V O L U M E 3

SUTRO HISTORIC DISTRICT

Resource Analysis Studies

for the

Comprehensive Design

and

Environmental Assessment

NATIONAL PARK SERVICE
GOLDEN GATE NATIONAL RECREATION AREA

SUTRO HISTORIC DISTRICT
Resource Analysis Studies
for the
Comprehensive Design
and
Environmental Assessment

September 1993

Prepared for
United States Department of the Interior
National Park Service
Golden Gate National Recreation Area
San Francisco, California

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In association with
EDAW, Inc.
San Francisco, California

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Economic Analysis

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Working Paper

Sutro Historic District Economic Analysis

Prepared for
EDAW, Inc.
and the National Park Service

21 April 1992

ERA Project No. 10363

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Working Paper

SUTRO HISTORIC DISTRICT ECONOMIC ANALYSIS

This working paper documents the input of Economics Research Associates (ERA) into the Sutro Historic District Comprehensive Design Plan being prepared by the multi-disciplinary team led by EDAW, Inc. Much of ERA's work has already been presented verbally in workshop settings, but is presented again here. The paper is organized into three main sections: Existing Conditions discovered in initial research, Issues Raised during the process, and Conclusions and Recommendations reached regarding design of the site.

EXISTING CONDITIONS

Data collected by ERA indicate that the Cliff House Complex and the surrounding Sutro Historic District has reached a mature stage in the evolution of a visitor destination which implies patronage is no longer growing rapidly. All indicators of visitation examined in this report reflect a flat trend, with annual visitation in the area fluctuating between 1.0 and 1.5 million. Similarly, annual concession revenues to the Park Service have remained relatively stable at approximately $550,000. The status quo is essentially a steady state.

The following section discusses in detail existing levels of visitation and concessionaire revenues at the Cliff House/Sutro District. Data were gathered from interviews, NPS reports, GGNRA accounts and the DKS Associates traffic survey. All tables are in the appendix.

Indicators of Visitation

Diversity of Visitors

The Cliff House/Sutro District has traditionally attracted a diverse array of people. It is popular with local and foreign visitors attracted by the drama of shifting ocean scenery, waves crashing against the rugged cliffs and ruins harkening back to more glorious days. Visitors range from local nature-lovers who spend half a day hiking and picnicking along the trails past the ruins, to old-timers who bring friends and relatives for traditional meat and potatoes dinner at the Cliff House, to tourists brought by buses for quick ten-minute edge-of-the-world experiences. Visitors are made up of people of all ages, the majority of whom

are local residents. That is, based on interviews with the Cliff House complex operator, at least 70 percent of their year-round patrons are local residents.

Other Attractions Volumes and Trends

General visitation statistics help place Cliff House/Sutro District visitation data in perspective. According to the study conducted by ERA of the economic impact of tourism on San Francisco, the size of annual visitation in San Francisco is approximately 13 million people. This total includes visitors staying in and out of the city, as well as Bay Area residents visiting the city. Visitors from outside the Bay Area make up about 8 million people, including over 2.7 million people staying at San Francisco hotels. Table 1 presents San Francisco visitation statistics. These 13 million people represent over 42 million visitor-days.

Annual patronage recorded at the downtown Visitors Bureau Information Center is approximately half a million people (see Table 2). Two other locations in San Francisco, closer to the Sutro District, are presented in Table 3. The De Young Museum attracts about 500,000 patrons a year, and the Palace of the Legion of Honor attracts under 200,000. Tables 2 and 3 present visitation to these specific facilities over at least a ten year period. While the annual number of visitors using visitor services has steadily increased due to marketing and increased visibility, the number of visitors to museums has fluctuated according to popularity of exhibits. The seasonal pattern in San Francisco tourism, with its peaking in July, August and September, can be seen in Table 2.

