a more comprehensive survey of these suitable areas is conducted. Timing of the survey is critical, as plants can be identified with certainty only during their blooming period (July - October); if left to individual scheduling this requirement may unreasonably delay permit approval and complicate home construction. Should San Francisco gumplant be identified on the site-specific surveys recommended as part of this project, information gained from an area-wide survey will provide a valuable perspective in evaluating regional significance of impacts.

Such a survey should be conducted by a qualified botanist. Potential habitat (including habitat identified in this report) should be identified and visited as necessary during the blooming period of the gumplant.

10.3.4 HICKMAN'S CINQUEFOIL

Although historic records exist for Hickman's cinquefoil in the vicinity of Moss Beach, this plant has not been identified there since 1933, and is believed to have been extirpated by beach cliff erosion and development (CNDDB, 1989). Apparently suitable habitat still exists in the study area, and the possibility that the plant still occurs there cannot be ruled out without a systematic survey. As discussed above under the San Francisco gumplant, specific site surveys have been recommended (037-086-170; 037-112-040/070) but would not necessarily cover all suitable potential habitat areas; should plants be discovered on an individual lot, other habitat in the area should to be surveyed to assess effectively potential impacts on the population. An area-wide survey of potential habitat should be conducted using the recommendations outlined above, but during the April - August blooming period of the cinquefoil.

10.3.5 CALIFORNIA STRAWBERRY

California strawberry (**Fragaria chiloensis**) is valuable to commercial strawberry breeders, and is also a very common coastside plant. Potentially desirable genetic material can be identified only by experts, who should ideally visit the plants in situ to appreciate plant adaptations to local habitat conditions.

Recommendations for site-specific surveys have been made in this report for numerous parcels. Since these surveys will all require the participation of a very few select plant experts, it would be more efficient to conduct one comprehensive survey that is convenient for these professionals, at a time of the year that is optimum for evaluating the plant material, rather than requiring surveys be scheduled on a case-by-case basis. A comprehensive survey would also provide more detailed information that would be extremely useful in implementing the Local Coastal Plan policy 7.49 on California strawberry.

10.3.6 RIPARIAN HABITAT

Particularly well-developed riparian habitat occurs along the lower 4000 feet of Montara Creek, east of Highway 1. Riparian vegetation in this area has not been surveyed or described, and will not be included in any of the individual site surveys recommended in this report, yet this riparian area already is and will continue to be affected by ground water withdrawals from upstream alluvial areas. Monitoring any impacts associated with this project might best be done by inventorying and monitoring the aquatic habitat of Montara Creek. The aquatic habitat can be expected to be more sensitive to excessive ground water withdrawal than riparian vegetation would be. This area has been identified as a potential biomonitoring station and has been recommended for an aquatic survey.

10.4 IMPLEMENTATION

The proposed program can be implemented, in whole or in part, under the aegis of the County's Department of Environmental Management, Planning and Development Division. Funding for the proposed program can be provided through portions of mitigation fees to be assessed on successful lottery parcels, and on subsequent owners of new water wells.

The biomonitoring program should be established under the direct responsibility of a knowledgeable local biologist, with basic records and transect baseline data to be available for inspection both at Redwood City and in the general Mid-Coast area. Hydrologic monitoring, if implemented, requires accurate initial information on the conditions found and the construction used in establishing the well. The County may choose to maintain the monitoring program through the staff of the Environmental Health Division, or it may designate a qualified geologist, engineer or hydrologist, with appropriate registration, to supervise establishing the records and initiating the files. Records should be kept on file at Redwood City.

Both the biomonitoring and hydrologic monitoring programs are amenable to being coded into the County's geographic data management system, in which information pertinent to individual parcels may be readily recalled.

11 INITIAL LIST OF REFERENCES CITED AND SOURCES CONSULTED MONTARA - MOSS BEACH WATER WELL EIR

11.1 REFERENCES CITED

Blaney, H.P., and Ewing, P.A., 1949, Irrigation Practices and Consumptive Use of Water in Pajaro Valley, California: USDA Soil Conservation Service report to the Division of Water Resources, Department of Public Works, State of California. Appendix I to State Water Resources Board Bulletin No. 5, Santa Cruz-Monterey Counties Investigation, August, 1953.

Bradley, W. C., and Addicott, W. O., 1968, Age of First Marine Terrace Near Santa Cruz, California: Geol. Soc. Amer. Bull., v. 79, p. 1203-1210, Sept., 1968.

California Department of Fish and Game, 1983, At the Crossroads. Resources Agency. Amended July 1983.

California Department of Forestry, 1980, Golden Gate Park Forest Management Plan. Resources Agency, Sacramento

California Department of Transportation and U.S. Department of Transportation Federal Highway Administration, 1983, Devils Slide Draft Environmental Impact Statement, Rep. 4-SM-1-34.0/41.0, Devils Slide, 4210-120771, 333.

California Department of Water Resources, 1965, Coastal San Mateo County Investigation: DWR Bulletin No. 138, 159 p.

California Department of Water Resources, 1974, Evaluation of Ground Water Resources: Livermore and Sunol Valleys, DWR Bulletin No. 118-2, 153 p.

California Department of Water Resources, 1981, California Rainfall Summary, Monthly Total Precipitation 1849-1980: 43 p.

California Department of Water Resources, 1982, Inventory of Instream Flow Requirements Related to Stream Diversions: DWR Bulletin 216, 301 p.

California Native Plant Society. 1988. Inventory of Rare and Endangered Vascular Plants of California. Special publication No. 1, 4th edition. CNPS, Sacramento, CA.

California Natural Diversity Data Base, 1988, Occurrences of Special Animals, Plants, and Natural Communities: Montara Mountain 7 1/2' U.S.G.S. quadrangle, San Mateo County. Unpublished map and computer printout dated December 14, 1988.

Carroll, D.E. and Walker, Linda, 1979, Report on Purisima Creek Adjudication: Water Supply and Use of Water, Proofs of Claim and Preliminary Order of Determination: California State Water Resources Control Board, 77 p.

Darrow, R.L., 1963, Age and Structural Relationships of the Franciscan Formation in the Montara Mountain Quadrangle, San Mateo County, California: California Div. Mines and Geology, Spec. Rept. 78, 23 p.

Earth Science Associates, 1986, Evaluation of Ground Water Development Potential in the Half Moon Bay and El Granada Areas: Unpublished Preliminary Report, 41 p.

Earth Science Associates and Luhdorff and Scalmanini, 1987, Half Moon Bay Airport/Pillar Point Marsh Ground Water Basin, Phase I Study Report (Preliminary Report): Unpublished Report 16 p.

Flint, Philip S., 1977, Environmental Study of the Pillar Pt. Marsh, San Mateo County, California, Part I. Baseline Data: Report prepared for Coastside County Water District. 57 p.

Flint, Philip S., 1978, Environmental Monitoring Study of the Pillar Pt. Marsh, San Mateo County, California, Part II. Progress Report: Report to Coastside County Water District, 46 p.

Geoconsultants, Inc., 1987a, Ground Water Assessment, Half Moon, Bay, California: Unpublished Report, 26 p.

Geoconsultants, Inc., 1987b, Interim Ground Water Assessment, Alsace Lorraine Area, Half Moon Bay, California: Unpublished Report.

Geo/Resource Consultants, Inc., 1987, Princeton Commercial Water Well Development: Letter report to Farallone Vista Associates, with attachments, March 10, 1987.

Geo/Resource Consultants, Inc., Princeton Water Well Development Letter report to Farallone Vista Associates, with attachments, April 3, 1987.

Hauge, C., 1987, Water level records for state monitored wells, unpublished data

HEA, A Division of Kleinfelder, Inc., 1984, Pajaro Basin Ground Water Management Study: Report to the Association of Monterey Bay Area Governments, 238 p.

Hecht, B., 1978, Hydrologic and Water Quality Impacts of the Proposed Expansion of Felton Quarry, Felton, California: H. Esmaili & Associates report prepared for ENVIRON, July, 1978, 54 p.

Hecht, B., 1983, Storm Hydrology and Definition of Sand-Hill Recharge Areas, Pajaro Basin, California: Appendix E to Pajaro Basin Ground Water Management Study, prepared for the Association of Monterey Bay Area Governments, 32 p.

Henry Hyde Associates, 1986, Montara-Moss Beach Water System: Report to County of San Mateo, Multipaged.

Holland, Robert F., 1986, Preliminary Descriptions of the Terrestrial Natural Communities of California. California Department of Fish and Game.

Hutton, C. O., 1959, Mineralogy of Beach Sands Between Half Moon and Monterey Bays, California: Cal. Div. Mines Spec. Report 59, 32 p.

Ingles, Lloyd G. 1965. Mammals of the Pacific States. Stanford University Press, Stanford, CA.

Johnson, N.M., Esmaili, H., and Hecht, B., 1982, San Lorenzo Valley On-Site Wastewater Disposal Management Study: H. Esmaili & Associates report to San Lorenzo Valley Water District, 182 p. plus appendices.

Johnson, N.M. and Hecht, B., 1987, Results of Test Drilling for Ground water Supplies at Cascade Ranch, South-Coastal San Mateo County: Kleinfelder report prepared for Trust for Public Lands, 50 p.

Kleinfelder & Associates, 1986, Soil and Ground Water Investigation, Super 7 Facility, Highway 1 & Vermont Avenue, Moss Beach, California: Unpublished Report, 9p.

Kleinfelder, Inc., 1988, El Granada Ground Water Investigation Report: Report to County of San Mateo Department of Health Services, Environmental Health Division, 57 p.

Knott, J.M., 1973, Effects of Urbanization On Sedimentation and Floodflows in Colma Creek basin, California: USGS Open-File Report, 54 p.

Leighton and Associates, 1971, Geologic Report of Seal Cove - Moss Beach Area: Report to County of San Mateo, 16 p.

Lombardi, L. V. 1949, A Quantitative Study of Recent Sediments in Halfmoon Bay, California: M.S. Thesis, Stanford University, 53 p.

Lowney-Kaldveer Associates, 1974, Ground Water Investigation, Denniston Creek Vicinity, San Mateo County, California: Unpublished Report, 12 p.

Luhdorff and Scalmanini Consulting Engineers, 1982, Evaluation of Ground Water Development Potential, Montara Water Service Area: Report to Citizens Utility Company of California, August 1982, 18 p.

Martz, Craig, and Shadle, S.M., 1983, Biological Assessment, Endangered Species, for the Proposed Relocation of Route 1 at Devils Slide in San Mateo County. Prepared for Federal Highway Administration and California Department of Transportation.

Mayfield, David, and Shadel, S.M., 1983, Natural Environment Study, Proposed Devils Slide Bypass. Prepared for California Department of Transportation.

Munz, Philip, and Keck, D.D.,, 1968, A California Flora, With Supplement. Univ. Calif. Press, Berkeley and Los Angeles.

National Oceanic and Atmospheric Administration, Climatological Data Annual Summary, California: 1951-1986: National Climatic Data Center Annual Report, 57 p.

Pampeyan, E.H., 1981, Geologic Map of the Montara Mountain Quadrangle, San Mateo County, California: U.S. Geol. Survey Open-File Report 81-451, map scale 1:12000.

Rantz, S.E., 1974, Mean Annual Runoff in the San Francisco Bay Region, California 1931-70: USGS Misc. Field Studies Map MF-613.

Rau, John G. and Wooten, D.C., 1980, Environmental Impact Analysis Handbook: McGraw Hill, Inc.

San Mateo County Planning and Development Division, 1985, San Mateo County Local Coastal Program Policies, Nov. 1985 edition, multipaged.

San Mateo County, 1987, Initial Study and Negative Declaration for the Warheit Well Water Supply Alternative, Pescadero, California: SCH 87090801, October 14, 1987.

Scalmanini, Joseph, 1988, Prepared Testimony and Qualifications of Joseph C. Scalmanini: Water Supply for Farallone Vista Project: Exhibit "Farallone Vista Associates #1" before California Public Utilities Commission Hearing of January 1988, Belmont, CA, File #85-06-010.

Small, Arnold. 1874. Birds of California. Collier Books, New York.

Spotts, J. H., 1958, Heavy Minerals of Some Granitic Rocks of Central California: Unpublished Ph.D. thesis, Stanford University, 80 p.

Stebbins, Robert C. 1966. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin, Boston.

Thomas, John H., 1961, Flora of the Santa Cruz Mountains. Stanford Univ. Press, Stanford, California.

Thomas Reid Associates, 1987, Environmental Assessment of Water Supply Alternatives for the Community of Pescadero, California: Prepared for San Mateo County, 85 p.

Thornthwaite, C.W. and Mather, J.R., 1955, The Water Balance: Drexel Institute of Technology, Publications in Climatology, Vol. VIII, no. 1, 85 p.

University of California, Cooperative Extension, Determining Daily References Evapotranspiration: Leaflet 21426, 12 p.

USDA Soil Conservation Service, 1961, Soil Survey: San Mateo Area, California: Series 1954, No. 13, 111 p.

USDA Soil Conservation Service, 1980, Soil Survey of Santa Cruz County, California: 148 p, 10pl.

USDA Soil Conservation Service, 1984, Strawberry Hills Target Area, Monterey County, California: Watershed Area Study Report, 55 p.

USDA Soil Conservation Service, in prep, Soil Survey: San Mateo County, Eastern Part, and San Francisco County, California: Preliminary soil maps and tables, subject to revision, provided courtesy of the SCS Paso Robles field office.

U. S. Fish and Wildlife Service, 1973, The Endangered Species Act of 1973, as amended. P.L. 93-205 (87 Stat. 884)

Wentworth, Carl M., 1986, Maps of Debris Flow Features Evident After the Storms of December 1955 and January 1982, Montara Mountain Area, California: U.S. Geological Survey Open-File Map 86-363, 2 pl, map scale 1:24000.

Wisney, Paul B., 1983, Location Hydraulic Study For Environmental Impact Statement, Devils Slide Bypass, Rep. 4-SM-1 PM 34.0/41.0, 4-210-120771, Caltrans District 4 Hydraulics Section, 79 p.

11.2 INDIVIDUALS AND ORGANIZATIONS CONSULTED

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Jim Bartel, USFWS Endangered Species Office

Randy Benthin, California Department of Fish and Game

James Bentley, Citizens Utilities Company of California

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Ken LaJoie, U.S. Geological Survey

Diane Landry, California Coastal Commission

John Lane, City of Santa Cruz Museum

Rich Lilley, Montara Youth Hostel

Chief Rolf Loeffler, Point Montara Fire Protection District

B. J. Mackle, Carillo Unified School District

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Herb Niedenberger, Citizens Utilities Company of California

Naomi Patridge, Cabrillo Unified School District

Capt. Richard Platt, San Mateo County Sheriff's Office

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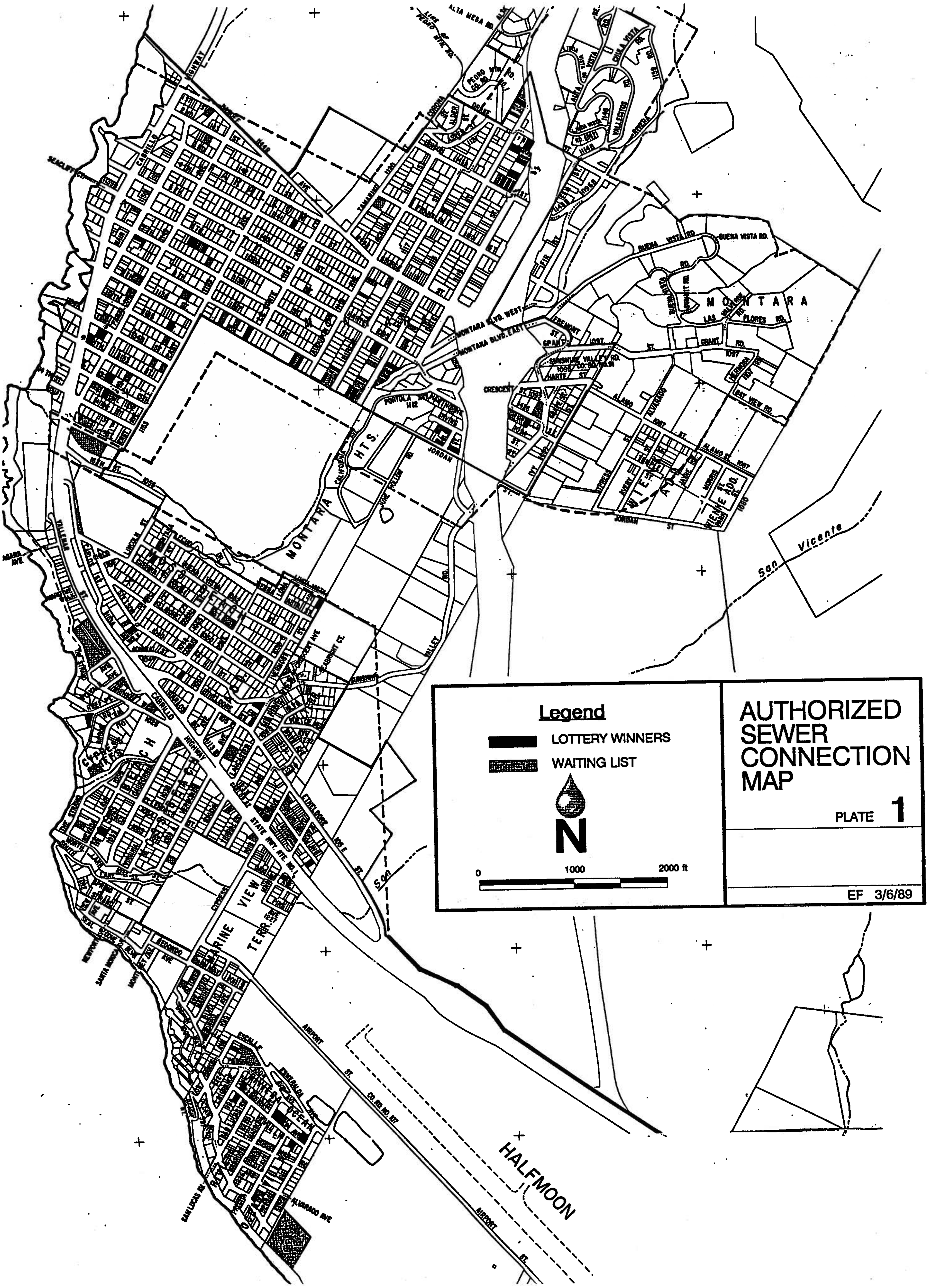
Rick York, California Department of Fish and Game, NDDB

Brian Zamora, San Mateo County Environmental Health

PLATE



AUTHORIZED SEWER CONNECTION MAP

PLATE 1

EF 3/6/89

Legend

▬	LOTTERY WINNERS
▨	WAITING LIST

N

0 1000 2000 ft

APPENDIX A

APPENDIX A

WAIT LIST NO.	PARCEL NUMBER	LOT NUMBER(S)	ZONING	EXISTING WELL	LOT SIZE[1] (Sq. Feet)	POTENTIAL FOR SEPTIC & WELL
85.	036-014-130	5,6,7	Res.	Y	7,500	
145.	036-021-030	37,38,39	Res.		9,000	
8.	036-022-029	9,10	Res.		6,000	
18.	036-022-150	IV, 4	Res.		10,000	
2.	036-022-150	PARCEL III (3)	Res.		10,000	
50.	036-022-310	11, PRTN 12	Res.		5,000	
110.	036-024-150	6,7,8	Res.		9,000	
11.	036-025-250	36,37	Res.		6,000	
117.	036-031-130	5,6	Res.		6,000	
66.	036-032-200	14,15	Res.		6,000	
141.	036-033-280	4,5	Res.		5,500	
113.	036-033-370	1,40	Res.		6,000	
158.	036-034-050	3,4	Res.		9,000	
52.	036-034-050/070	10,11,12	Res.		15,600	
63.	036-042-180		Res.		8,500	
92.	036-052-010/020	6,7	Com.		5,000	
51.	036-053-100/110/90	7,8,9	Com.	Y	8,000	
120.	036-055-230	NLY 1/2 OF 19,20,21,22	Res.		5,500	
75.	036-055-240	SLY 1/2 OF 19,20,21,22	Res.		5,500	
81.	036-058-130	1,2,3	Res.		8,000	
20.	036-062-140	20	Res.		3,000	
94.	036-071-010	29,30,31	Res.		11,100	
62.	036-085-210	31	Res.	Y	6,600	
86.	036-092-160	18	Res.		5,000	
130.	036-093-080	2	Res.		5,000	
84.	036-095-040	21	Res.		7,500	
108.	036-095-190	18 PRTN 19	Res.		10,000	
7.	036-095-230	61	Res.		7,500	
34.	036-095-320	3	Res.		7,500	
48.	036-095-340	4	Res.		7,500	
155.	036-101-250	35 & 36	Res.		6,300	
154.	036-101-340	25,26	Res.		6,300	
152.	036-101-370	42	Res.		3,100	
54.	036-102-220	11 & D	Res.		6,300	
122.	036-102-240	8,9	Res.		6,300	
140.	036-102-240/260	10,C	Res.		6,300	
32.	036-102-490	6,7	Res.		6,300	
15.	036-104-040	28,29,30	Res.	Y	9,400	
16.	036-104-300	PARCEL I (7 & 6)	Res.		6,300	
55.	036-104-300	PARCEL 2 (9 & 8)	Res.		6,300	
126.	036-104-300/390	PARCEL 3 (C + 10)	Res.		6,300	
65.	036-104-330	20,21	Res.		6,300	
70.	036-104-400	12,13	Res.		6,300	
79.	036-104-410	D & 11	Res.		6,300	
74.	036-105-190/200	3,4	Res.		6,300	
89.	036-105-310	43,44	Res.		6,300	
27.	036-111-230	15,16	Res.		7,400	
132.	036-111-240	18,17	Res.		6,100	