National Park Service Statistics

Additional insight into the levels of visitation at specific attractions can be acquired by examining public use statistics collected by the National Park Service (NPS). Despite the fact that the NPS considers these statistics unreliable due to a number of inoperable traffic and pedestrian counters and outdated demographic formulas, we include them here to provide minimum parameters. The NPS statistics are useful in describing minimum levels of visitation at specific GGNRA sites, as well as in providing information about the seasonality of visitation.

Visitation to all NPS-GGNRA sites are presented on Table 4. Total annual visitation during 1981 to 1985 averaged over 20 million visits. The most popular attractions were

Aquatic Park, Ocean Beach, Land's End and Fort Mason. Each of these sites attracted over 2 million visits per year. Six attractions along the western shore of the city are separated for analysis purposes. Table 4 shows that in the early 1980s these six sites attracted an average of 7.5 million visits annually, of which approximately 14 percent, or an average of over a million visits, were made to the Cliff House area.

Estimated annual visitation to Cliff House from 1981 to October 1991 is shown on Table 5. Fourteen percent, or the 1981-1985 percent share of the Cliff House to total visitation to six GGNRA sites, was used to estimate 1986-1990 annual average. Cliff House annual visitation was relatively stable at approximately one million visits during the entire ten year period. Fiscal year 1990 was an exception. Visitation during this year reflected the impact of the October 1989 earthquake.

The seasonality of visitation to all GGNRA sites is shown on Table 7. According to 1990 NPS statistics, visitation peaks during the summer months at approximately 1.5 million total visits per month and ebbs during the winter season at 1.0 million total visits per month. This trend holds true for 1991 visitation data to six GGNRA sites and the Cliff House as presented in Table 8 and Table 9. For all GGNRA attractions, spring and summer are the busiest time of the year.

Traffic Counts

Traffic statistics collected by DKS Associates reflect similar levels of visitation to the Cliff House. Pedestrian traffic counts at the Cliff House entrance averaged approximately 200 people per 15 minutes during peak weekend hours and 68 people during weekday hours. ERA translated these average figures to an annual estimate as presented on Table 11. Assuming that the DKS data are representative of an eight-hour weekend and weekday day, total annual Cliff House visitation would be over 1.2 million visits. This rough estimate is consistent with NPS data, keeping in mind that the NPS data represent minimum levels of visitation.

In terms of peak day and peak hours, DKS data indicates that weekend pedestrian traffic is three times heavier than weekday traffic. Parking utilization shown on Table 10 tells the same story.

Concession Revenues

The Cliff House/Sutro District area is a an important source of revenues for GGNRA. It represents one of only two GGNRA sites from which concession revenues flow to the local agency (GGNRA) rather than to the federal general fund. From this standpoint, the provision of quality services and facilities would not only maximize revenues to GGNRA but also benefit the Cliff House/Sutro District in that site-generated revenues could be used to further improve and maintain on-site services and facilities.

Five concessions are currently being operated in the Cliff House area:

- The Cliff House complex - which offers three types of restaurant dining, bar and deli;
- The Seal Rock Gift Shop which is located in the North Annex of the Cliff House complex;
- Louis' Restaurant;
- Musee Mecanique; and
- Giant Camera.

As presented in Table 12, GGNRA revenues from concessionaires during the last five years remained relatively stable, except for fiscal year 1990, when the effect of the October 1989 earthquake decreased revenues by nearly $190,000. During a typical year, such as reflected by fiscal year 1989, revenues amount to over $550,000, with the Cliff House complex contributing 70 percent of total revenues.

ISSUES RAISED

The following economic facts and issues were originally presented by ERA to the EDAW design team in order to stimulate discussion at the Imaging Workshop on February 18, 1992.

Visitation Issues

1. Is it desirable to attract more visitors to the Sutro Historic District?

   - Marketing strategies vs. Product enhancement strategies

   - Which purposes of visit should be emphasized?
     - Appreciation of physical and biological site characteristics
     - Sightseeing, views from the site
     - Restaurant dining and drinking
     - Souvenir hunting
     - Physical exercise
     - Sense of history
     - Sense of lawlessness

2. Is it desirable to extend the average length of stay?

   - Present the visitor with more information on what there is to see and do.