1/5/89

WAIT LIST NO.	PARCEL NUMBER	LOT NUMBER(S)	ZONING	EXISTING WELL	LOT SIZE[1] (Sq. Feet)	POTENTIAL FOR SEPTIC & WELL
136.	036-111-250	19,20	Res.		4,900	
98.	036-111-250	21,22	Res.		4,400	
102.	036-111-260	23	Res.		9,400	
90.	036-113-060	32,33	Res.		6,000	
53.	036-113-390	8,9	Res.		5,000	
57.	036-113-410	16,17	Res.		6,000	
24.	036-113-420	14,15	Res.		5,000	
142.	036-122-010	1	Res.		3,100	
91.	036-123-020	47,48	Res.		6,300	
17.	036-132-060	6	RM		3,700	
67.	036-132-080/090	8,9	RM		7,400	
97.	036-132-210	PRTN 12,13,14,15,16	RM		14,900	
1.	036-132-220	10.11 PRTN	RM		8,100	
40.	036-161-140	27,28,29	Res.		9,300	
28.	036-161-240	36,37,PRTN 35	Res.	Y	6,200	
80.	036-161-270	3,4	Res.		6,300	
125.	036-161-280	5,6	Res.		6,300	
25.	036-161-290	7,8	Res.		6,300	
58.	036-161-300	9,10	Res.		6,300	
128.	036-161-310	11,12	Res.		6,300	
6.	036-161-320	13,14	Res.	Y	6,300	
31.	036-161-330	19,20	Res.		6,300	
123.	036-161-340	21,22	Res.		6,300	
59.	036-161-350	23,24	Res.		6,300	
131.	036-281-070/080	18,19,20	RM		6,400	
138.	036-281-090	15,16,17	RM		7,900	
147.	036-282-240	35,36,PRTN 37,38,39	RM		11,100	
133.	036-282-260	32,33,34	RM		9,000	
26.	036-282-270	30,31	RM		6,000	
56.	036-284-190	7,8	RM		6,400	
139.	037-012-090	7,8,9	Res.		2,600	
10.	037-013-250	23,24,25,	Res.		9,000	
146.	037-013-350	9,10	Res.		6,000	
37.	037-014-040	14,15	Res.		6,000	
83.	037-014-040	12,13	Res.		6,000	
88.	037-014-290	NPRTN OF 18,19,20	Res.		4,500	
76.	037-015-260	24,25,26,27 & PRTN 21,22,2	Res.		16,500	
144.	037-021-060	4 THRU 12	Res.		>41,800	Y
95.	037-022-050	PRTN 6 THRU 14	Res.		17,200	
72.	037-061-060	13,14	Res.		7,000	
38.	037-062-150	7,8	Res.	Y	5,000	
129.	037-065-100	30,31,32	Res.		7,500	
45.	037-065-230	26,27	Res.		5,000	
87.	037-067-070	25,26	Res.		5,000	
156.	037-067-190	17 & 18	Res.		5,000	
96.	037-067-190	19,20	Res.		5,000	
21.	037-067-200	15,16	Res.		5,000	
14.	037-074-240	13,14	Res.		5,400	
134.	037-084-230	27,28	Res.		5,100	
47.	037-084-280	31,32	Res.	Y	4,600	
82.	037-086-160	10 THRU 27	Res.		40,500	Y

WAIT LIST NO.	PARCEL NUMBER	LOT NUMBER(S)	ZONING	EXISTING WELL	LOT SIZE[1] (Sq. Feet)	POTENTIAL FOR SEPTIC & WELL
93.	037-086-170	28 THRU 49	Com.		60,400	Y
114.	037-094-140	17,18,19,20	Res.		9,200	
107.	037-094-280	7,31,32,33	Res.		8,600	
43.	037-096-250	23,24	Res.		5,000	
100.	037-112-040/070	6,17,18,19	Res.		10,400	
22.	037-113-130	22,23,24	Res.		5,000	
143.	037-116-030	14,15,16	Res.		7,800	
112.	037-123-430-3	CYPRESS CLIFFS - 12	Res.		17,500	Y
33.	037-123-560	N/A	Res.		9,800	
106.	037-132-250	10,11	Res.		8,400	
104.	037-133-140	8, & 1/2 OF 9	Res.		4,500	
118.	037-143-020	9,10,11,12,13,14	?		15,600	
49.	037-144-070	9	Com.		4,200	
3.	037-144-260	1,2	Res.		5,600	
71.	037-146-070	5,6	Res.		5,000	
4.	037-153-060	7	Res.		2,500	
150.	037-156-030	3,4	Res.		5,000	
78.	037-157-060	1	Res.		1,300	
103.	037-157-060	2,3	Res.		7,100	
127.	037-171-190	3,4	Res.		5,400	
149.	037-171-480	6,7,8	Res.		6,300	
151.	037-171-650	8,9	Res.		4,200	
73.	037-174-220	34,36	Res.		3,500	
148.	037-174-450	31,32,33	Res.		7,900	
29.	037-174-470	37,38,39,40,41	Res.		7,900	
12.	037-182-020	3,4	Res.		4,850	
35.	037-182-030	7	Res.		2,800	
109.	037-183-110/120	20,21,22,23	Res.		6,500	
39.	037-184-080	19,20	Res.		4,550	
13.	037-185-050/280	3,4	Res.		4,200	
124.	037-186-010	7,8	Res.		4,200	
69.	037-186-030/040	3,4	Res.		4,000	
121.	037-221-020/030	5,6	Res.		5,700	
46.	037-221-050	8	Res.		3,200	
111.	037-221-070	10	Res.		2,800	
60.	037-221-100	13	Res.		2,800	
68.	037-223-150	22, PRTN OF 23	Res.		6,400	
116.	037-223-160	PRTN 23,24,PRTN 25	Res.		6,400	
30.	037-223-170	25, PRTN 26	Res.		3,200	
36.	037-223-170/180	27, PRTN 26	Res.		7,900	
153.	037-225-010	1	Res.		3,000	
137.	037-225-070	8	Res.		3,000	
119.	037-226-060	8	Res.		3,000	
115.	037-256-100	14 THRU 21	Res.		34,300	Y
19.	037-256-140	3,4	Res.		5,000	
44.	037-258-020	3,4	Res.		5,000	
157.	037-259-170	25,26	Res.		5,300	
23.	037-259-200	31,32	Res.		5,300	
101.	037-277-050/12,	15,16	Res.		5,000	
41.	037-278-010	12,13	Res.		4,800	
61.	037-278-070	5,5A	Res.		5,000	

WAIT LIST NO.	PARCEL NUMBER	LOT NUMBER(S)	ZONING	EXISTING WELL	LOT SIZE[1] (Sq. Feet)	POTENTIAL FOR SEPTIC & WELL
64.	037-278-130	14,15	Res.		5,000	
105.	037-279-060	1,2,3	Res.		13,200	
135.	037-284-060/90/110	12,13,14,15	Res.		10,000	
159.	037-284-060/90/110	12,13,14,15	Res.		10,000	
99.	037-284-070/100	16,17	Res.		5,000	
9.	037-285-120/130	3,4,5	Res.		7,200	
5.	037-287-03	17,18,19	Res.		7,400	
42.	037-287-070	21,32,33,34	Res.		15,800	
77.	037-300-010		PAD		160,000	Y

[1] Lot sizes are approximate and serve only to indicate if site might be large enough to both well and septic system. Mi an unsewered area for a lot containing both a well and septic system is 100 feet by 160 feet or 16,000 square feet (Ch San Mateo Ordinance Code). Larger lot may be required depending on lot configuration, drainage field size, and buildi

APPPENDIX B

SPECIFIC PARCEL INVENTORY - PAGE 1

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-014-130	RUD, RES	Occasional wild strawberries	Minor: loss of strawberries	Evaluate strawberries; transplant
036-021-030	DEV	---	---	---
036-022-029	RUD	---	---	---
036-022-150	RUD	---	---	---
036-022-310	RUD	---	---	---
036-024-150	RES, RUD	Occasional wild strawberries	Minor: loss of strawberries	Evaluate strawberries; transplant
036-025-250	CG, RUD	Occasional native plants, bunchgrass	Minor: loss of native plant material	Transplant bunchgrasses if possible
036-031-130	CG, RUD	Occasional native plants, bunchgrass	Minor: loss of native plant material	Transplant bunchgrasses if possible
036-032-200	RUD	---	---	---
036-033-280	RES, CG	Occasional native plants, bunchgrass	Minor: loss of native plant material	Transplant bunchgrasses if possible

SPECIFIC PARCEL INVENTORY - PAGE 2

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-033-370	RES, CG	Occasional native plants, bunchgrass	Minor: loss of native plant material	Transplant bunchgrasses if possible
036-034-050	RUD	—	—	—
036-034-050/ 070	RES	—	—	—
036-042-180	RUD	—	Possible siltation of adjacent riparian area area during construction	Refer to Section 7.10 in LCP for performance standards; control erosion and siltation in riparian
036-052-010/ 020	RUD	—	—	—
036-053-100/ 110/90	RUD	Occasional wild strawberries, other native plants	Minor: loss of strawberries and native plants	Evaluate strawberries and transplant; transplant other natives if possible
036-055-230	RUD	Occasional wild strawberries, other native plants	Minor: loss of strawberries and native plants	Evaluate strawberries and transplant; transplant other natives if possible
036-055-240	RUD	Occasional wild strawberries, other native plants	Minor: loss of strawberries and native plants	Evaluate strawberries and transplant; transplant other natives if possible

SPECIFIC PARCEL INVENTORY - PAGE 3

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-058-130	RUD, CG	Occasional wild strawberries, other native plants	Minor: loss of strawberries and native plants	Evaluate strawberries and transplant; transplant other natives if possible
036-062-140	RUD	---	---	---
036-071-010	DEV	Existing residence	---	---
036-085-210	CON, EUK, RUD	1. Adjacent to damaged riparian corridors; see notes and map	1.Potential damage to adjacent stream from construction, runoff	1. Adhere to LCP--specified setbacks and performance standards; if appropriate, plant native riparian species in buffer;
		2. Potential monarch butterfly overwintering habitat in trees	2. Potential loss of butterfly trees	2.Survey for butterflies in fall as specified.
036-092-160	RUD	---	---	---
036-093-080	RUD	---	---	---
036-095-040	RES	---	---	---
036-095-190	RUD, RES	---	---	---
036-095-230	RES	---	---	---
036-095-320	DEV	Residence under construction	---	---

SPECIFIC PARCEL INVENTORY - PAGE 4

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-095-340	CG, RUD	Site badly damaged by construction activity on adjacent lot; occasional native bunchgrasses	Minor: loss of native bunchgrasses; potential damage to bunchgrass community on adjacent parcel	Transplant bunchgrasses if possible; avoid damage to adjacent parcel during construction
036-101-250	RUD	---	---	---
036-101-340	RUD, RES	---	---	---
036-101-370	RES	---	---	---
036-102-220	RUD	---	---	---
036-102-240	EUK, CG	1. Frequent wild strawberries (2 species) : see notes 2. Potential monarch butterfly overwintering habitat in trees	1. Potential loss of strawberries 2. Potential loss of butterfly trees	1. Evaluate strawberries; transplant if appropriate 2. Survey for butterflies in fall as specified
036-102-240/ 260	RUD, CG	Frequent wild strawberries (2 species) : see notes	Potential loss of strawberries	Evaluate strawberries; transplant if appropriate
036-102-490	EUK, CG	1. Frequent wild strawberries (2 species) : see notes 2. Potential monarch butterfly overwintering habitat in trees	1. Potential loss of strawberries 2. Potential loss of butterfly trees	1. Evaluate strawberries; transplant if appropriate 2. Survey for butterflies in fall as specified
036-104-040	CON	2 large pines have been girdled	---	---

SPECIFIC PARCEL INVENTORY - PAGE 5

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-104-300	DEV	Residence under construction	---	---
036-104-300/ 390	DEV	Residence under construction	---	---
036-104-330	RUD	---	---	---
036-104-400	CON, RUD	Occasional wild strawberries remain in cleared conifer stand	Potential loss of strawberries	Evaluate strawberries, transplant if appropriate
036-104-410	CON, RUD	Occasional wild strawberries remain in cleared conifer stand	Potential loss of strawberries	Evaluate strawberries, transplant if appropriate
036-105-190/ 200	RUD	---	---	---
036-105-310	RES	---	---	---
036-111-230	RUD, RIP	Ruderal portion recently cleared and graded up to riparian vegetation along Montara Creek: see note and map	Potential damage to riparian from construction erosion and siltation	Only LCP-permitted construction or other activity in riparian corridor or buffer; adhere to LCP defined setbacks and performance standards; control runoff

SPECIFIC PARCEL INVENTORY - PAGE 6

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-111-240	RUD, RIP	Ruderal portion recently cleared and graded up to riparian vegetation along Montara Creek: see note and map	Potential damage to riparian from construction erosion and siltation	Only LCP-permitted construction or other activity in riparian corridor or buffer; adhere to LCP defined setbacks and performance standards; control runoff
036-111-250	RUD, RIP	Ruderal portion recently cleared and graded up to riparian vegetation along Montara Creek: see note and map (Lots 19, 20)	Potential damage to riparian from construction erosion and siltation	Only LCP-permitted construction or other activity in riparian corridor or buffer; adhere to LCP defined setbacks and performance standards; control runoff
036-111-250	RUD, RIP	Ruderal portion recently cleared and graded up to riparian vegetation along Montara Creek: see note and map (Lots 21, 22)	Potential damage to riparian from construction erosion and siltation	Only LCP-permitted construction or other activity in riparian corridor or buffer; adhere to LCP defined setbacks and performance standards; control runoff

SPECIFIC PARCEL INVENTORY - PAGE 7

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-111-260	RUD, RIP	Riparian corridor on this parcel has been damaged by clearing up to stream bank: see notes and map	Potential damage to riparian from construction erosion and siltation	Restore riparian vegetation along stream bank; only LCP-permitted construction or other activity in riparian corridor or buffer; adhere to LCP defined setbacks and performance; control runoff
036-113-060	RUD	---	---	---
036-113-390	CG, RES	Occasional native bunchgrasses	Minor: loss of native bunchgrasses	Transplant bunchgrasses if possible
036-113-410	CG, RES	Occasional native bunchgrasses	Minor: loss of native bunchgrasses	Transplant bunchgrasses if possible
036-113-420	CG, RES	Occasional native bunchgrasses	Minor: loss of native bunchgrasses	Transplant bunchgrasses if possible
036-122-010	RES, RUD	---	---	---
036-123-020	RES	---	---	---
036-132-060	CON, EUK	1.Occasional wild strawberries 2.Potential monarch butterfly overwintering habitat in trees	1.Potential loss of strawberries 2.Potential loss of butterfly trees	1. Evaluate strawberries; transplant if appropriate 2. Survey for butterflies in fall as specified

SPECIFIC PARCEL INVENTORY - PAGE 8

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-132-080/ 090	CON, EUK	1.Occasional wild strawberries 2.Potential monarch butterfly overwintering habitat in trees	1.Potential loss of strawberries 2.Potential loss of butterfly trees	1. Evaluate strawberries; transplant if appropriate 2. Survey for butterflies in fall as specified
036-132-210	CON, EUK	1.Occasional wild strawberries 2.Potential monarch butterfly overwintering habitat in trees	1.Potential loss of strawberries 2.Potential loss of butterfly trees	1. Evaluate strawberries; transplant if appropriate 2. Survey for butterflies in fall as specified
036-132-220	CON, EUK	1.Occasional wild strawberries 2.Potential monarch butterfly overwintering habitat in trees	1.Potential loss of strawberries 2.Potential loss of butterfly trees	1. Evaluate strawberries; transplant if appropriate 2. Survey for butterflies in fall as specified
036-161-140	RUD	---	---	---
036-161-240	DEV	Existing residence	---	---
036-161-270	EUK	Potential monarch butterfly overwintering habitat in trees	Potential loss of butterfly trees	Survey for butterflies in fall as specified
036-161-280	EUK	Potential monarch butterfly overwintering habitat in trees	Potential loss of butterfly trees	Survey for butterflies in fall as specified

SPECIFIC PARCEL INVENTORY - PAGE 9

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-161-290	EUK	Potential monarch butterfly overwintering habitat in trees	Potential loss of butterfly trees	Survey for butterflies in fall as specified
036-161-300	EUK	1.Occasional wild strawberry 2.Adjacent to freshwater wetland: see map 3.Potential monarch butterfly overwintering habitat in trees	1.Potential loss of strawberries 2.Possible damage to wetland 3.Potential loss of butterfly trees	1.Evaluate strawberries, transplant if appropriate 2.All activity and 3.Survey for butterflies in fall as specified
036-161-310	EUK	1.Occasional wild strawberry 2.Adjacent to freshwater wetland: see map 3.Potential monarch butterfly overwintering habitat in trees	1.Potential loss of strawberries 2.Possible damage to wetland 3.Potential loss of butterfly trees	1.Evaluate strawberries, transplant if appropriate 2.All activity and 3.Survey for butterflies in fall as specified fly overwintering habitat
036-161-320	EUK	1.Occasional wild strawberry 2.Adjacent to freshwater wetland: see map 3.Potential monarch butterfly overwintering habitat in trees	1.Potential loss of strawberries 2.Possible damage to wetland 3.Potential loss of butterfly trees	1.Evaluate strawberries, transplant if appropriate 2.All activity and 3.Survey for butterflies in fall as specified construction to avoid wetland and buffer
036-161-330	RUD	Parcel is upslope from a small freshwater wetland	Potential damage to wetland during construction	All construction activity including siltation, to avoid wetland

SPECIFIC PARCEL INVENTORY - PAGE 10

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
036-161-340	RUD	Parcel is upslope from a small freshwater wetland	Potential damage to wetland during construction	All construction activity including siltation, to avoid wetland
036-161-350	RUD	Parcel is upslope from a small freshwater wetland	Potential damage to wetland during construction	All construction activity to avoid wetland
036-281-070/ 080	EUK	Potential monarch butterfly overwintering habitat in trees	Potential loss of butterfly trees	Survey for butterflies in fall as specified
036-281-090	EUK	Potential monarch butterfly overwintering habitat in trees	Potential loss of butterfly trees	Survey for butterflies in fall as specified
036-282-240	RUD	---	---	---
036-282-260	RUD	---	---	---
036-282-270	RUD, RES	---	---	---
036-284-190	RES, CG	Occasional native bunchgrasses, other native plants	Minor: loss of native bunchgrasses	Transplant bunchgrasses if possible
037-012-090	RUD	Occasional wild strawberries	Minor: loss of strawberries	Evaluate strawberries; transplant if appropriate
037-013-250	RUD	---	---	---

SPECIFIC PARCEL INVENTORY - PAGE 11

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
037-013-350	RES	---	---	---
037-014-040	CG, RUD	1.Occasional wild strawberries; 2.Large stand of pampas grass (Lots 12, 13)	Minor: loss of strawberries	1.Evaluate strawberries; transplant if appropriate 2.Remove all pampas grass
037-014-040	CG, RUD	Occasional wild strawberries large stand of pampas grass (Lots 12, 13)	Minor: loss of strawberries	1.Evaluate strawberries; transplant if appropriate 2.Remove all pampas grass
037-014-290	CG, RUD	Occasional native plants; 2 species of bunchgrass	Minor: loss of native plant material	Transplant native bunchgrasses if possible
037-015-260	RUD, RIP	Site recently cleared, removing native grassland vegetation, and possibly damaging adjacent riparian	Possible construction impacts on adjacent riparian	Mark and avoid riparian zone and buffer; control runoff and erosion into this area
037-021-060	RIP, CON	1.Significant riparian vegetation along Montara Creek see notes and map 2.Small population of strawberry at SE end of site see notes 3.Potential monarch butterfly overwintering habitat in trees	1.Possible significant impacts on riparian zone and buffer 2.Possible loss of strawberries 3.Potential loss of butterfly trees	1.No construction or other activity in riparian; adhere to LCP specified setbacks and performance standards; control runoff 2.Evaluate strawberries; transplant if appropriate 3. Survey for butterflies in fall as specified

SPECIFIC PARCEL INVENTORY - PAGE 12

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
037-022-050	CG, RUD	1.Significant population of wild strawberries 2.Occasional native plants	1.Possible loss of strawberries 2.Minor: loss of native plants	1.Evaluate strawberries transplant if appropriate 2.Propagate or transplant natives if possible
037-061-060	CG, RES	Occasional native plants, bunchgrasses	Minor: loss of native plants	Transplant bunchgrasses if possible
037-062-150	RUD	Site cleared of vegetation	---	---
037-065-100	CG, RUD	Well-developed patch of native bunchgrasses	Minor: loss of native bunchgrass	Transplant bunchgrass if possible
037-065-230	RES	---	---	---
037-067-070	RUD	---	---	---
037-067-190	RUD, RES	Lots 17, 18	---	---
037-067-190	RUD, RES	Lots 15, 16	---	---
037-067-200	RUD, RES	---	---	---
037-074-240	EUK	---	---	---
037-084-230	RUD	---	---	---
037-084-280	RUD	---	---	---

SPECIFIC PARCEL INVENTORY - PAGE 13

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
037-086-160	CG, CON, RUD	1.Adjacent to unique habitat (see below); 2.Occasional native plants; at least two species of native bunchgrasses: see notes and map	1.Potential damage during construction to sensitive adjacent habitat 2.Potential loss of native native plants	1.Avoid any entry into adjacent habitat; 2.Transplant bunchgrasses if possible
037-086-170	CG	Botanically unique coastal grassland of significant value on ocean bluff: see notes and map	Significant impact to unique botanical resource: see notes	Impact cannot be mitigated: see notes
037-094-140	DEV	---	---	---
037-094-280	DEV	---	---	---
037-096-250	RUD	1.Occasional wild strawberries; 2.Large population of pampas grass	Minor: loss of strawberries	1.Evaluate strawberries; transplant if appropriate; 2.Remove all pampas grass
037-112-040/ 070	CG, RES, RUD	1.Exceptional patch of wild strawberries along ocean bluff 2.Native plants, bunch-grasses: see notes and map	1.Potential loss of unique strawberries 2.Potential loss of native grasses, other plants	ocean bluff setbacks 1.Evaluate strawberries; transplant if appropriate 2.Transplant bunchgrasses if possible 3.Adhere to LCP-defined ocean bluff setbacks
037-113-130	RES	---	---	---

SPECIFIC PARCEL INVENTORY - PAGE 14

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
037-116-030	RES	---	---	---
037-123-430-3	RUD	Site is adjacent to riparian corridor; riparian buffer extends onto site: see notes and map	Potential damage to riparian from construction, clearing runoff	Adhere to LCP designated setbacks and performance standards; control runoff avoid clearing or dumping in riparian area
037-123-560	RES	---	---	---
037-132-250	RUD, RIP	Riparian corridor crosses corner of site: see notes and map	Potential damage to riparian from construction, erosion and siltation	No construction or other activity in riparian or buffer; adhere to LCP-specified setbacks and performance standards; control runoff
037-133-140	RES	---	---	---
037-143-020	RES	---	---	---
037-144-070	DEV	Existing building has been on site since late 1800s	---	---

SPECIFIC PARCEL INVENTORY - PAGE 15

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
037-144-260	RUD, RIP	Riparian corridor crosses corner of Lot 2: see notes and map	Potential damage to riparian from construction, erosion and siltation	No construction or other activity in riparian or buffer; adhere to LCP-specified setbacks and performance standards; control runoff
037-146-070	RUD	---	---	---
037-153-060	RES, RUD	---	---	---
037-156-030	RIP	Entire site is in riparian corridor: see notes and map	Potentially significant damage to riparian corridor from construction, erosion and siltation	No construction or other activity in riparian or buffer; adhere to LCP-specified setbacks and performance standards; control runoff
037-157-060	RUD, EUK	Lots 1, 2, 3	---	---
037-171-190	RUD	---	---	---
037-171-480	RUD	---	---	---
037-171-650	RES	---	---	---
037-174-220	RUD	---	---	---
037-174-450	RUD	---	---	---
037-174-470	DEV	Existing residence	---	---

SPECIFIC PARCEL INVENTORY - PAGE 16

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
037-182-020	RUD	---	---	---
037-182-030	RUD, RIP	Riparian corridor crosses corner of site: see notes and map	Potential damage to riparian from construction, erosion and siltation	No construction or other activity in riparian or buffer; adhere to LCP-specified setbacks and performance standards; control runoff
037-183-110/120	RUD	Small freshwater wetland just SW of site	Potential damage to wetland during construction, or from runoff	Avoid wetland during construction; control runoff
037-184-080	RES	---	---	---
037-185-050/280	RUD, CON	---	---	---
037-186-010	RES	---	---	---
037-186-030/040	RUD	---	---	---
037-221-020/030	RUD	---	---	---
037-221-050	RUD	---	---	---
037-221-070	RUD	---	---	---
037-221-100	RUD	---	---	---

SPECIFIC PARCEL INVENTORY - PAGE 17

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
037-223-150	RUD	Site has large Monterey pines on edge	---	---
037-223-160	RUD	Site has large Monterey pines on edge	---	---
037-233-170	RUD	Site has large Monterey pines on edge	---	---
037-223-170/ 180	RUD	Site has large Monterey pines on edge	---	---
037-225-010	RUD	---	---	---
037-225-070	RUD	---	---	---
037-226-060	RUD	---	---	---
037-256-100	CG, RUD	Good example of coastal terrace prairie, with frequent strawberries and at least 3 species of native perennial bunchgrasses: see notes	1. Potential loss of strawberries 2. Potential loss of native bunchgrasses, other native plants	1. Evaluate strawberries; transplant if appropriate 2. Transplant native grasses and other plants if possible
037-256-140	RUD	---	---	---
037-258-020	RUD	---	---	---
037-259-170	RUD, RES	---	---	---
037-259-200	RUD	---	---	---

SPECIFIC PARCEL INVENTORY - PAGE 18

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
037-277-050/12	RES, RUD	---	---	---
037-278-010	RES	---	---	---
037-278-070	CG	Frequent native bunchgrasses; site damaged by vehicle tracks	Loss of native bunchgrasses	Transplant bunchgrasses if possible
037-278-130	CG	Frequent native bunchgrasses, other native plants	Loss of native plants, bunchgrasses	Transplant bunchgrasses if possible
037-279-060	RUD, CG	N portion of site with dense bunchgrasses, other natives	Loss of native bunchgrasses	Transplant bunchgrasses if possible
037-284-060/90/110	RUD	Lots 12, 13, 14, 15	---	---
037-284-070/100	RUD	---	---	---
037-285-120/130	RUD	---	---	---
037-287-03	RUD	---	---	---
037-287-070	RUD	Dense patches of native coyote brush	Minor: loss of native shrubs, wildlife cover	No effective mitigation

Parcel No.	Habitat Types	Special Features	On-Site Impacts	Mitigations
037-300-010	RUD	Dense patches of native coyote brush on this large (almost 4 a.) parcel	Loss of native shrubs, wildlife cover; possibly significant depending on development plans	Use native plants, especially bunchgrasses, as landscaping to enhance remaining open space

EXPLANATORY NOTES: SPECIFIC PARCEL INVENTORY

036-042-180 This site is adjacent to a designated damaged riparian corridor, but may be too far above the stream to be restored effectively with native riparian vegetation. The riparian and buffer boundaries should be determined.

036-085-210 This site is adjacent to a damaged riparian area, although it is not mapped as such on the County Sensitive Features map. Native riparian vegetation has been replaced by a mixture of conifers, eucalyptus, and ruderal plants (see map).

036-102-240
036-102-240/
260
036-102-490 Possible hybrids between *F. vesca californica* and *F. chiloensis* may occur on this site and should be specifically evaluated and protected as appropriate.

036-111-230
036-111-240
036-111-250
036-111-250 These parcels are adjacent to well-developed riparian vegetation. Riparian and buffer zone should be specifically determined and monitored (see map).

036-111-260 This parcel is adjacent to Montara Creek. Riparian vegetation has recently been removed up to streambank. This vegetation should be restored, by planting. If necessary, unless a valid permitted use as specified in the LCP (Section 7.9) exists. Any necessary flood control that may be necessary on this site should be specified by a qualified professional.

030-161-300
030-161-310
030-161-320
030-161-330
030-161-340
030-161-350 These sites are all either adjacent to or in the immediate vicinity of a small freshwater wetland. Existing information is inadequate to delineate the wetland boundary, which should be done to establish a protective buffer prior to any development. Construction of access roads as they are currently laid out on paper would seriously impact this wetland. Consideration should be given to rerouting access in this area.

037-015-260 Adjacent riparian corridor may include the SW corner of this parcel; on-site riparian vegetation may be damaged. Riparian boundary should be determined more precisely.

037-021-060 Riparian corridor along Montara creek; strawberries occur in association with *F. vesca californica* and may hybridize. Riparian and buffer boundaries should be specifically determined and the strawberries should be evaluated.

037-022-055 *Fragaria chiloensis* is abundant throughout this parcel.

037-086-160 This parcel is similiar to the adjacent parcel described below but contains a higher proportion of introduced plant material.

037-086-170 This parcel is dominated throughout by a unique *Koeleria cristata* / *Armeria maritima*/ *Eryngium armatum* grassland. It appears to be potential habitat for *Grindelia maritima* and *Potentilla hickmanii* as well, and should be more thoroughly evaluated. If this parcel contains significant resources, acquisition or preservation for the public benefit may be appropriate.

037-112-040/070 This parcel is on an ocean bluff, overlooking Fitzgerald Marine Reserve in Moss Beach. An unusual population of *Fragaria chiloensis* with 3-, 4-, and 5-leaved plants grows here, along with other native plants. This site is potential habitat for *Grindelia maritima* and *Potentilla hickmanii*. The strawberries should be evaluated and a plant survey done at the appropriate time of the year for the other two species.

037-123-430-3 Riparian buffer may extend onto this parcel and should be more specifically determined (see map).

037-132-250 Boundary of riparian corridor and buffer should be determined. This site is quite disturbed; some modest restoration of riparian habitat within the buffer zone would enhance the wildlife habitat value here (see map).

037-144-260 Riparian corridor and buffer boundary should be specifically determined (see map).

037-156-030 Exact boundaries of riparian and buffer should be delineated for this parcel, which appears to be located entirely within the riparian habitat (see map).

037-182-030 Riparian corridor and buffer zone need to be determined for this site (see map).

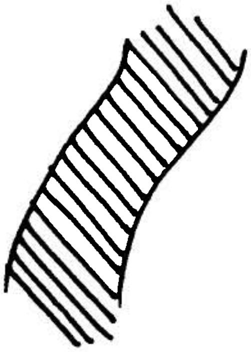
037-256-100 Coastal prairie and strawberries should be mapped to determine if an impact-free building location exists on site. This site is near the potential San Francisco garter snake habitat and should be evaluated as suitable upland habitat.

LEGEND: SPECIFIC PARCEL MAPS

APPROXIMATE BOUNDARY, RIPARIAN CORRIDOR

On streams with riparian vegetation, this boundary shows the approximate limit of that vegetation.

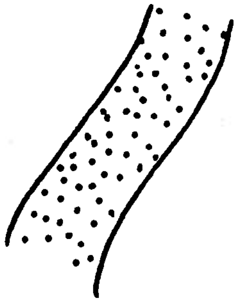
On streams with no riparian vegetation, this boundary extends approximately 30 feet from the high water mark (intermittent streams) or 50 feet from the high water mark (permanent streams).



APPROXIMATE LOCATION, RIPARIAN VEGETATON BUFFER

Buffer extends 30 feet from the riparian vegetation boundary on intermittent streams.

Buffer extends 50 feet from the riparian vegetation boundary on permanent streams.



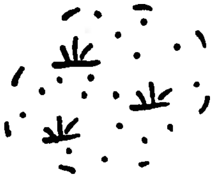
GENERALIZED LOCATION, CALIFORNIA STRAWBERRY (<u>FRAGARIA</u> <u>CHILOENSIS</u>)

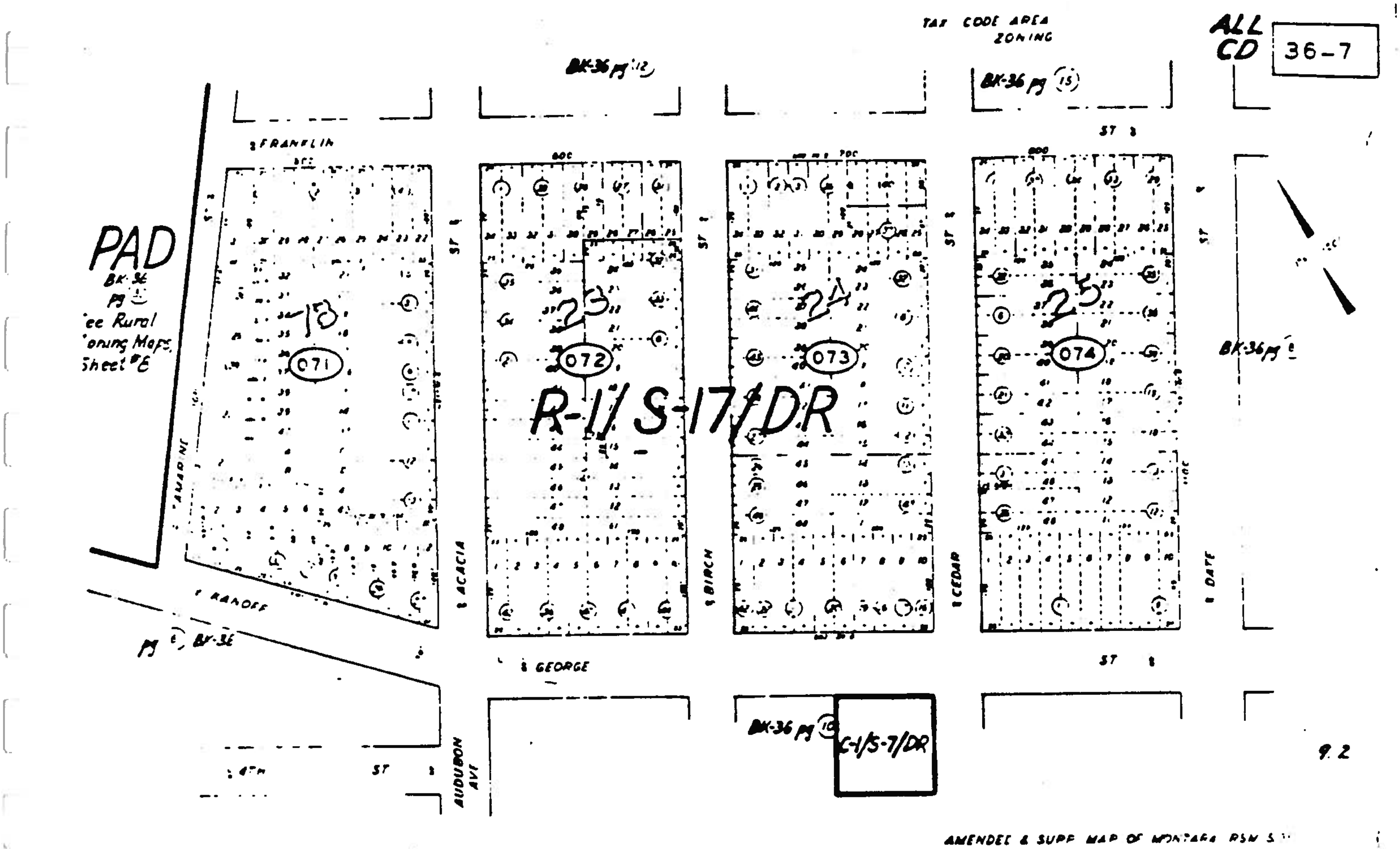
▲

GENERALIZED LOCATION, UNIQUE PLANT ASSOCIATION

●

GENERALIZED LOCATION, FRESH WATER WETLAND

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BK-36 pg 15
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See Rural Zoning Maps, Sheet #E
071
072
073
074
18
23
24
25
R-1/S-17/DR
ACACIA
BIRCH
CEDAR
DATE
TAMARIND
RANDOLF
BK-36 pg 8
pg 6 BK-36
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BK-36 pg 10
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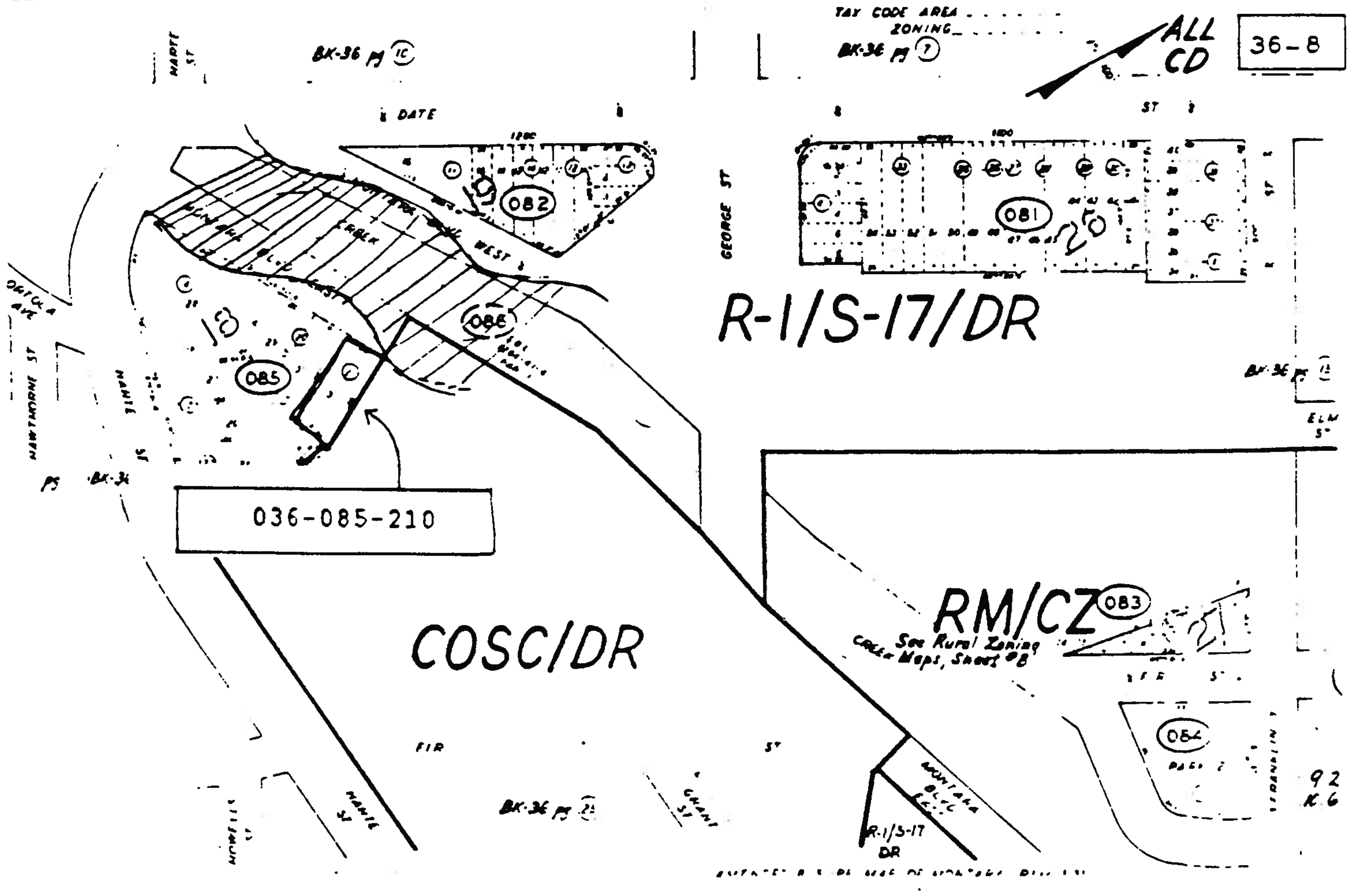
AMENDED & SUPP MAP OF MONTARA RSM 5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19
18
R-1/S-17/DR
BK-36 pg 13
ELM ST
HAWTHORNE ST
NAMTE ST
pg BK-36
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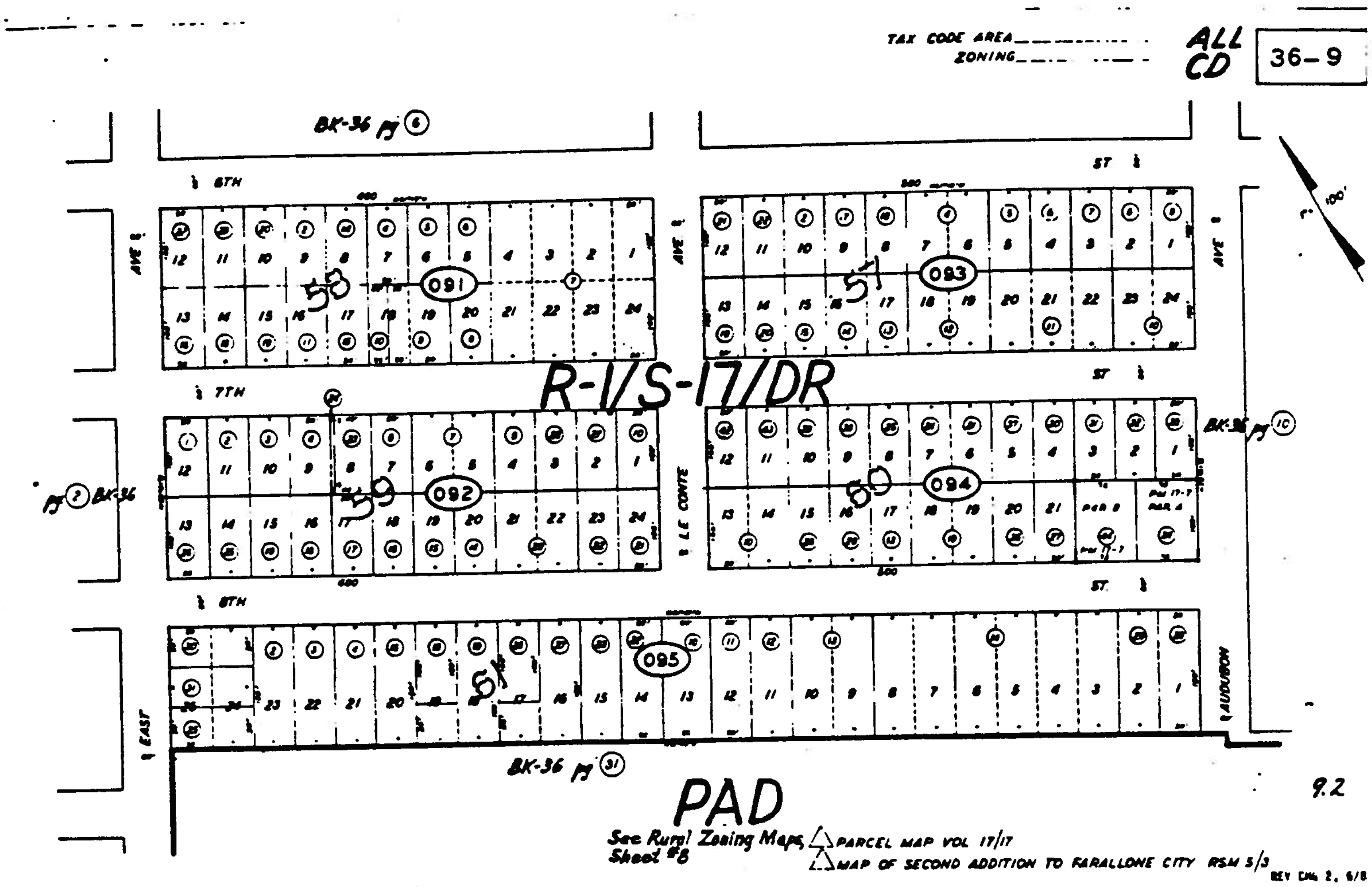