   - Present the visitor with additional things to see and do.

   - Do you want to make money from it?

Revenue and Concession Related Issues

3. There is a significant opportunity for concession revenues at this time.

   - Even though improvements could be made to the existing concession facilities, the existing concessions attract high volumes of people and high gross revenues. The Cliff House Restaurant is one of the highest volume restaurants in San Francisco.

- The Sutro Historic District is one of only two areas in GGNRA where concession revenues are kept locally. In other locations within GGNRA, NPS concession revenue flows directly to the Federal General Fund.

- All concession agreements in the Sutro Historic District are nearing the end of their terms, or have already been converted to short term agreements (pending the outcome of this study). Thus, there is essentially a "blank slate" for creating concessions.

- Due to pending legislation and the current national mood, the competition for future concessions is likely to be more open and intense than ever before.

4. Should existing commercial uses be rejuvenated and/or expanded or contracted?

- Restaurant uses
  - More space for existing businesses?
  - More restaurants?

- Gift shops/retail

- "Amusements"
  - Rejuvenate existing amusements on Cliff House lower level?
  - Additional amusements in the spirit of Sutro Baths?

5. Should other/different commercial uses be considered?

- Overnight accommodations

- Conference center

- Well regulated sidewalk vendors
  - Pretzels
  - Hot dogs
  - Coffee/espresso
  - T Shirts, etc.

- Larger scale commercial recreation attractions

6. Boundary and jurisdictional issues:

   - Who should own/control/regulate the sidewalk? (The City does now).

   - Will lease revenues from any new facilities still flow to the GGNRA?

7. Access issues:

   - If bus parking is relocated, how will people get to various locations on site? Will it affect patronage?

   - How to maintain handicapped access.

   - Could shuttles or electric vehicles be operated at a profit?

CONCLUSIONS AND RECOMMENDATIONS

Most of the following recommendations were first presented at the team working session in the EDAW offices on March 31, 1992. In some cases, additional discussion has been added to explain or justify recommendations for this working paper.

Regarding Visitation

ERA's analysis of all available data indicates that there is a current flow of approximately 1.0 to 1.5 million people per year. Visitation is two to three times higher on weekends than weekdays. Out of town visitation is higher during the summer months, and due to the influence of weather, visitation in general is higher on sunny and warm days. Even so, people are using the site every day, and visitation never drops to nothing, even in the dead of winter.

There is a great diversity of people currently using the site. The Sutro district appeals to both Bay Area residents, and to visitors (tourists) from outside the Bay Area. Highly significant for this analysis is the diversity of motivation for people to come to the site:

- To see the coastline and waves crashing on the edge of the continent;
- Restaurant dining and drinking;
- Picnicking;
- Sightseeing and exploring;
- To experience a sense of danger;
- Fishing; and
- Hiking/walking/biking.

It is ERA's opinion that all of these purposes and uses of the site are legitimate. As described in more detail below, ERA also believes that these experiences may be enhanced through additional design and management practices by the National Park Service.

Given the purpose of visit, the origin of the user, and the mode of transportation by which they arrive (e.g., tour bus versus private automobile), there is a resulting diversity of time spent by visitors at the site. Length of stay in the Sutro Historic District ranges from:

- A 10 to 15-minute stopover as part of a guided bus tour of San Francisco sites; to
- A 1 to 2-hour dining experience; and including
- Picnicking and exploring of the site for several hours.

ERA suggests that it is appropriate to provide for experiences of all of these time durations as alternative uses of the site. Furthermore, the visitors recreational experience, and the visitors understanding of the true natural and cultural significance of the site will be enhanced if the visitor is provided with even more opportunities which induce him or her to extend their length of stay. ERA's more specific recommendations regarding facilities and design are based upon three general recommendations for the visitor experience.