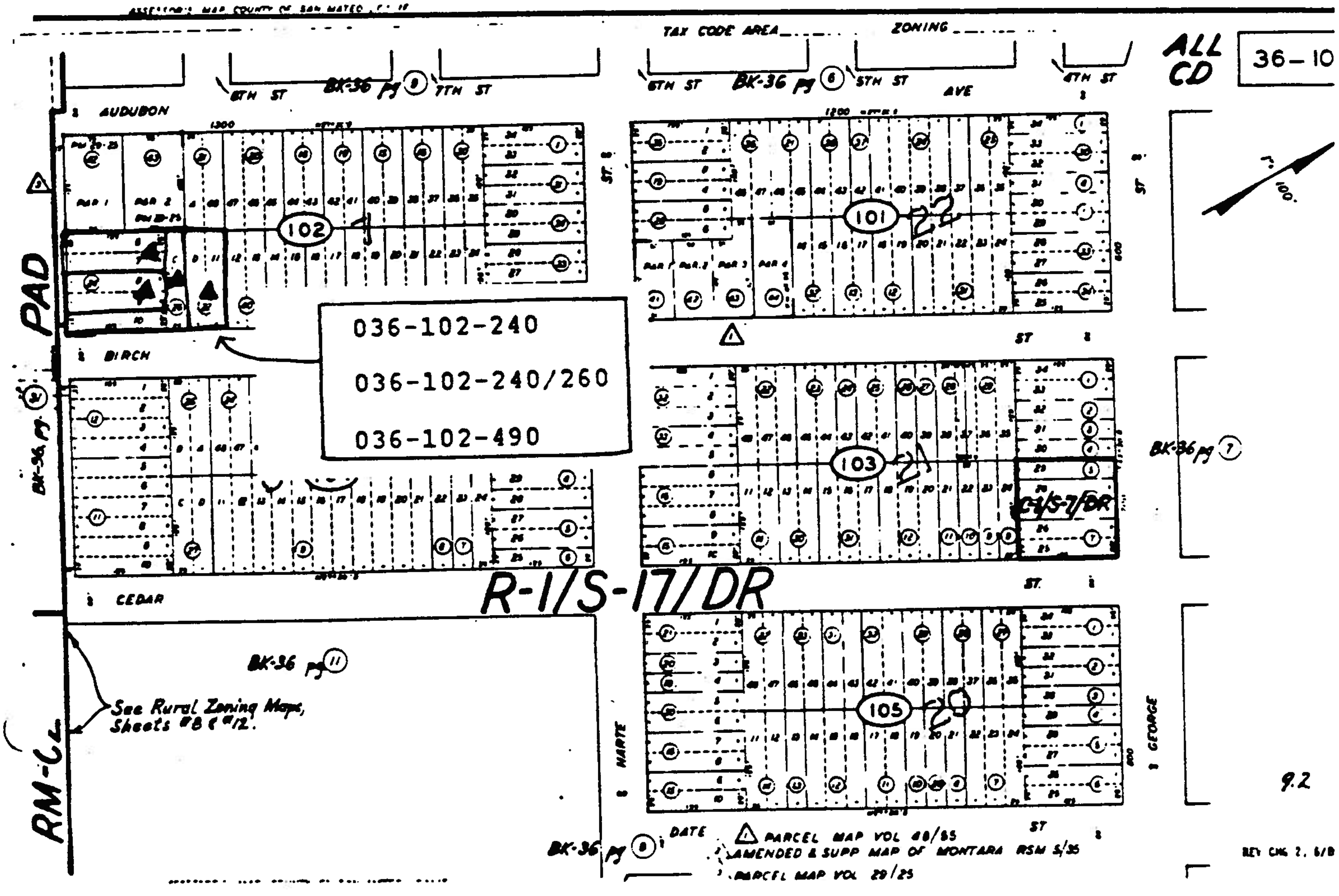

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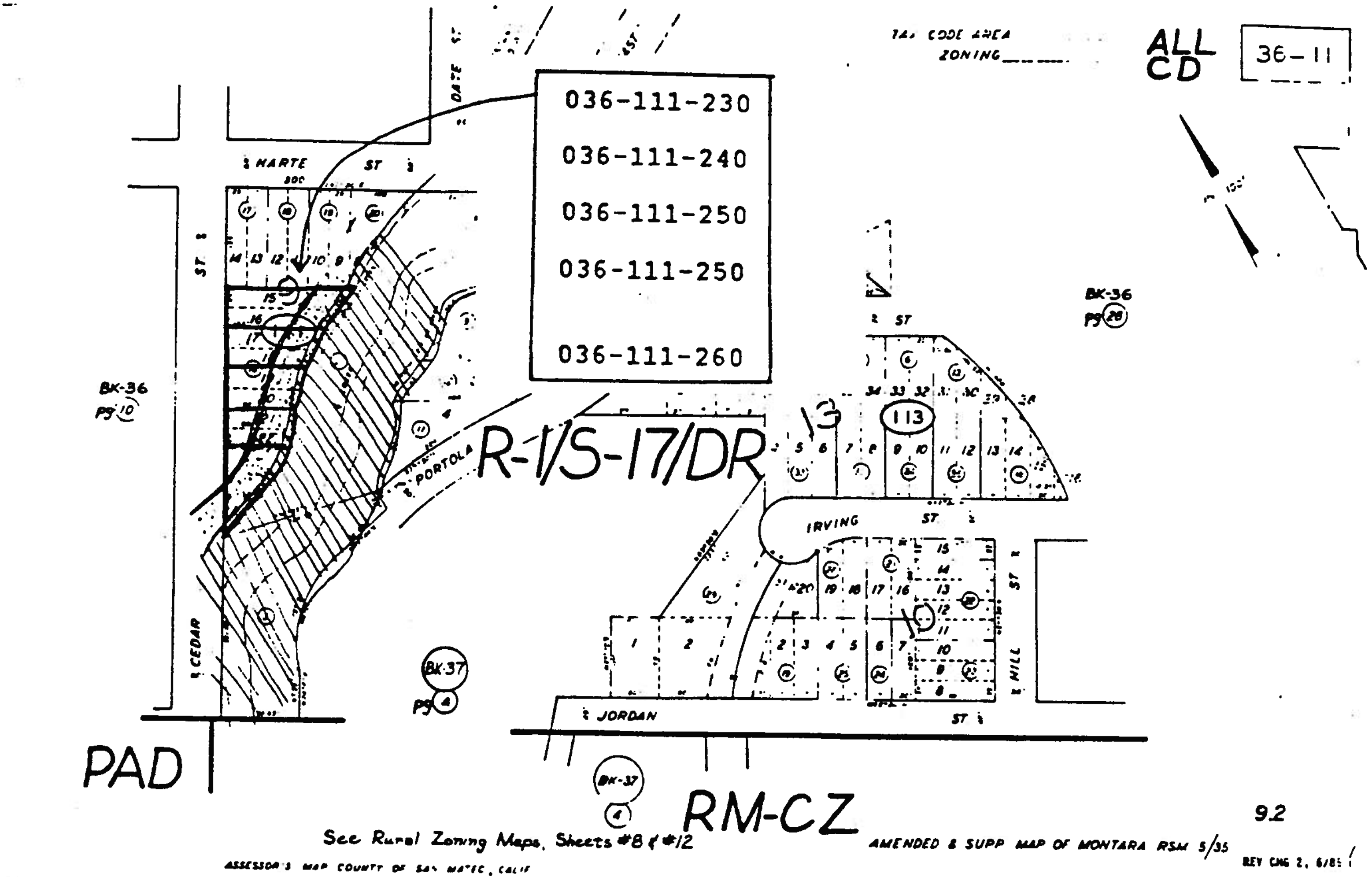
036-102-240/260

036-102-490



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PORTOLA
IRVING ST
JORDAN ST
HILL ST
BK-36 pg 10
BK-36 pg 28
BK-37 pg 4
113
R-1/S-17/DR
PAD
RM-CZ
9.2
See Rural Zoning Maps, Sheets #8 & #12
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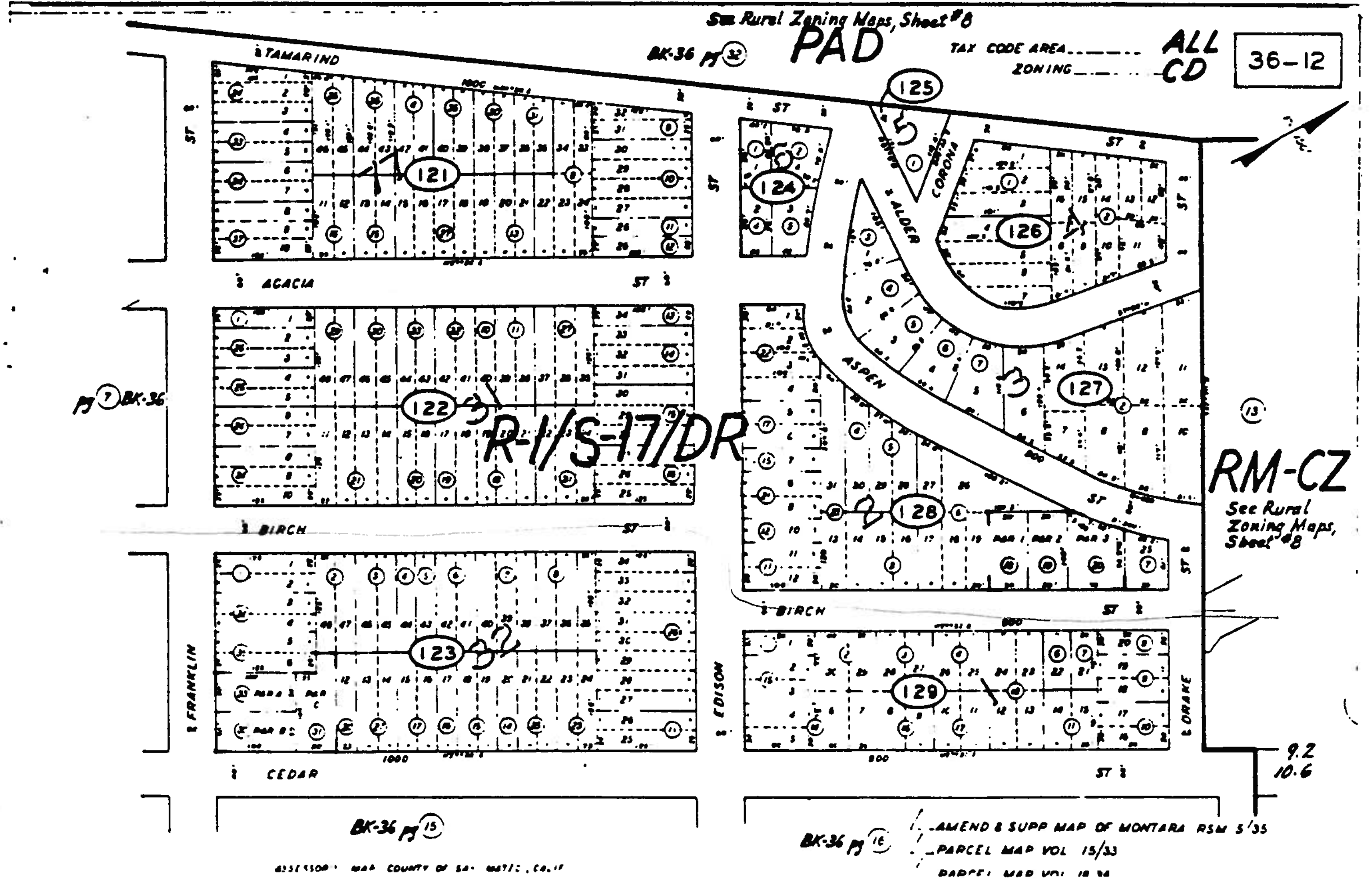
REV CHG 2, 6/85
ASSESSOR'S MAP COUNTY OF SAN MATEO, CALIF.



See Rural Zoning Maps, Sheet #8
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BK-36 pg 32
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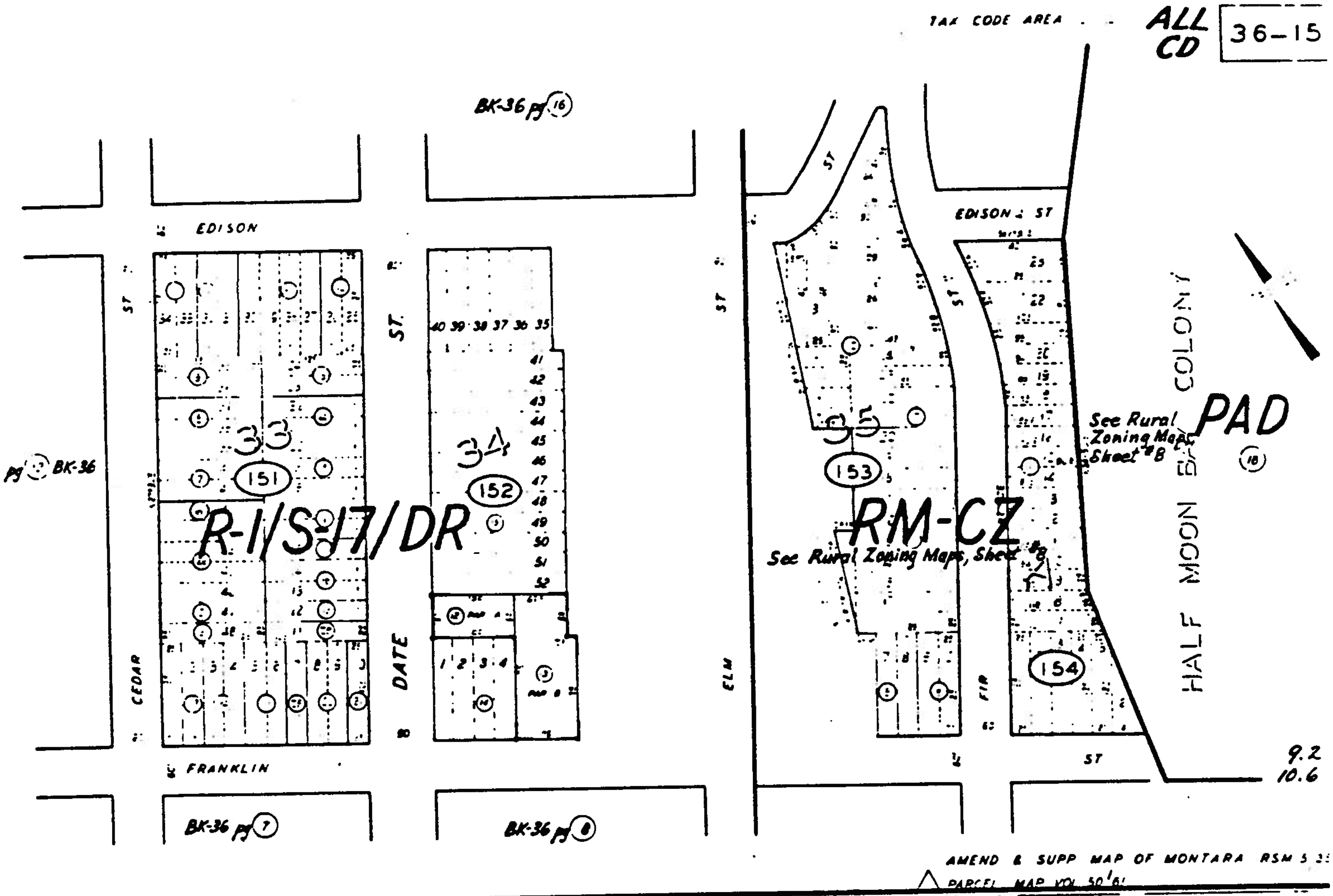
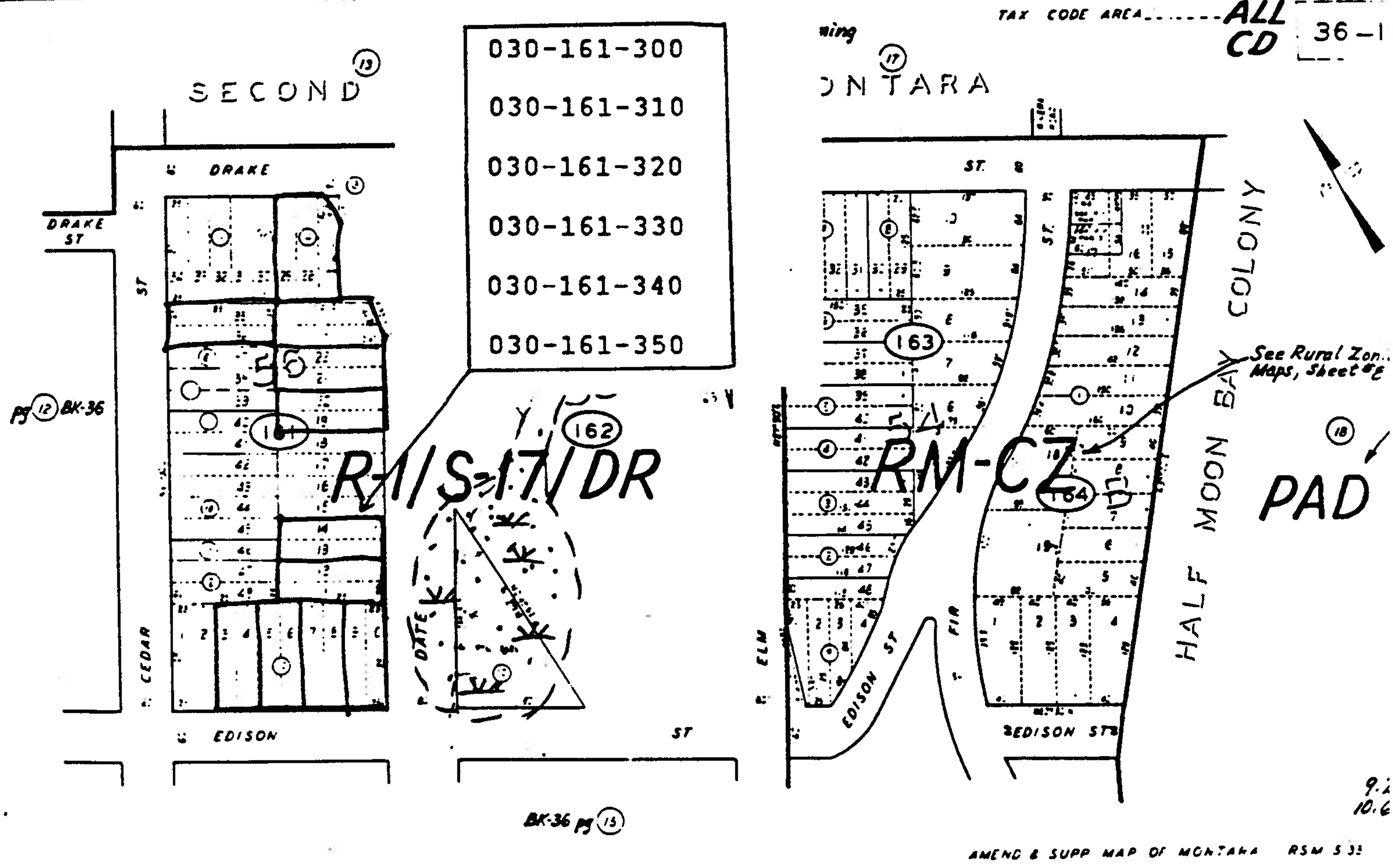
BIRCH ST
CEDAR ST
FRANKLIN
EDISON
DRAKE
ALDER
CORONA
ASPEN ST
121
122
123
124
125
126
127
128
129
R-1/S-17/DR
RM-CZ
See Rural Zoning Maps, Sheet #8
BK-36 pg 7
BK-36 pg 15
BK-36 pg 16
9.2
10.6
AMEND & SUPP MAP OF MONTARA RSM 5/35
PARCEL MAP VOL 15/33
PARCEL MAP VOL 18/36
ASSESSOR'S MAP COUNTY OF SAN MATEO, CALIF.





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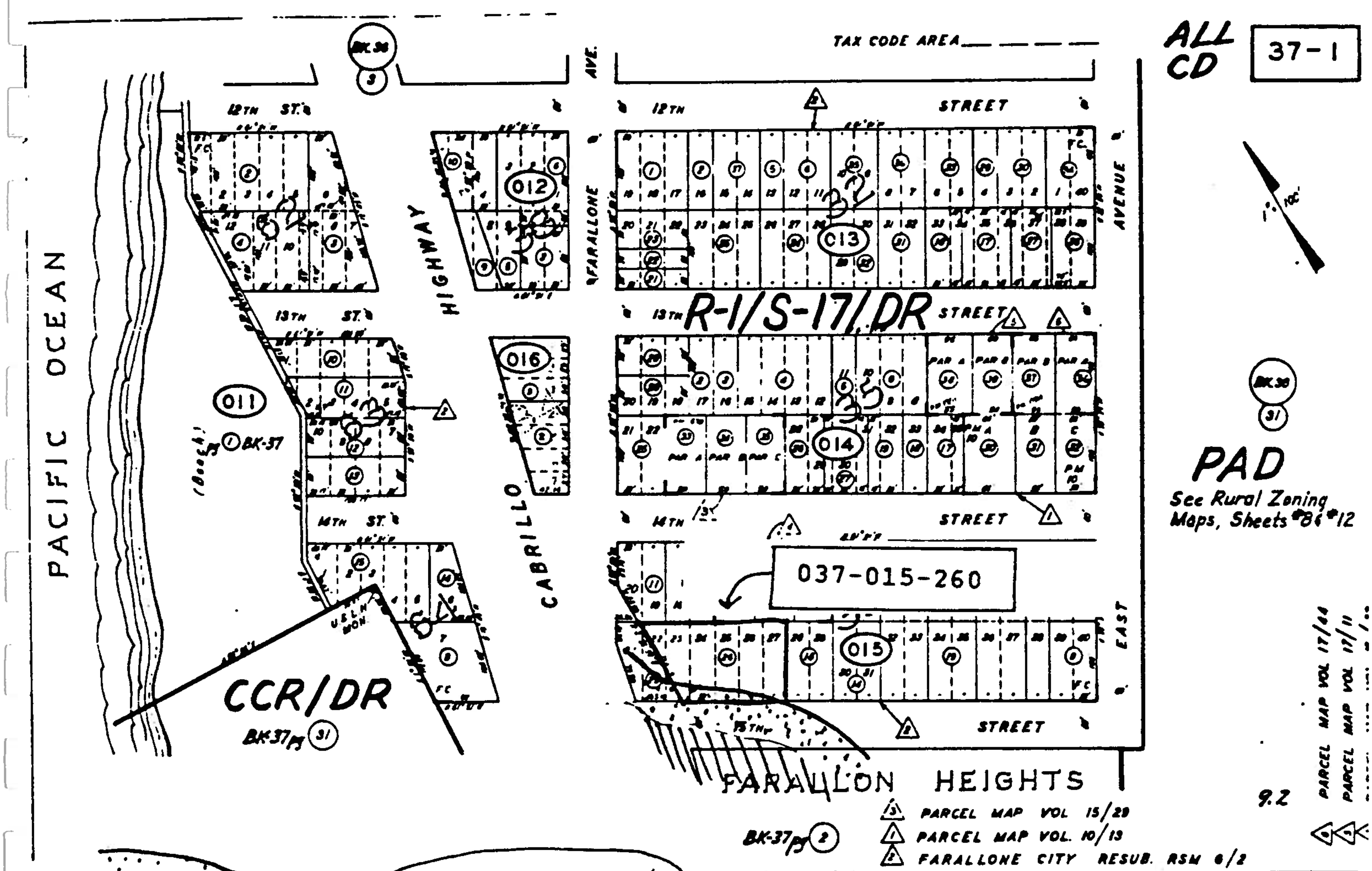
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PACIFIC OCEAN
HIGHWAY
CABRILLO
FARALLONE AVE.
AVENUE
EAST
012
013
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014
015
R-1/S-17/DR
CCR/DR
BK-37 pg 31
① BK-37
(Book A)
037-015-260
FARALLON HEIGHTS
BK-37 pg 2
BK-36 31
PAD
See Rural Zoning Maps, Sheets #8 & #12
3 PARCEL MAP VOL 15/29
1 PARCEL MAP VOL. 10/13
2 FARALLONE CITY RESUB. RSM 6/2
PARCEL MAP VOL 17/44
PARCEL MAP VOL 17/11
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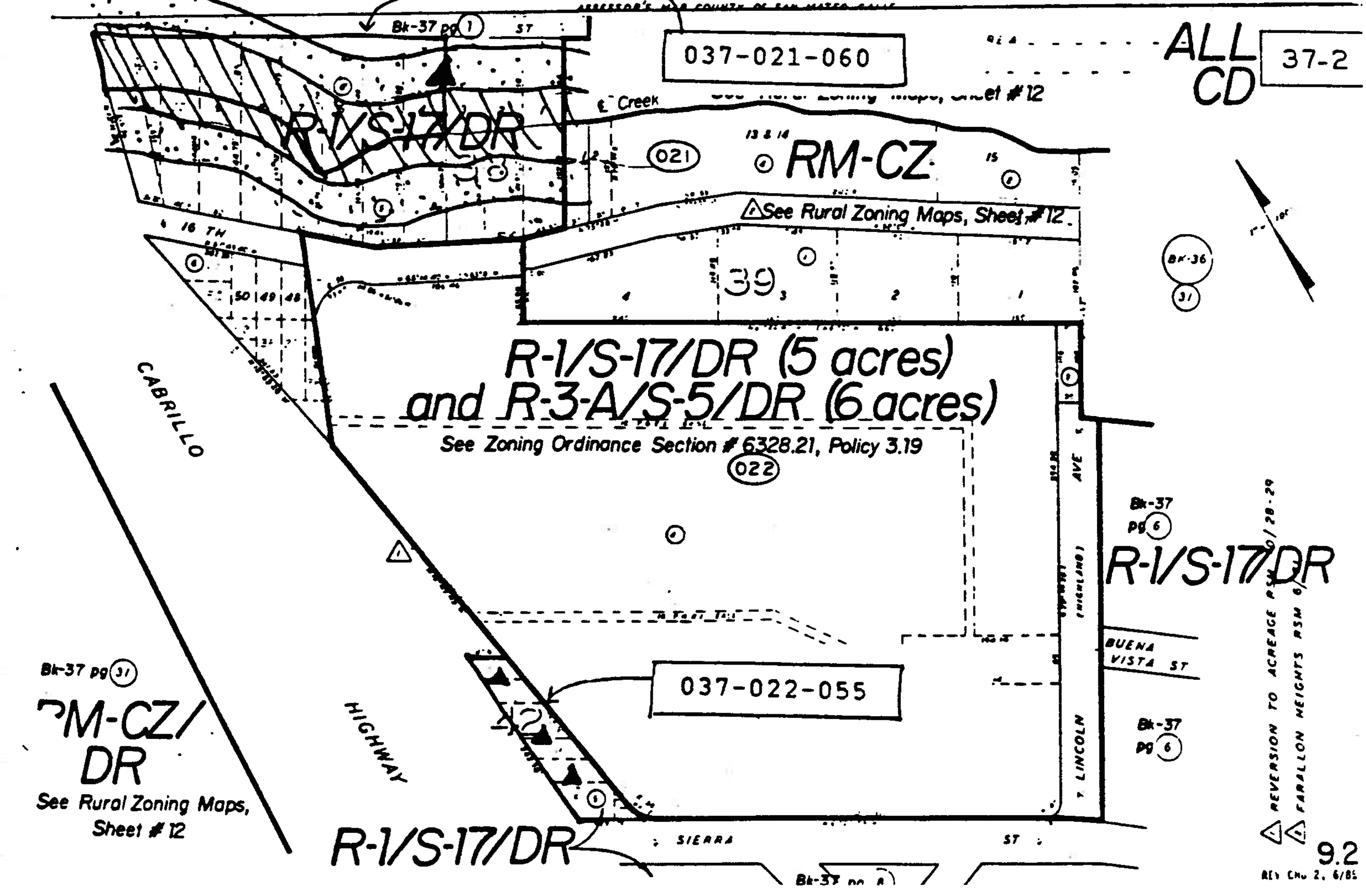
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Bk-37 pg 1
ST
037-021-060
Creek
See Rural Zoning Maps, Sheet #12
R-1/S-17/DR
021
RM-CZ
13 & 14
15
See Rural Zoning Maps, Sheet #12
16TH
39
R-1/S-17/DR (5 acres) and R-3-A/S-5/DR (6 acres)
See Zoning Ordinance Section # 6328.21, Policy 3.19
022
CABRILLO
HIGHWAY
037-022-055
42
Bk-37 pg 31
RM-CZ/DR
See Rural Zoning Maps, Sheet #12
R-1/S-17/DR
SIERRA ST
Bk-37 pg 8
Bk-37 pg 6
R-1/S-17/DR
BUENA VISTA ST
LINCOLN (HIGHLAND) AVE
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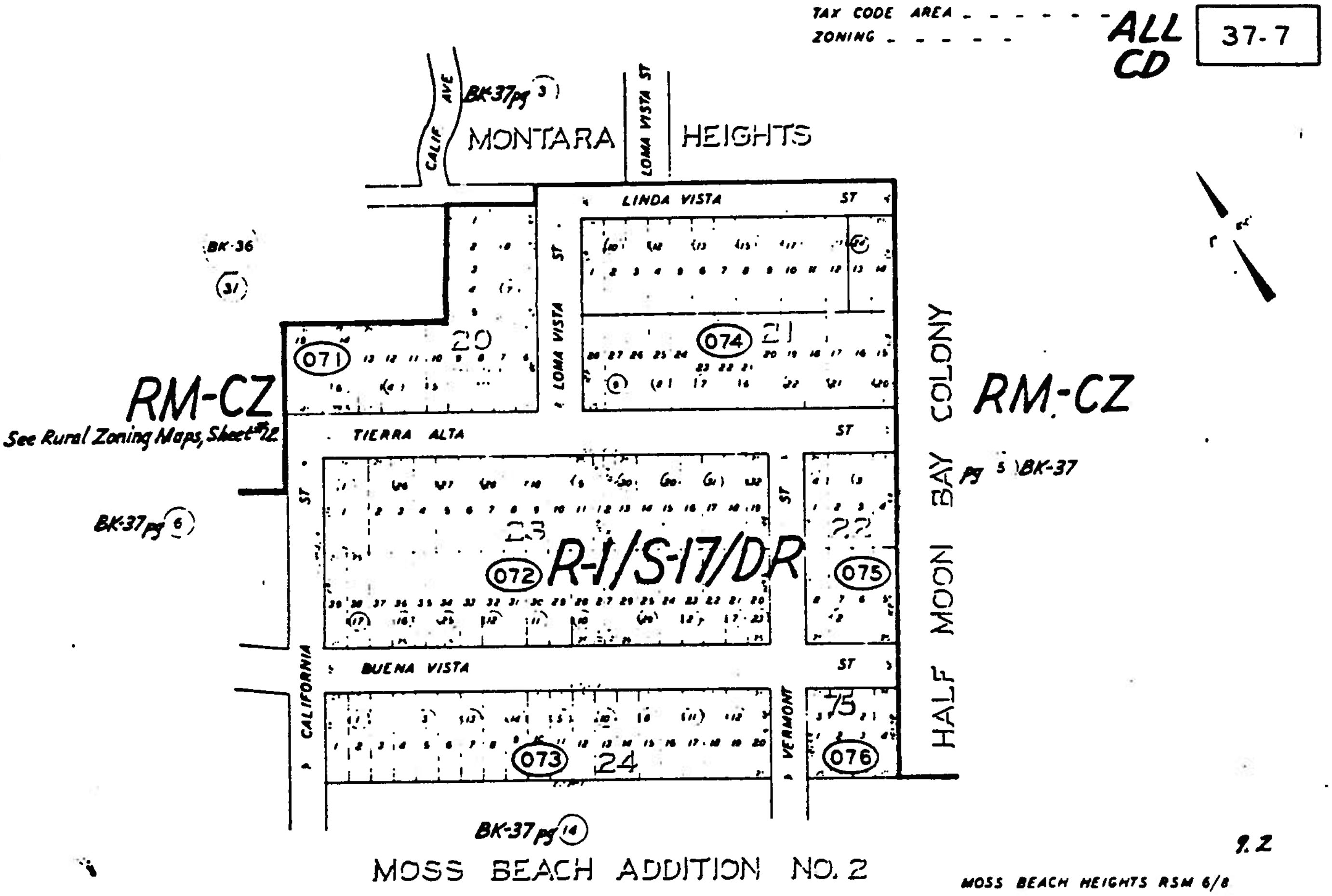
FARALLON HEIGHTS RSM 6/
9.2
REV CHG 2, 6/85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20
074
21
RM-CZ
See Rural Zoning Maps, Sheet #12
TIERRA ALTA ST
BK-37 pg 6
23
072
R-1/S-17/DR
22
075
HALF MOON BAY COLONY
pg 5 BK-37
BUENA VISTA ST
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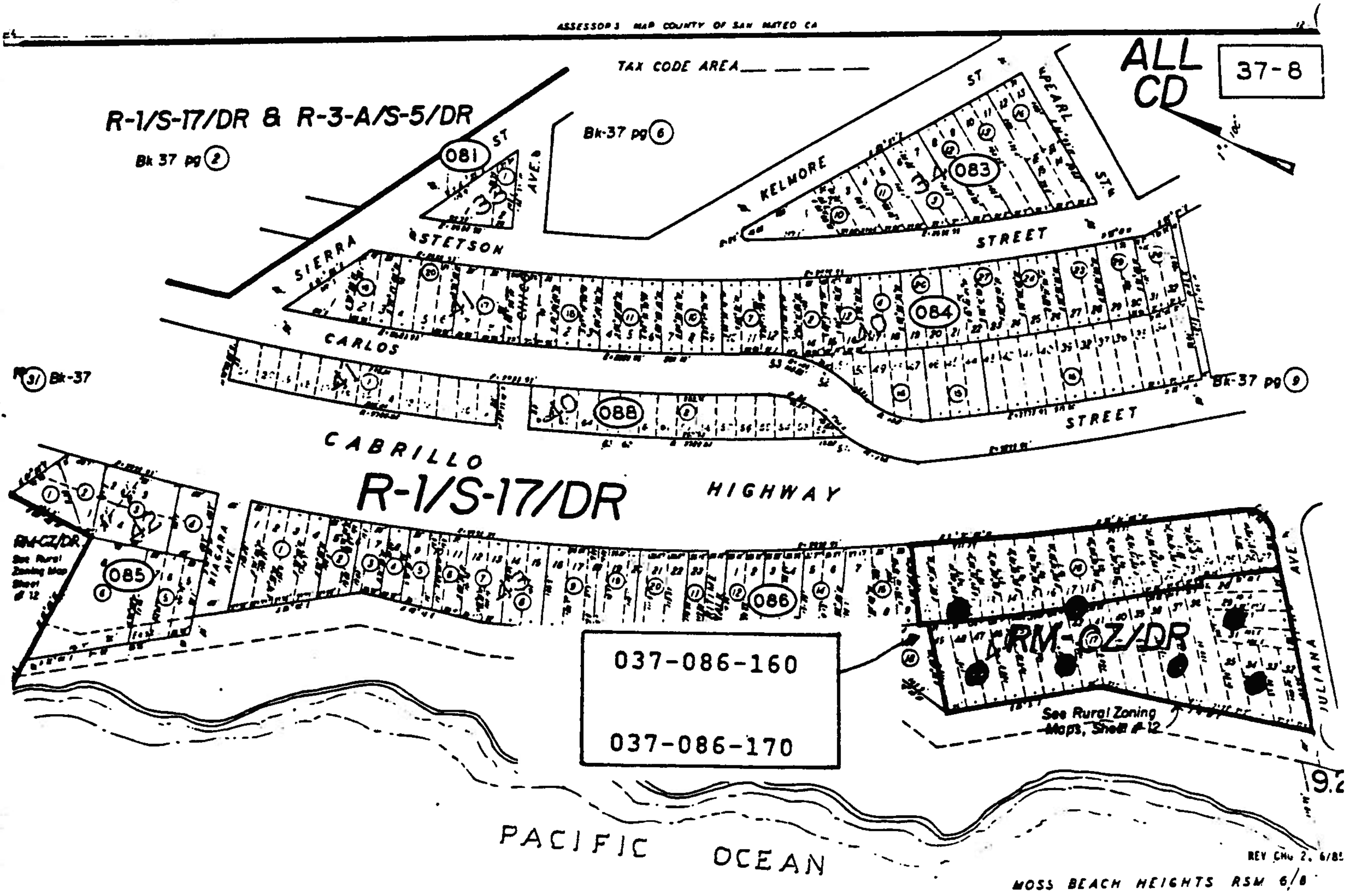
9.2
MOSS BEACH HEIGHTS RSM 6/8