1. NPS should provide more information about what already exists on the site. In other words, the Park Service should have a more visible presence, and a more extensive interpretation program.

2. Better access should be provided to the various features and areas of the site. Access should begin with better usage of parking facilities and traffic flow. Once out of their vehicles, visitors should have enhanced pathways along several strategically chosen routes which would serve the dual purposes of making portions of the site more attractive and accessible, as well as diverting foot traffic out of more environmentally sensitive areas.

3. By providing better access to remote areas of the site and providing better information about what features are available, the Park Service will effectively be providing more things for visitors to do on the site. Enhanced interpretive programs regarding the water works for the baths, the Sutro Heights Gardens and parapet overlook, and other features will further add activities and destinations for pedestrians within the historic district. ERA also believes that it would be appropriate to add tasteful commercial amusements to portions of the site that are in keeping with the historic use by Adolph Sutro. A current example of a compatible use would be the Musee Mecanique in the lower level of the Cliff House (although the potential of this amusement attraction needs to be rejuvenated and the contemporary video arcade games are out of character).

ERA's recommendations regarding visitation are designed to create more meaningful, and somewhat more lengthy, visits on the part of site users, without necessarily attracting greater visitor volumes to the site. However, as the enhanced attractiveness of the area becomes more broadly known, it is also reasonable to expect that additional people may want to experience the offerings of the Sutro Historic District. ERA is also of the opinion that enhanced attraction of the site to additional visitors is in keeping with Adolph Sutro's historical influence on the site.

Concession Recommendations

The primary concessions in the Sutro Historic District today are food and beverage service and souvenir shops. ERA's analysis of the San Francisco market for these uses has

lead us to conclude that when they are properly operated and presented, there is significant market demand for food and beverage and gift/souvenir retail at the Sutro Historic site. Furthermore, the current gross revenue achieved by these businesses is limited primarily by the size of their facilities, and secondarily by the congestion in access to these facilities, and not at all by underlying market demand. In other words, if visitors could get to and flow through the site with greater ease, and if the shops and restaurants are even larger than they are today, ERA would expect the gross revenues of these establishments to increase proportionately. This is a good location for these types of services in San Francisco, and only a very bad operator could drive the business away.

The enabling legislation for concession operations at the Sutro Historic District creates a unique resource for the GGNRA. Because the proceeds from concession lease operations are retained locally, the Park Service should recognize its great incentive in maintaining the financial viability and health of these concessionaires. Again, ERA points out that the commercial use of the site is a significant part of the Adolph Sutro legacy. Concession operations are providing services that park users do want and need on the site. For these reasons, ERA strongly believes that there should be no net loss of commercial square footage during the redesign and potential redevelopment of the Sutro Historic District. On the contrary, some increase in commercial square footage could be supported by market demand, so long as access were maintained and congestion reduced in the new circulation design. The resulting greater business volumes in the future could be used to offset the costs of demolishing poor structures and redeveloping space in newer facilities (that are more sensitively designed for the maintenance of historic values and/or environmental values of the site).

For the same reasons, ERA would also maintain that there should be no net loss of access to the site through redesign, which implies that the inventory of existing parking should be maintained, if not expanded, and that there should still be space provided in the new plan for bus visitors.

The current concessionaire mix also includes some commercial amusements in the style of Adolph Sutro and the adjacent Playland from early in this century. These include the Mechanical Museum and the Camera Obscura. Although these uses seem to conflict with the natural features of the site, once one understands the history of the last 100 years in this district, it is clear that these uses are part of the cultural importance of this area of San Francisco. The Mechanical Museum as currently operated produces a very low revenue per

square foot, and is essentially an under utilization of the space. If historical amusements of this type are to remain part of the interpretive program for this park unit, they should be relocated to a more accessible space, and presented in a more attractive manner. However, they are likely to remain museum/educational/interpretive resources, rather than commercial concession ventures which can support the cost of new building construction and also return a profit to the Park Service.