ASSESSOR'S MAP COUNTY OF SAN MATEO CA
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AVE
Bk-37 pg 6
KELMORE ST
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083
PEARL ST
SIERRA
STETSON
STREET
CARLOS
084
Bk-37 pg 9
(31) Bk-37
088
STREET
CABRILLO HIGHWAY
R-1/S-17/DR
RM-CZ/DR
See Rural Zoning Map Sheet #12
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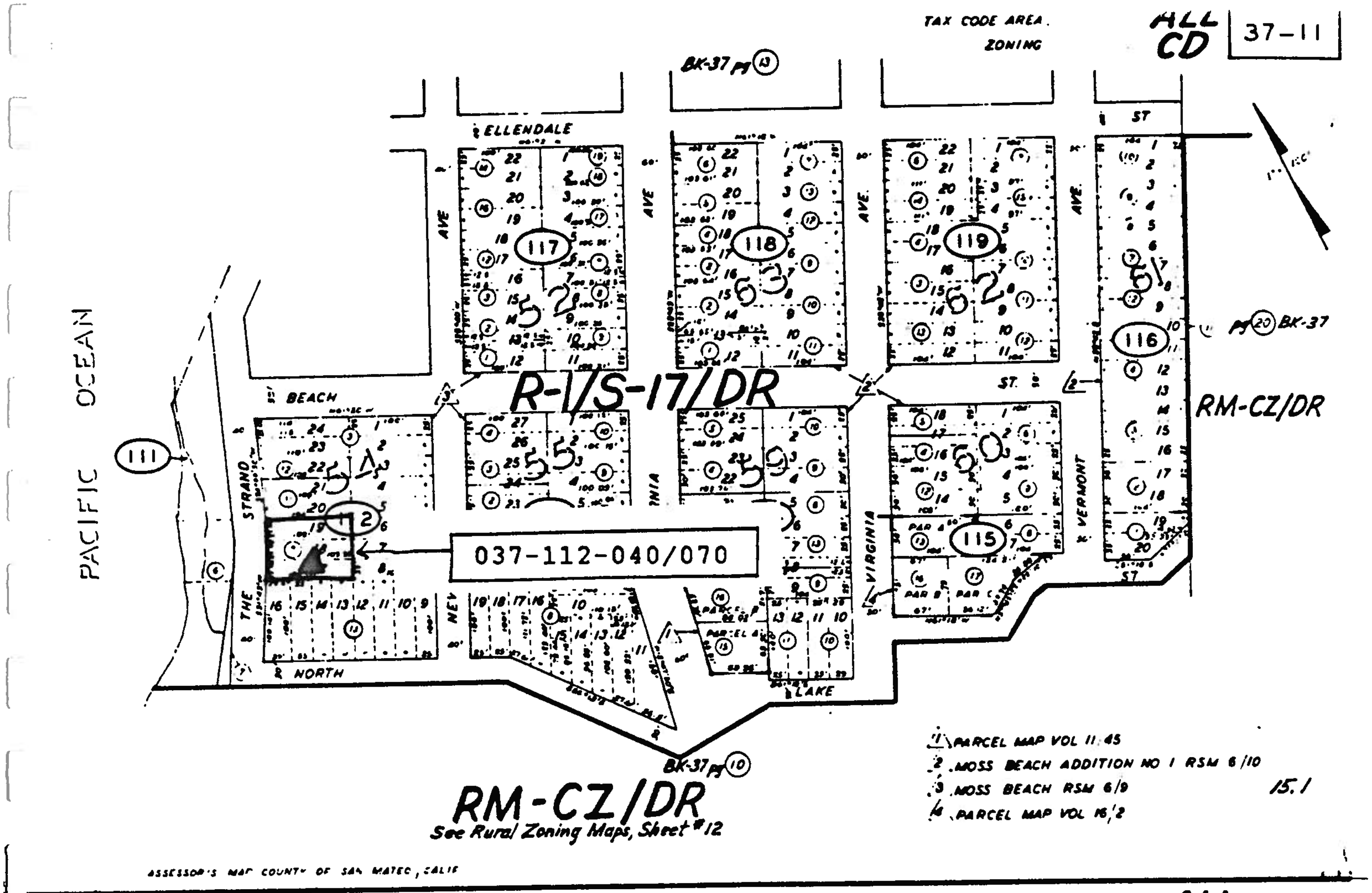
086
037-086-160
037-086-170
RM-CZ/DR
See Rural Zoning Maps, Sheet #12
JULIANA AVE
9.2
PACIFIC OCEAN
REV CHG 2, 6/85
MOSS BEACH HEIGHTS RSM 6/8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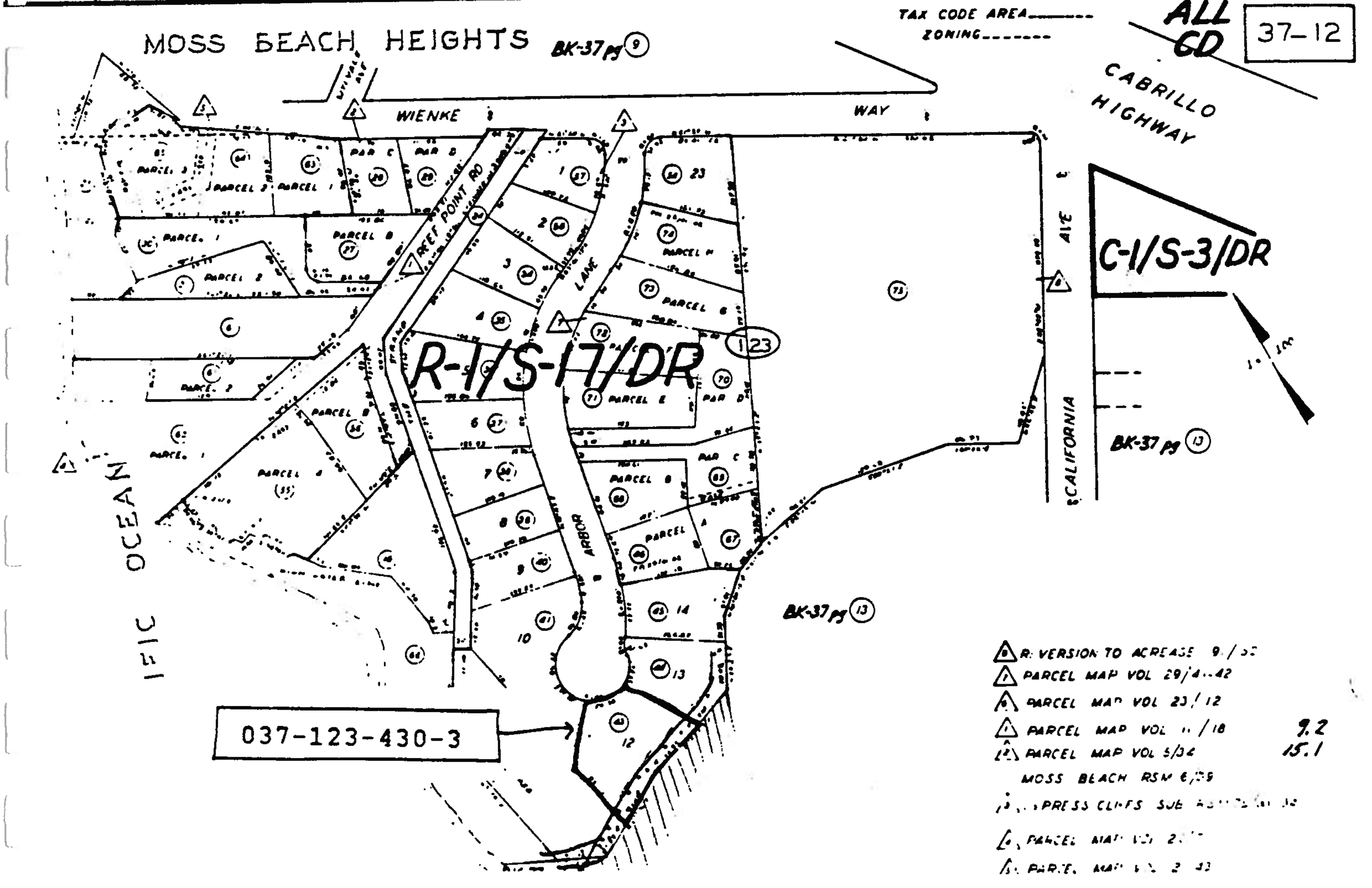
ZONING
ALL CD
37-11
BK-37 pg ⑬
ELLENDALE AVE
AVE
AVE
AVE
ST
117
118
119
116
111
112
115
BEACH
ST.
PACIFIC OCEAN
THE STRAND
R-1/S-17/DR
RM-CZ/DR
037-112-040/070
VIRGINIA
VERMONT
NEV
NORTH
LAKE
ST
BK-37 pg ⑳
BK-37 pg ⑩
1 PARCEL MAP VOL 11/45
2 MOSS BEACH ADDITION NO 1 RSM 6/10
3 MOSS BEACH RSM 6/9
4 PARCEL MAP VOL 16/2
15.1
RM-CZ/DR
See Rural Zoning Maps, Sheet #12
ASSESSOR'S MAP COUNTY OF SAN MATEO, CALIF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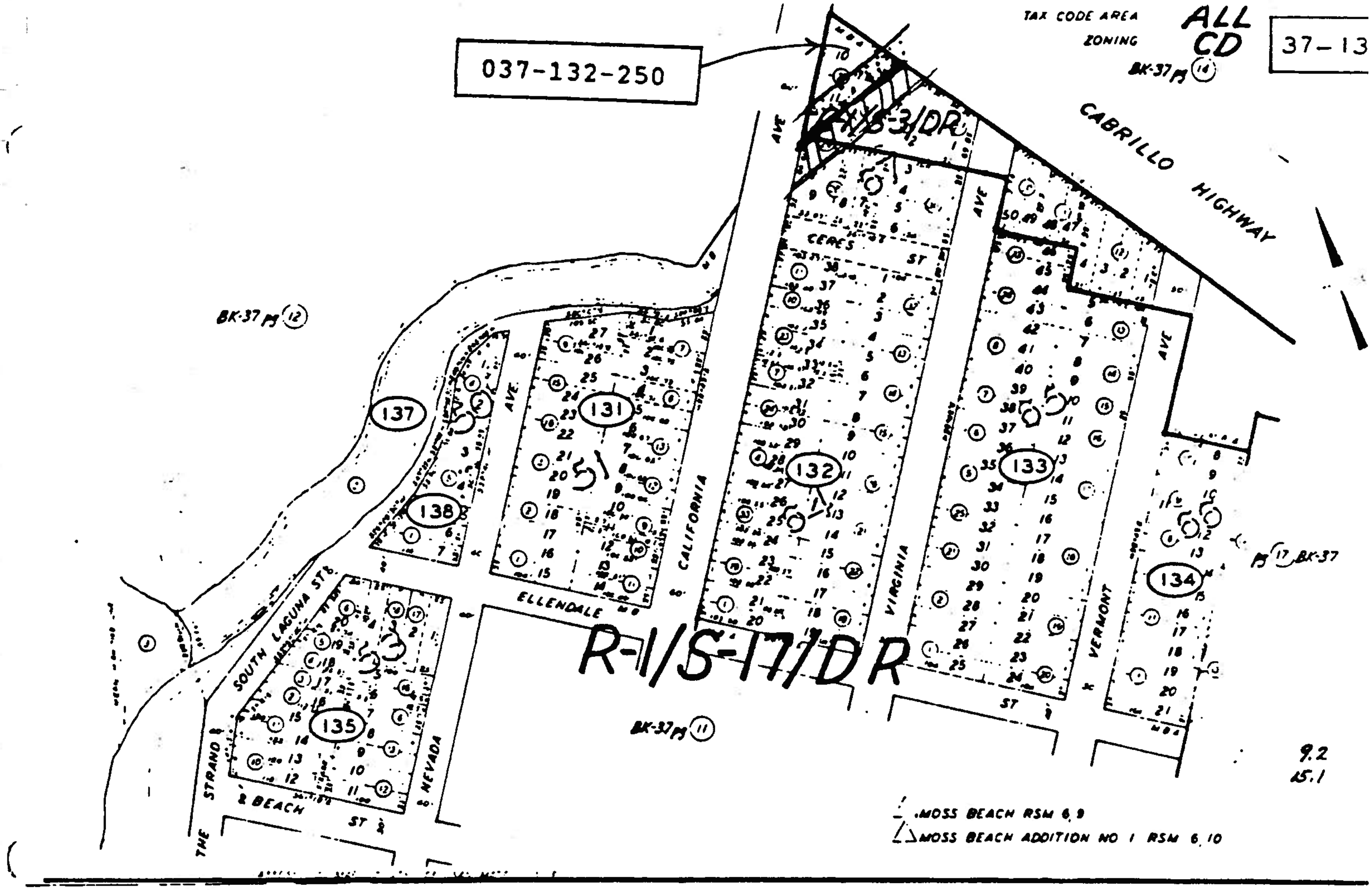
CABRILLO HIGHWAY
WIENKE WAY
REEF POINT RD
STRAND
ARBOR LANE
CALIFORNIA AVE
123
R-1/S-17/DR
C-1/S-3/DR
OCEAN
PACIFIC
BK-37 pg ⑬
BK-37 pg ⑬
037-123-430-3
REVERSION TO ACREAGE 9/32
PARCEL MAP VOL 29/41-42
PARCEL MAP VOL 23/12
PARCEL MAP VOL 11/18
9.2
PARCEL MAP VOL 5/34
15.1
MOSS BEACH RSM 6/29
PRESS CLIFFS SUB
PARCEL MAP VOL 2
PARCEL MAP VOL 2 33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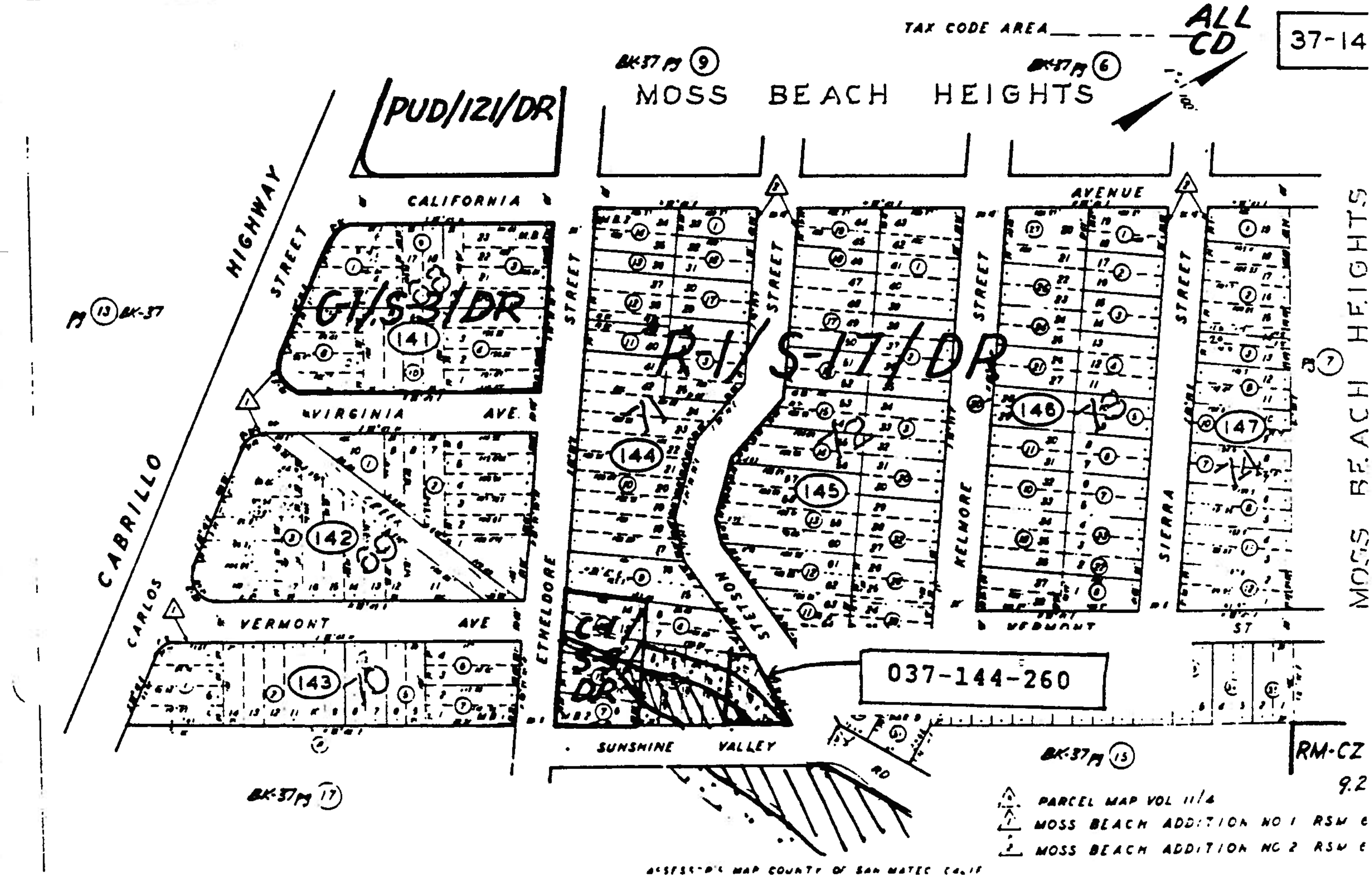
37-13
037-132-250
BK-37 pg 14
CABRILLO HIGHWAY
R-1/S-3/DR
CERES ST
BK-37 pg 12
137
131
132
133
138
134
AVE
CALIFORNIA
VIRGINIA
VERMONT
ELLENDALE
SOUTH LAGUNA ST
THE STRAND
NEVADA
BEACH ST
135
R-1/S-17/DR
BK-37 pg 11
pg 17 BK-37
9.2
15.1
MOSS BEACH RSM 6, 9
MOSS BEACH ADDITION NO 1 RSM 6, 10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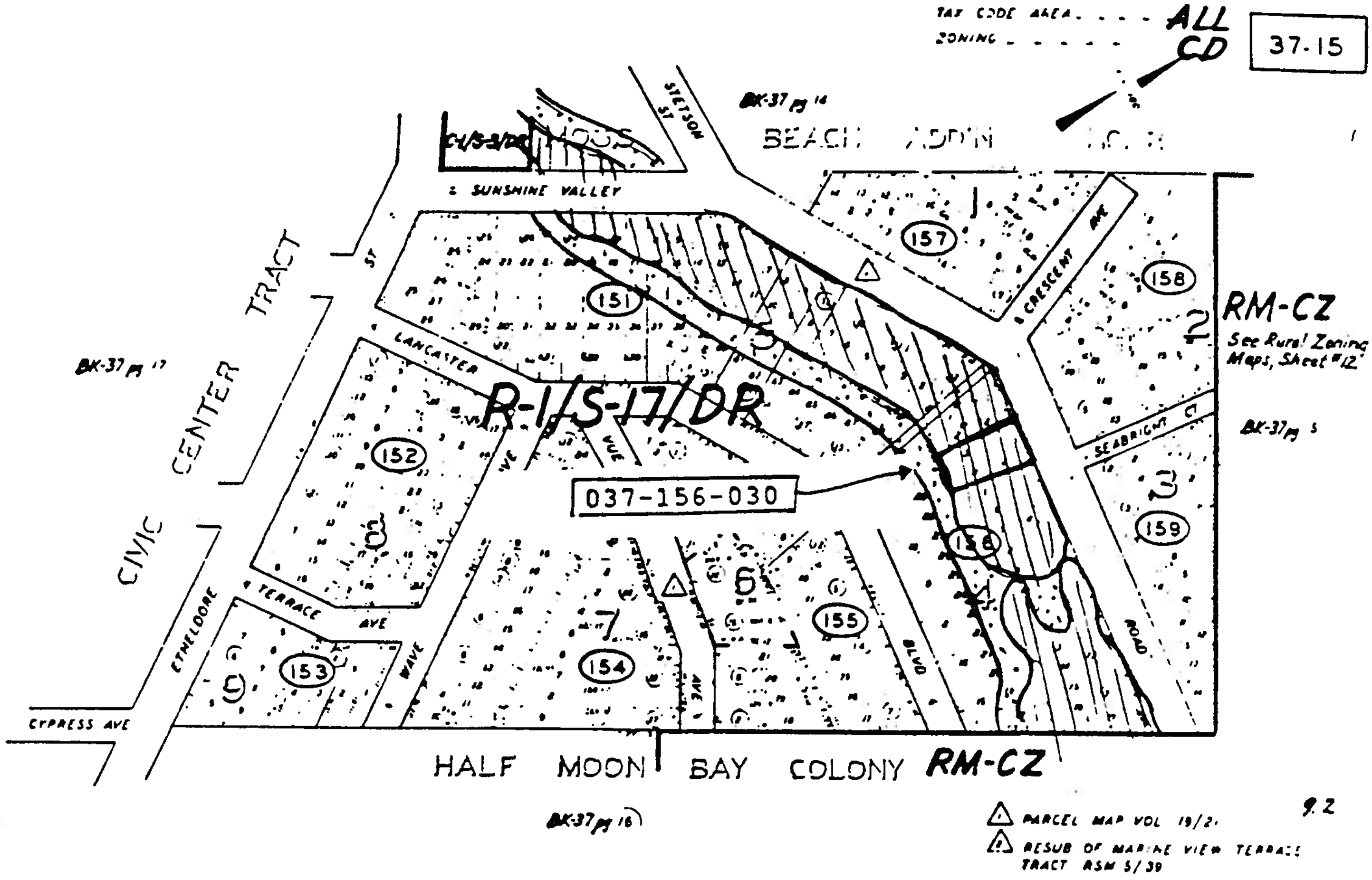
CD
37-14
BK-37 pg 9
BK-37 pg 6
MOSS BEACH HEIGHTS
PUD/121/DR
CALIFORNIA
AVENUE
CABRILLO HIGHWAY
STREET
G1/S-3/DR
141
R-1/S-17/DR
pg 13 BK-37
VIRGINIA AVE
144
145
146
147
pg 7
142
CARLOS
VERMONT AVE
ETHELDORE
STETSON
KELMORE
SIERRA
VERMONT ST
C-1/S-3/DR
143
037-144-260
SUNSHINE VALLEY RD
BK-37 pg 15
RM-CZ
9.2
BK-37 pg 17
PARCEL MAP VOL 11/4
MOSS BEACH ADDITION NO 1 RSM 6
MOSS BEACH ADDITION NO 2 RSM 6
ASSESSOR'S MAP COUNTY OF SAN MATEO CALIF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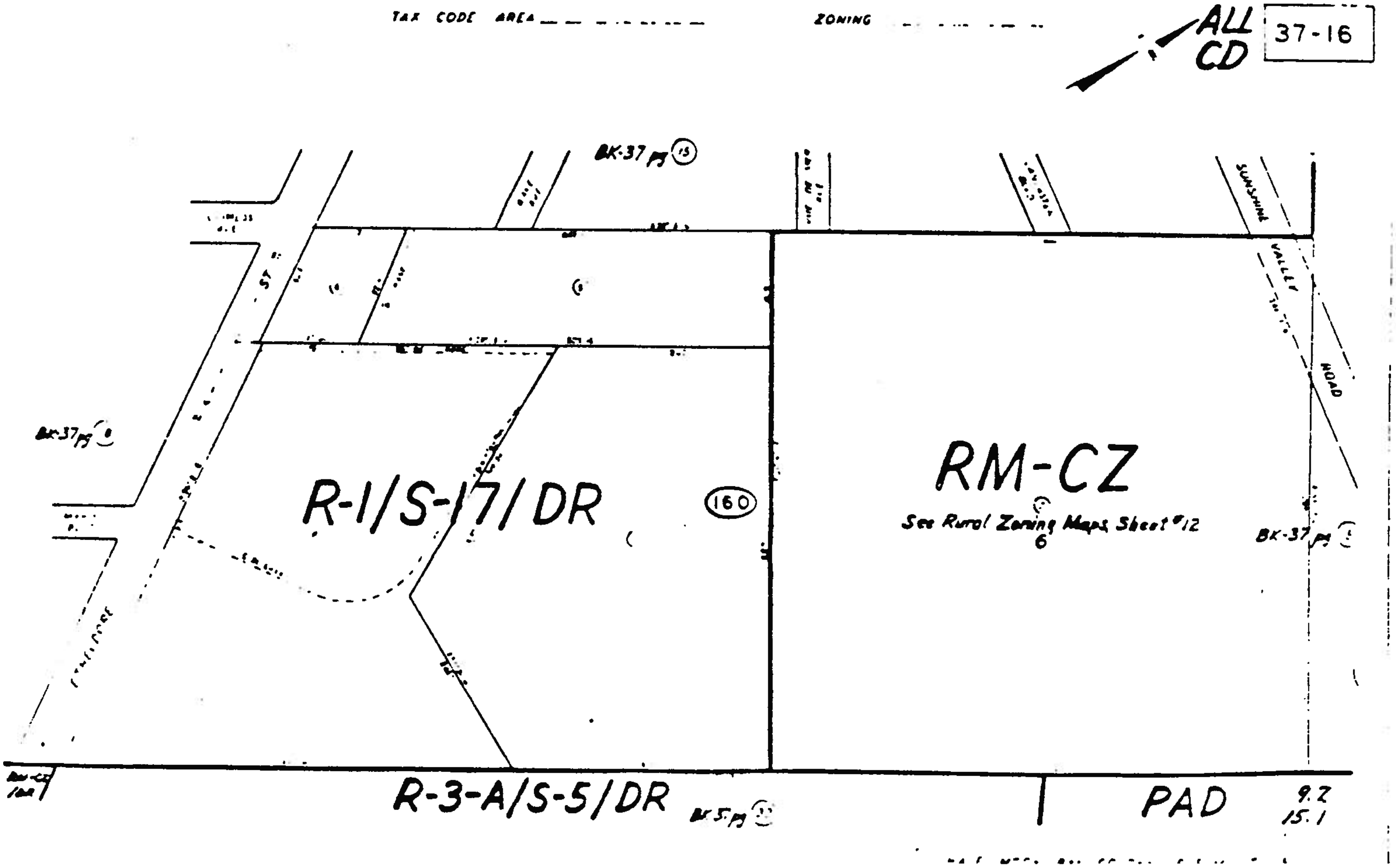
ZONING
ALL
CD
37-15
BK-37 pg 14
STETSON ST
BEACH ADD'N
C-1/S-3/DR
SUNSHINE VALLEY
ST
CIVIC CENTER TRACT
BK-37 pg 17
LANCASTER
R-1/S-17/DR
151
152
153
154
155
156
157
158
159
CRESCENT AVE
SEABRIGHT CT
RM-CZ
See Rural Zoning Maps, Sheet #12
BK-37 pg 5
037-156-030
ETHELDORE
TERRACE AVE
WAVE
VUE
AVE
BLVD
ROAD
CYPRESS AVE
HALF MOON BAY COLONY
RM-CZ
BK-37 pg 16
9.2
PARCEL MAP VOL 19/21
RESUB OF MARINE VIEW TERRACE TRACT RSM 5/39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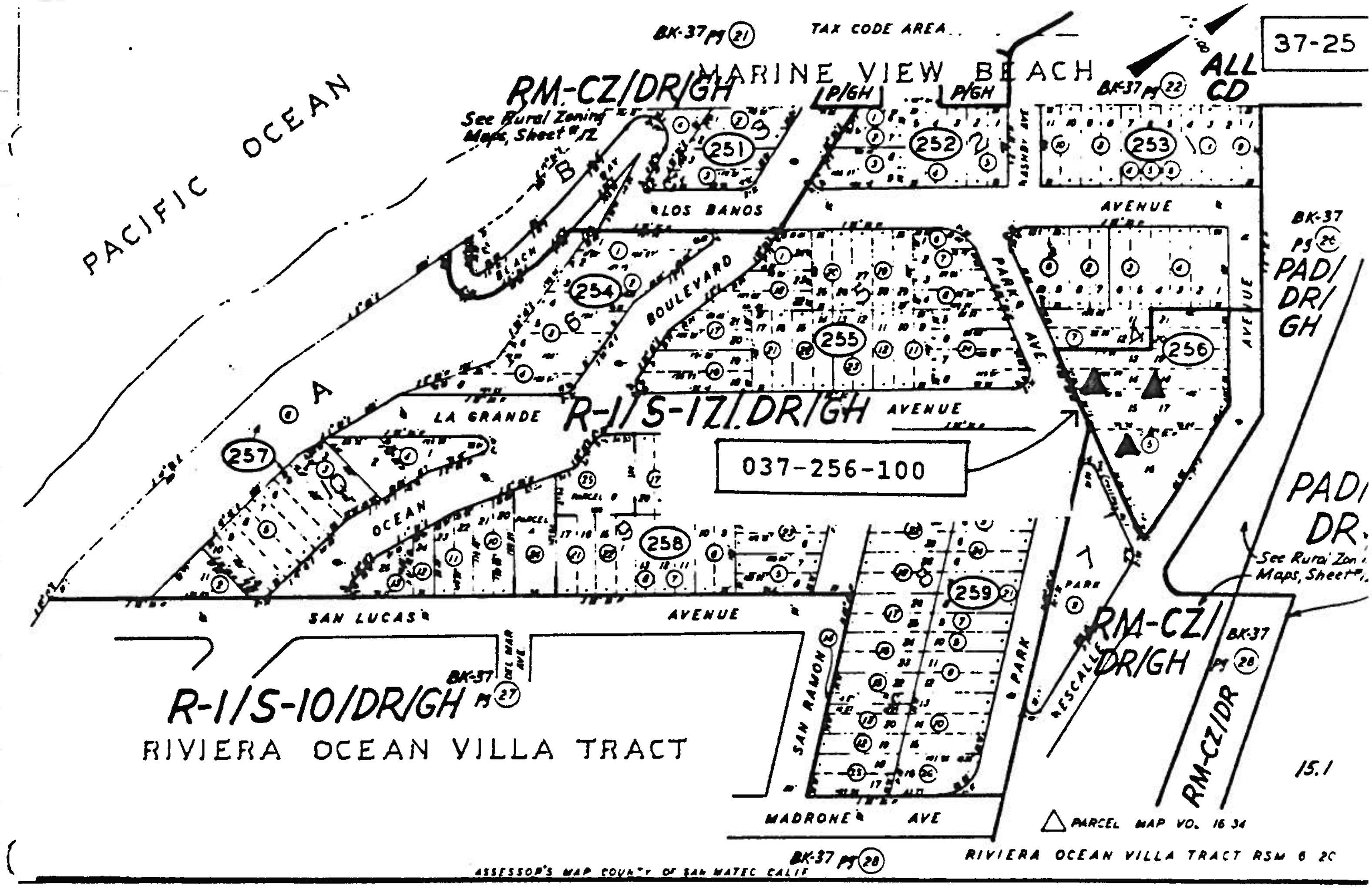
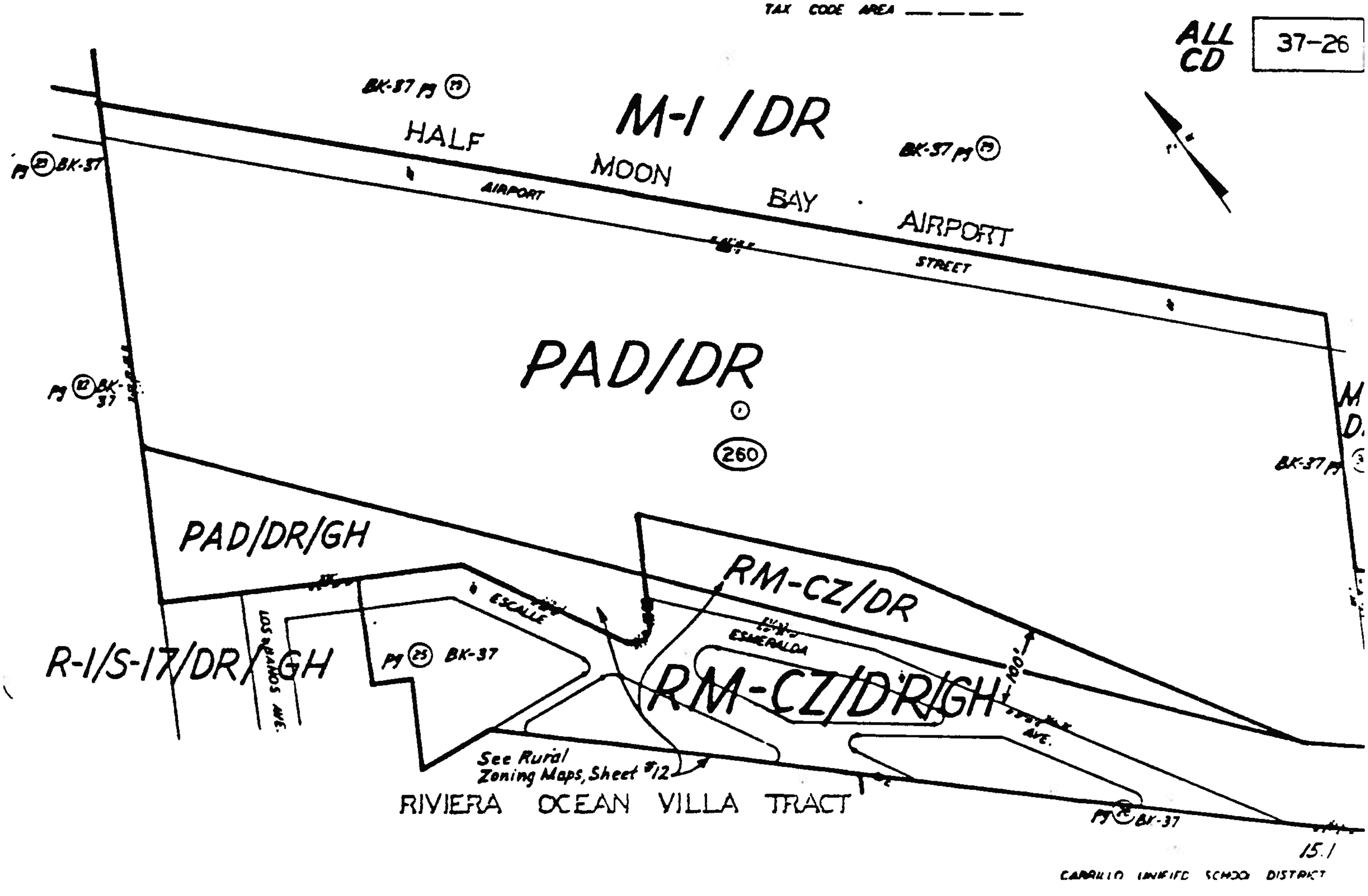
ALL
CD
37-16
BK-37 pg 15
ST
BK-37 pg 8
ETHELDORE
R-1/S-17/DR
160
RM-CZ
See Rural Zoning Maps Sheet #12
6
SUNSHINE VALLEY ROAD
BK-37 pg 5
R-3-A/S-5/DR
BK 5 pg 2
PAD
9.2
15.1


37-25
ALL CD
TAX CODE AREA
BK-37 pg 21
BK-37 pg 22
BK-37 pg 26
BK-37 pg 27
BK-37 pg 28
MARINE VIEW BEACH
PACIFIC OCEAN
RM-CZ/DR/GH
P/GH
See Rural Zoning Maps, Sheet #12
LOS BANOS
AVENUE
BEACH
BOULEVARD
PARK AVE
LA GRANDE
AVENUE
R-1/S-17/DR/GH
037-256-100
OCEAN
SAN LUCAS
AVENUE
DEL MAR AVE
SAN RAMON
PARK
ESCALLE
MADRONE
AVE
R-1/S-10/DR/GH
RIVIERA OCEAN VILLA TRACT
PAD/DR/GH
PAD/DR
See Rural Zoning Maps, Sheet #12
RM-CZ/DR/GH
RM-CZ/DR
251
252
253
254
255
256
257
258
259
15.1
PARCEL MAP VOL 16 34
RIVIERA OCEAN VILLA TRACT RSM 6 20
ASSESSOR'S MAP COUNTY OF SAN MATEO CALIF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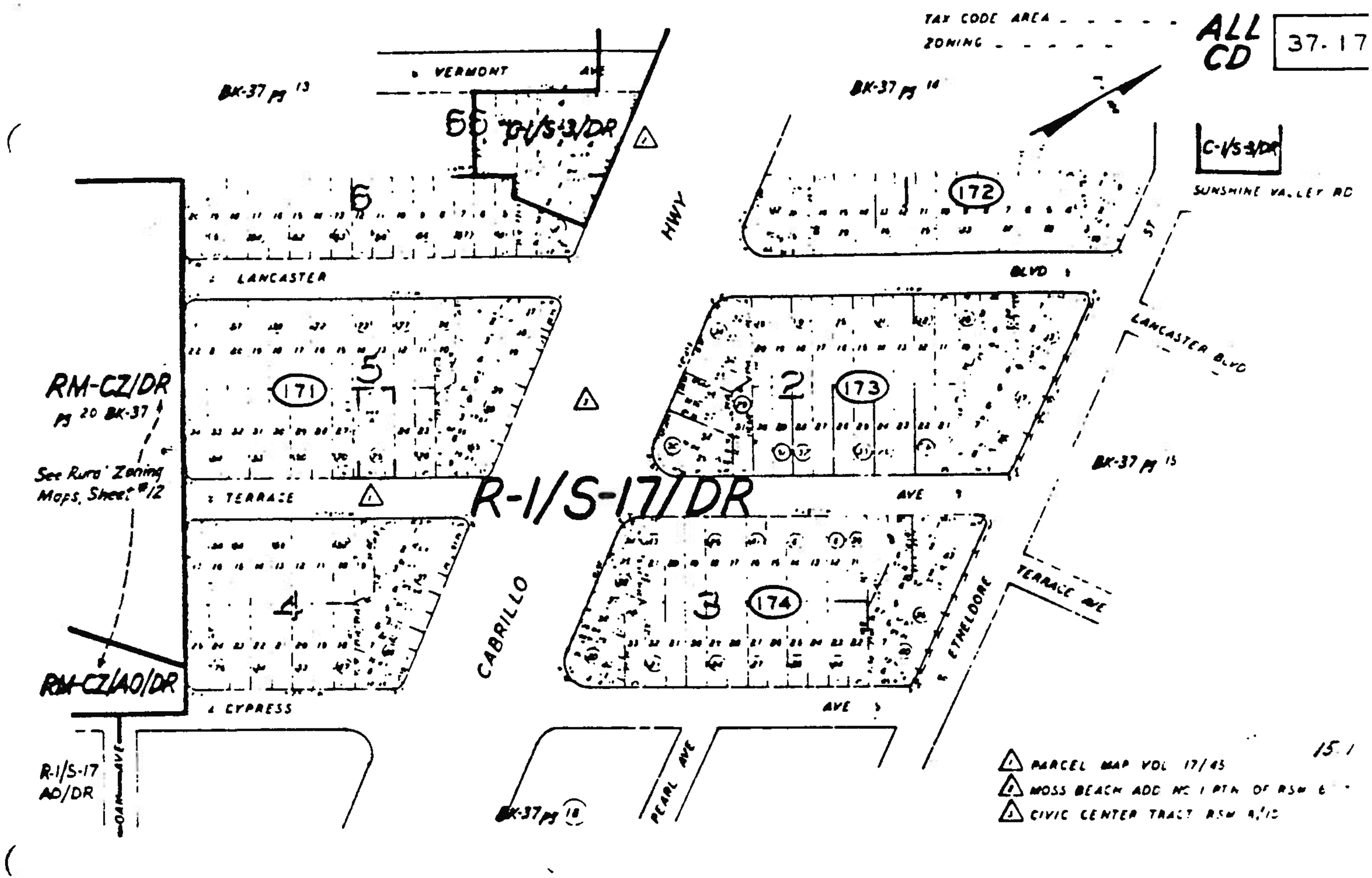
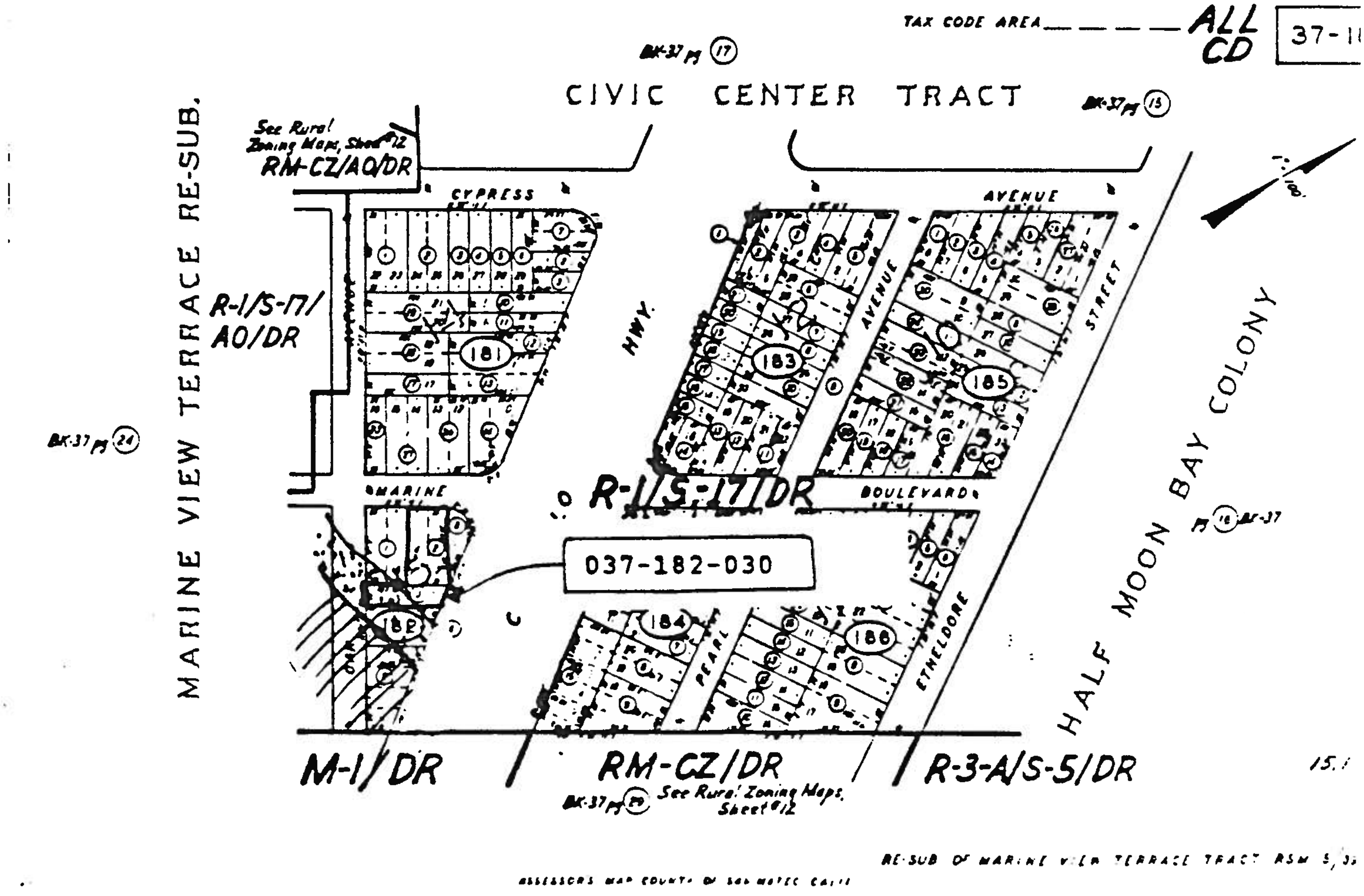
37-26
BK-37 pg 19
BK-37 pg 21
BK-37 pg 12
BK-37 pg 25
M-1/DR
HALF MOON BAY AIRPORT
AIRPORT STREET
PAD/DR
260
PAD/DR/GH
RM-CZ/DR
ESCALLE
ESMERALDA
LOS BANOS AVE
R-1/S-17/DR/GH
RM-CZ/DR/GH
100'
AVE.
See Rural Zoning Maps, Sheet #12
RIVIERA OCEAN VILLA TRACT
15.1
CABRILLO UNIFIED SCHOOL DISTRICT


TAX CODE AREA
ZONING
ALL
CD
37-17
BK-37 pg 13
BK-37 pg 14
VERMONT AVE
C-1/S-3/DR
C-1/S-3/DR
SUNSHINE VALLEY RD
6
172
HWY
LANCASTER
BLVD
ST
LANCASTER BLVD
RM-CZ/DR
pg 20 BK-37
See Rural Zoning Maps, Sheet #12
5
171
2
173
BK-37 pg 15
TERRACE
R-1/S-17/DR
AVE
4
CABRILLO
3
174
ETHELDORE
TERRACE AVE
RM-CZ/AO/DR
CYPRESS
AVE
R-1/S-17 AO/DR
OAK AVE
PEARL AVE
BK-37 pg 18
PARCEL MAP VOL 17/45
MOSS BEACH ADD NO 1 PTN OF RSM 6
CIVIC CENTER TRACT RSM 8/10
15.1
ASSESSOR'S MAP COUNTY OF SAN MATEO CA


TAX CODE AREA
ALL
CD
37-1
BK-37 pg 17
CIVIC CENTER TRACT
BK-37 pg 15
See Rural Zoning Maps, Sheet #12
RM-CZ/AO/DR
CYPRESS
AVENUE
MARINE VIEW TERRACE RE-SUB.
R-1/S-17/AO/DR
181
HWY.
183
AVENUE
185
STREET
HALF MOON BAY COLONY
BK-37 pg 24
MARINE
R-1/S-17/DR
BOULEVARD
pg 16 BK-37
037-182-030
182
184
PEARL
186
ETHELDORE
M-1/DR
RM-CZ/DR
R-3-A/S-5/DR
BK-37 pg 20
See Rural Zoning Maps, Sheet #12
15.1
RE-SUB OF MARINE VIEW TERRACE TRACT RSM 5/33
ASSESSOR'S MAP COUNTY OF SAN MATEO CALIF

APPENDIX C

INITIAL STUDY
ENVIRONMENTAL EVALUATION CHECKLIST

I. BACKGROUND:

Project Title: Montara/Moss Beach Water Well EIR

File No.: EP 88-5

Project Location: Undeveloped parcels within the Montara Sanitary District, Montara and Moss Beach Communities

Assessor's parcel No.: 60 listed parcels, chosen by lottery to receive sewer permits, within the Montara Sanitary District, plus undeveloped parcels meeting County standards for use of onsite waste-disposal systems

Applicant/Owner: County of San Mateo, via Planning and Development Division

Date Environmental Information Form Submittal: N/A

PROJECT DESCRIPTION

Montara Sanitary District proposes to issue up to 60 permits to connect to sewers in an area formerly under moratorium for new water connections. As no additional water hookups are authorized, the probable source of domestic water for the proposed new residences is likely to be new wells serving the homes or individual parcels.