Facility and Design Recommendations

ERA believes that the Sutro Historic District should be a showcase for how the National Park Service can preserve, enhance and interpret a unique piece of the California Coast with its stunning juxtaposition of raw pacific nature and urban development in one of the world's most favorite cities. ERA recommends that in order to achieve this showcase vision, the Park Service should be willing to demolish some old structures, and build completely new facilities as necessary. Design principles from an economic perspective include the objectives of extending the length of stay of visitors, and providing a wider variety of activities and recreational opportunities onsite, and communicating a deeper awareness of the cultural and natural resources of the site. A wide variety of purposes of visit and expenditures of time on the part of visitors should still be accommodated by the site design.

Central to ERA's recommendations, and in concert with the team consensus at the March 31st workshop, ERA endorses the development of a new visitor center complex at the edge of the Merrie Way parking lot. The parking lot itself would become the most significant inventory of car parking spaces, and would become the only place for tour buses to load/unload (and a primary parking location for buses). Thus, the out-of-town (i.e., one-time) visitors would have the Merrie Way parking lot and visitors center as their primary point of contact with the site. Bay Area resident users of the site (i.e., repeat visitors) would have the option of driving to parking spaces on the street closer to the Cliff House if their primary motivation were a restaurant meal with its scenic overlook.

For all visitors to the site, the crucial "edge" experience of crashing waves and California coastline could be obtained either through a stroll to the Cliff House area, as is currently the most common practice, or by an alternative path to be enhanced or redeveloped to connect the Merrie Way visitors center with the observation platform to the north of the baths atop the water works and tunnel complex.

The new visitor center, with appropriate signage and interpretation would also serve as the access point to the path connecting parking facilities with the Sutro Heights Park and Ocean Beach overlook. For those with more time or those seeking a longer walk, this parking area could also serve as an alternative parking access to the Battleship Memorial, and Golden Gate Bridge overlook and the walk along the Lands End cliff tops.

Separation of Visitor Types

In terms of more specific recommendations regarding the buildings and the concession opportunities within them, ERA proposes a guiding concept of separating the types of visitors. The food and beverage operations in the Cliff House complex already cater primarily to Bay Area residents, or to visitor parties who are being hosted by Bay Area residents. This visitation pattern seeks meal and bar service, and tends not to require souvenirs, and involves a stay of an hour or more. ERA suggests this use pattern should be retained and enhanced, and that the Cliff House complex be devoted primarily to food and beverage operations. Within the complex, there should be a variety of offerings, however, so that there are different facilities for those with different price ranges in mind, or with different amounts of time to spend on eating and drinking activities. Sale of souvenirs and the offering of commercial amusements which are not a part of the dining experience should be minimized in this complex.

Cliff House Complex

ERA understands that some demolition of parts of the complex is warranted for safety reasons, but that certain wings on the historic Cliff House structure could be reconstructed in keeping with the architectural character of 1909. ERA recommends that this selective demolition and reconstruction be done so that the food and beverage complex retain approximately 30,000 square feet of space (including kitchen and storage and receiving spaces) when the project is complete.

New Visitor Center at Merrie Way

The more infrequent visitors, including the one-time tourists from out of town, would be directed to the new visitors center complex at the Merrie Way parking lot under ERA's visitor splitting concept. Although it would be appropriate to provide some food and beverage services as described below in this complex, the emphasis would be on the needs of a more

diverse and often shorter term visitor. ERA recommends that the following components be included in a new visitor center complex totalling 10,000 to 15,000 square feet:

1. NPS Visitor Center and Point of Contact. This highly visible location should provide information about the site, as well as information on other Park Service units and activities in the San Francisco Bay Area. Within or proximal to this visitors center should be viewing areas, both enclosed and open, of the Sutro Baths, Sutro Heights, Cliff House, and coastline stretching to the north. A couple of thousand square feet of interior space is likely to be needed for these purposes.