County staff have noted than an unspecified number of additional undeveloped parcels in this planning area may conceivably meet criteria for use of septic tanks or other onsite waste-disposal systems. While the Board of Supervisors has affirmed that septic tanks are not appropriate in an urban area, it is possible that such parcels might ultimately be served by individual water wells. The Board therefore has requested that the effects on the local ground-water system of both the 60 specific parcels and the additional undeveloped parcels be jointly considered.

The effects of the proposed wells and potential septic system on water levels and water quality within the terrace, alluvial, and bedrock aquifers within the Montara/Moss Beach area will be the focus of the EIR on the project. Areas where water wells may be drilled with lesser impact will be identified, as well as areas where significant adverse impacts are anticipated. Other issues to be discussed include erosion and sedimentation from additional grading, impacts on community services, growth inducement, vegetation and wildlife (including riparian zones), and potential effects of relying on septic systems for waste disposal in future residential expansion.

The EIR will also discuss alternatives to the proposed drilling of 60 individual water wells. At the present time, two alternatives have been identified: (1) developing a smaller number of community wells to serve the 60 proposed residences, and (2) watershed-scale recharge-and-extraction programs to serve more homes, potentially with lesser economic and environmental impact.

II. ENVIRONMENTAL ANALYSIS

Any controversial answers or answers needing clarification are explained on an attached sheet. For source, refer to pages 11 and 12.

	IMPACT					SOURCE
	NO	YES				
		Not Significant	Significant-Unless Mitigated	Significant	Cumulative	
1. LAND SUITABILITY AND GEOLOGY						
Will (or could) this project:						
a. Involve a unique landform or biological area, such as beaches, sand dunes, marshes, tidelands, or San Francisco Bay.		X	X			B,F,O
b. Involve construction on slope of 15% or greater.		X				E,I
c. Be located in an area of soil instability (subsidence, landslide or severe erosion)?			X	X		Bc,D
d. Be located on, or adjacent to a known earthquake fault?			X	X		Bc,D
e. Involve Class I or Class II Agriculture Soils and Class III Soils rated good or very good for artichokes or Brussels sprouts.		X				M
f. Cause significant erosion or siltation?			X			M,I
g. Result in damage to soil capability or loss of agricultural land?		X				A,M
h. Be located within a flood hazard area?	X					G

	IMPACT					SOURCE
	NO	YES				
		Not Signi-ficant	Signi-ficant-Unless Mitigated	Signi-ficant	Cumu-lative	
i. Be located in an area where a high water table may adversely affect land use?		X				D
j. Affect a natural drainage channel or streambed, or watercourse?			X			E
2. VEGETATION AND WILDLIFE						
Will (or could) this project:						
a. Affect federal or state listed rare or endangered species of plant life in the project area?			X			F
b. Involve cutting of heritage or significant trees as defined in the County Heritage Tree and Significant Tree Ordinance?			X			I,A
c. Be adjacent to or include a habitat food source, water source, nesting place or breeding place for a federal or state listed rare or endangered wildlife species?			X			F
d. Significantly affect fish, wildlife, reptiles, or plant life?			X			I
e. Be located inside or within 200 feet of a marine or wildlife reserve?				X		E,F,O
f. Infringe on any sensitive habitats?			X			F
g. Involve clearing land that is 5,000 sq. ft. or greater (1,000 sq. ft. within a County Scenic Corridor) that has slopes greater that 20% or that is in a sensitive habitat or buffer zone?					X	I,F,Bb

a. Generate pollutants (hydrocarbon, thermal odor, dust or smoke particulates, radiation, etc.) that will violate existing standards of air quality on site or in the surrounding area?		X				I,N,R
b. Involve the burning of any material, including brush, trees and construction materials?			X			I
c. Be expected to result in the generation of noise levels in excess of those currently existing in the area, after construction?		X				Ba,I

	IMPACT					SOURCE
	NO	YES				
		Not Significant	Significant-Unless Mitigated	Significant	Cumulative	
d. Involve the application, use or disposal of potentially hazardous materials, including pesticides, herbicides, other toxic substances, or radioactive material?		X				I
e. Be subject to noise levels in excess of levels determined appropriate according to the County Noise Ordinance or other standard?		X				A,Ba,Bc
f. Generate noise levels in excess of levels determined appropriate according to the County Noise Ordinance standard?		X				I
g. Generate polluted or increased surface water runoff or affect groundwater resources?				X		I
h. Require a permit or other approval from any other agency? For example:		X				I,Q,S
U.S. Army Corps of Engineers	X					I,Q,S
State Water Resources Control Board	X					I,Q,S
Regional Water Quality Control Board	X					I,Q,S
State Department of Public Health	X					I,Q,S
San Francisco Bay Conservation and Development Commission	X					I,Q,S
U.S. Environmental Protection Agency	X					I,Q,S
County Airport Land Use Commission	X					I,Q,S
Caltrans	X					I,Q,S
Bay Area Air Quality Management District	X					I,Q,S
Coastal Commission		X				I,Q,S
City	X					I,Q,S
Sewer/Water District	X			X		I,Q,S
Other ______________________						I,Q,S

	IMPACT					SOURCE
	NO	YES				
		Not Signi-ficant	Signi-ficant-Unless Mitigated	Signi-ficant	Cumu-lative	
i. Require installation of a septic tank/leachfield sewage disposal system or require hookup to an existing collection system which is at or over capacity?		X				S
5. TRANSPORTATION:						
Will (or could) this project:						
a. Affect access to commercial establishments, schools, parks, etc.?		X				A,I
b. Cause noticeable increase in pedestrian traffic or a change in pedestrian patterns?		X				A,I
c. Result in noticeable changes in vehicular traffic patterns or volumes (including bicycles)?		X				I
d. Involve the use of off-road vehicles of any kind (such as trail bikes)?	X					I
e. Result in or increase traffic hazards?		X				S
f. Provide for alternative transportation amenities such as bike racks?	X					I
g. Generate traffic which will adversely affect the traffic carrying capacity of any roadway?		X				S

6. LAND USE AND GENERAL PLANS

Will (or could) this project:

	IMPACT					SOURCE
	NO	YES				
		Not Significant	Significant-Unless Mitigated	Significant	Cumulative	
a. Result in the congregating of more than 50 people on a regular basis?	X					I
b. Result in the introduction of activities not currently found within the community?	X					I
c. Employ equipment which could interfere with existing communication and/or defense systems?	X					I
d. Result in any changes in land use, either on or off the project site?		X				I
e. Serve to encourage off-site development of presently undeveloped areas or increase development intensity of already developed areas (examples include the introduction of new or expanded public utilities, new industry, commercial facilities or recreation activities)?			X			I,Q,S
f. Adversely affect the capacity of any public facilities (streets, highways, freeways, public transit, schools, parks, police, fire, hospitals), public utilities (electrical, water and gas supply lines, sewage and storm drain discharge lines, sanitary landfills) or public works serving the site?		X	X			I,S
g. Generate any demands that will cause a public facility or utility to reach or exceed its capacity?			X			I,S

	IMPACT					SOURCE
	NO	YES				
		Not Significant	Significant-Unless Mitigated	Significant	Cumulative	
i. Be adjacent to or within 500 feet of an existing or planned public facility?		X				A
j. Create significant amounts of solid waste or litter?		X				I
l. Substantially increase fossil fuel consumption (electricity, oil, natural gas, coal, etc.)?		X				I
m. Require an amendment to or exception from adopted general plans, specific plans, or community policies or goals?	X					B
n. Involve a change of zoning?	X					C
o. Require the relocation of people or businesses?	X					I
p. Reduce the supply of low-income housing?	X					I
q. Result in possible interference with an emergency response plan or emergency evacuation plan?	X					S
r. Result in creation of or exposure to a potential health hazard?		X				S
7. <u>AESTHETIC, CULTURAL AND HISTORIC</u>						
Will (or could) this project:						
a. Be adjacent to a designated Scenic Highway or within a State or County Scenic Corridor?		X				A,Bb

	IMPACT					SOURCE
	NO	YES				
		Not Signi-ficant	Signi-ficant-Unless Mitigated	Signi-ficant	Cumu-lative	
b. Obstruct scenic views from existing residential areas, public lands, public water body, or roads?		X				A,I
c. Involve the construction of buildings or structures in excess of three stories or 36 feet in height?		X				I
d. Directly or indirectly affect historical or archaeological resources on or near the site?		X				H
e. Visually intrude into an area having natural scenic qualities?		X				A,I

III. MITIGATION MEASURES

	Yes	No
Mitigation measures have been proposed in project application.	X	
Other mitigation measures are needed.	X	

The following measures are included in the project plans or proposals pursuant to Section 15070(b)(1) of the State CEQA Guidelines:

IV. MANDATORY FINDINGS OF SIGNIFICANCE

	Yes	No
1. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal, or eliminate important examples of the major periods of California history or prehistory?	X	X
2. Does the project have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals?		X
3. Does the project have possible environmental effects which are individually limited, but cumulatively considerable?	X	
4. Would the project cause substantial adverse effects on human beings, either directly or indirectly?		X

On the basis of this initial evaluation:

_____ I find the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared by the Planning Division.

_____ I find that although the proposed project could have a significant effect on the environment, there WILL NOT be a significant effect in this case because of the mitigation measures in the discussion have been included as part of the proposed project. A NEGATIVE DECLARATION will be prepared.

X I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

(Sign) William Rozar

Date _____

(Title) Senior Planner

V. SOURCE LIST

A. Field Inspection

B. County General Plan

- a. 1977 Noise Contour Maps, 1978 Noise Element
- b. Overview and Resource Management, General Plan Update
- c. Community Development, General Plan Update
- d. Housing Element
- e. Local Coastal Program
- f. Skyline Area General Plan Amendment
- g. Montara-Moss Beach-El Granada Community Plan
- h. Emerald Lake Hills Community Plan

C. County Ordinance Code

D. Geotechnical Maps

1. USGS Basic Data Contributions
    - a. #43 Landslide Susceptibility
    - b. #44 Active Faults
    - c. #45 High Water Table

2. Geotechnical Hazards Synthesis Maps

E. USGS Quadrangle Maps, San Mateo County 1970 Series (See F. and H.)

F. San Mateo County Rare and Endangered Species Maps, or Sensitive Habitats Maps

G. Flood Insurance Rate Map - National Flood Insurance Program

H. County Archaeologic Resource Inventory (Prepared by S. Dietz, A.C.R.S.)
Procedures for Protection of Historic and Cultural Properties--36 CFR 800 (See R.)

I. Project Plans or EIF

J. Airport Land Use Committee Plans, San Mateo County Airports Plan

K. Aerial Photography or Real Estate Atlas - REDI

APPENDIX D

NOTICE OF PREPARATION
RESPONSE FORM

TO:

FROM:
SAN MATEO COUNTY
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
COUNTY GOVERNMENT CENTER
REDWOOD CITY, CA 94063

PLEASE RETURN THIS NOTICE WITH YOUR COMMENTS BY:

TO BE COMPLETED BY LEAD AGENCY

PROJECT NAME: Montara/Moss Beach Water Well EIR

PROJECT LOCATION: Montara and Moss Beach communities, San Mateo County

DESCRIPTION OF PROJECT AND MAJOR LOCAL ENVIRONMENTAL ISSUES:

See attached sheet describing the background and project

CONTACT PERSON: (for contractor Barry Hecht
(for county) Bill Rozar

PHONE: (415) 527-0727
(415) 363-4161

TO BE COMPLETED BY INTERESTED INDIVIDUAL OR RESPONSIBLE AGENCY

LIST SPECIFIC ENVIRONMENTAL CONCERNS (USE ADDITIONAL SHEETS AS NECESSARY):

IF A RESPONSIBLE AGENCY, DESCRIBE SPECIFIC PERMIT AUTHORITY RELATED TO THIS PROJECT:

CONTACT PERSON:

PHONE:

DATE MAILED BY LEAD AGENCY:
December 14, 1988

DATE RECEIVED BY INTERESTED INDIVIDUAL OR RESPONSIBLE AGENCY:

DATE RESPONSE RECEIVED BY LEAD AGENCY:

INITIAL STUDY
ENVIRONMENTAL EVALUATION CHECKLIST

I. BACKGROUND:

Project Title: Montara/Moss Beach Water Well EIR

File No.: EP 88-5

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Date Environmental Information Form Submittal: N/A

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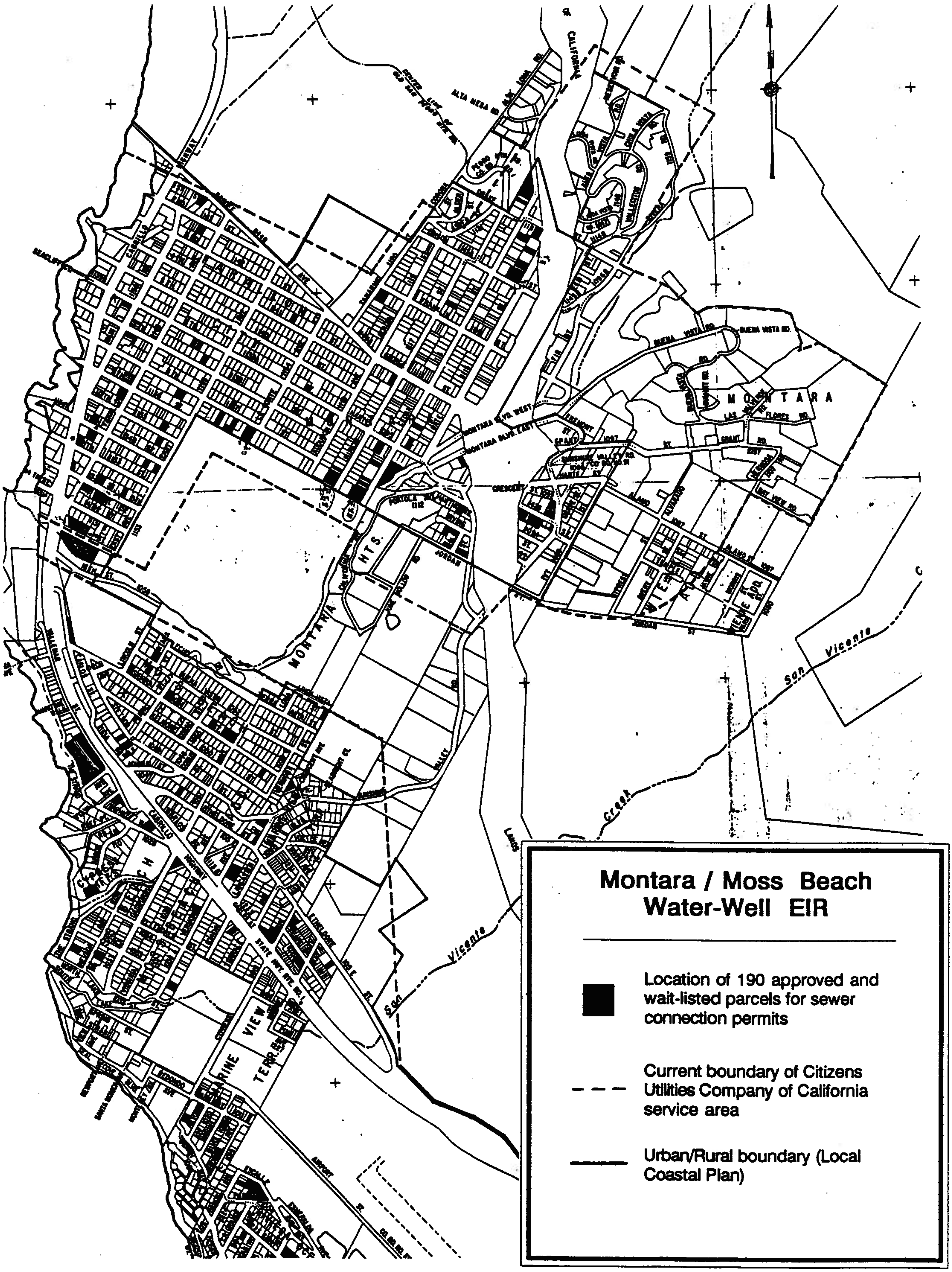
The effects of the proposed wells and potential septic system on water levels and water quality within the terrace, alluvial, and bedrock aquifers within the Montara/Moss Beach area will be the focus of the EIR on the project. Areas where water wells may be drilled with lesser impact will be identified, as well as areas where significant adverse impacts are anticipated. Other issues to be discussed include erosion and sedimentation from additional grading, impacts on community services, growth inducement, vegetation and wildlife (including riparian zones), and potential effects of relying on septic systems for waste disposal in future residential expansion.

The EIR will also discuss alternatives to the proposed drilling of 60 individual water wells. At the present time, two alternatives have been identified: (1) developing a smaller number of community wells to serve the 60 proposed residences, and (2) watershed-scale recharge-and-extraction programs to serve more homes, potentially with lesser economic and environmental impact.



Montara / Moss Beach Water-Well EIR

NOP Recipients, Montara-Moss Beach Water-Well EIR

I. Responsible Agencies

CALTRANS, District 4
PO Box 7310
San Francisco, CA 94120

Attn: Gary Adams

California Coastal Commission
631 Howard St
San Francisco, CA 94105

Attn: Gary L. Holloway

California Department of Fish and Game
PO Box 47
Yountville, CA 94599

Attn: Brian Hunter, Regl. Mgr.

Montara Sanitary District
PO Box 131
Montara, CA 94037

II. Other Agencies

Bay Area AQMD
939 Ellis Street
San Francisco, CA 94109

Cabrillo Unified School District
498 Kelly Ave
Half Moon Bay, CA 94019

County of San Mateo Airport
Route 1
Half Moon Bay, CA 94019

Montara Fire Department
501 Stetson
Moss Beach, CA 94038

JV Fitzgerald Marine Reserve
PO Box 451
Moss Beach, CA 94038

California Department of Parks and Recreation
PO Box 942896
Sacramento,CA 94296-0001

US Fish and Wildlife Service
Endangered Species Branch
2800 Cottage Way
Sacramento, CA 95825

Attn: Pete Sorrenson

III. State Clearinghouse

Office of Planning and Research
1400 Tenth St
Sacramento, CA 95814
Attn: State Clearinghouse