2. Historical Museum of Urban Amusements. If the Park Service agrees to continue to preserve and interpret the story of Playland as well as that of the Sutro Baths and other commercial amusements developed over the last 100 years in this area, then a space separate from the interpretive center should be provided in the complex. This space of 2,000 to 3,000 square feet could include some of the current assets of the Musee Mecanique, and should be designed to be a highly active (and fun and even noisy) amusement area. If properly designed and stocked, this interesting historical museum could also be a generator of offsetting revenues, sufficient to attract a concessionaire to operate and maintain the amusement attraction. Additional exhibits and amusements, such as the Giant Camera, also could be placed on rooftop or other outdoor locations to further expand this component of the complex.

3. National Park Store. It is becoming increasingly appropriate to have bookstores and high quality merchandise for sale in conjunction with a National Park interpretive facility. The existing bookstore operated by the cooperating association for GGNRA in the lower level of the current Cliff House complex is an example. ERA believes a facility of 1,500 to 2,000 square feet should be included in the visitors center complex.

4. Gift Shop. In addition to the high quality image of the bookstore, ERA believes there is also a legitimate visitor demand to be met for souvenirs of their visit to a National Park Service site, and to the City of San Francisco itself. While it would be preferable to avoid the "honky tonk, tee-shirt shop" image, ERA believes a gift shop/souvenir shop of 1,000 to 2,000 square feet would be completely consistent with the visitation pattern expected for this complex.

5. Food and Beverage Concession. Some provision of food and beverage onsite would also serve the needs of visitors, and reduce the requirement of visitors to travel down to the Cliff House complex for a simple snack or a cup of coffee. This requirement could be met by a snack bar or a cafeteria style operation within the visitor complex (the cafeteria at the Academy of Sciences was mentioned as an appropriate model in the working session on March 31st). This facility should also be operated by a concessionaire, and could be as large as 3,000 square feet if space was available.

6. Comfort Facilities. A variety of other services will provide comfort and convenience for visitors. Among the most important, are rest room facilities. These should be sized and located to handle the demands of tour bus operations.

7. Auditorium/Amphitheater. As a part of the interpretive facilities, there may also be a need for some form of amphitheater or auditorium. It is beyond ERA's ability to comment on whether this should be an indoor or outdoor facility, and what the space needs of such an amenity might be.

Thus, ERA envisions a visitors center complex at the Merrie Way location which would include a new building structure, of multiple stories probably stepping down the hillside, and including 10,000 to 15,000 square feet of building area.

Sidewalk Management

Another design and management issue involves the sidewalk connecting the Cliff House complex with the Merrie Way parking facility. The City of San Francisco currently owns the sidewalk, and has management authority over regulating its uses. This has created problems with unregulated tee shirt and souvenir vendors. Sidewalk vendors may indeed have a role in the use of the site, and could provide additional snack food and beverages as well as souvenir items as a convenience to the visitors. However, ERA believes the type of merchandise and presentation of vendors should be of a relatively high quality, and that the Park Service should have the authority to control and manage these vendors. For this reason, ERA would recommend that the Park Service either acquire the sidewalk from the City, or negotiate a dedication or lease agreement which gives the Park Service authority over use of the sidewalk.

Other Facilities

Two other major facilities have been suggested; a conference center, or overnight accommodations. ERA believes there would be little synergy with other site uses and either conference center or lodging on site. At best, such facilities might provide a little more concession revenue potential to an operator and to the Park Service, but at worst, would bring additional traffic and congestion to the site for purposes which are not primarily related to the cultural or natural features of the site.

Table 1
ESTIMATED NUMBER OF VISITORS IN SAN FRANCISCO, 1988

Type of Visitor	Estimated Number of People	Average stay (No. of days)	Total Visitor Days /5
Visitors staying at S. F. Hotels \1	2,920,000	3.6	10,512,000
Visitors staying elsewhere in S. F. \2	1,300,000	5.9	7,670,000
Visitors staying elsewhere in the Bay Area \3	4,200,000	2.5	10,500,000
Subtotal: Visitors from Outside the Bay Area	8,420,000	--	28,682,000
Bay Area residents visiting S. F. \4	4,800,000	2.8	13,440,000
TOTAL Visitor Activity in S. F.	13,200,000	--	42,100,000

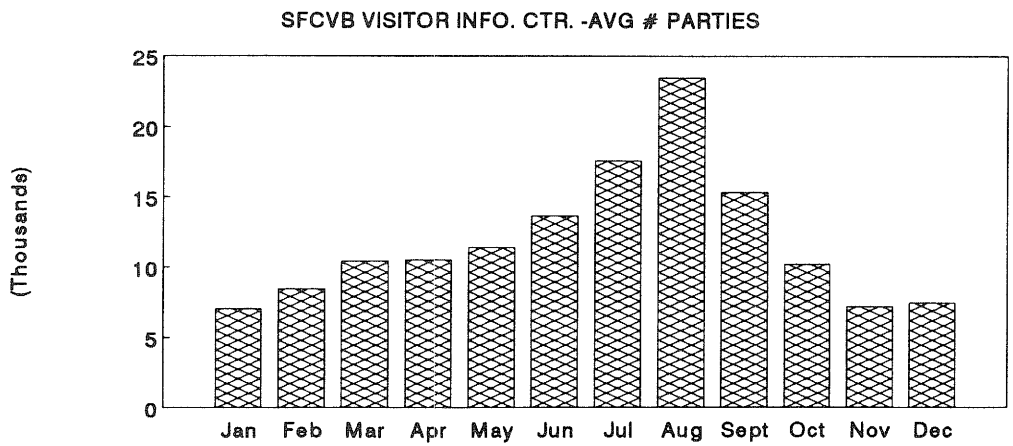
\1 Includes 607,000 meeting, convetion and trade show attendees.
\2 Visitors staying with friends and relatives or other SF accomodations.
\3 This group makes an average of 2.5 trips to SF during stay.
\4 This groups makes an average of 2.8 recreational day trips to SF per year for entertainment and shopping purposes.
\5 Visitor-days is equal to the number of visitors multiplied by the average number of days.

Source: San Francisco Convention and Visitors Bureau; Economics Research Associates

Table 2

SAN FRANCISCO VISITORS INFORMATION CENTER, NUMBER OF PARTIES, BY MONTH, 1973-1991

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total No. of Parties	Total No. People /2
1973	97	138	142	171	193	272	442	460	226	286	137	55	2,619	6,809
1974	149	171	178	217	196	297	470	632	355	245	114	147	3,171	8,245
1975	291	238	368	386	450	753	1,225	1,243	685	617	381	350	6,987	18,166
1976	341	355	561	366	1,402	1,677	1,596	7,018	6,667	6,973	4,504	4,421	35,881	93,291
1977	3,892	3,613	4,782	5,057	6,151	9,029	11,653	17,295	9,952	6,481	5,535	5,494	88,934	231,228
1978	5,524	5,788	7,873	6,347	9,382	11,696	13,968	25,820	1,684	11,980	6,480	6,758	113,300	294,580
1979	6,305	5,175	10,161	13,941	14,473	18,650	33,370	48,255	20,690	11,180	5,735	7,500	195,435	508,131
1980	7,620	8,890	8,980	9,120	11,110	14,030	21,440	33,850	19,100	13,468	8,080	8,490	164,178	426,863
1981	7,725	8,285	9,180	9,660	11,220	15,590	17,630	24,650	16,830	12,375	7,813	9,980	150,938	392,439
1982	7,120	7,090	9,980	10,800	11,135	14,820	24,350	26,830	13,250	11,725	5,310	6,015	148,425	385,905
1983	5,895	5,980	9,085	8,505	8,655	11,855	15,185	17,440	13,198	9,122	6,965	6,535	118,420	307,892
1984	6,300	6,875	9,185	7,650	9,425	9,925	10,640	14,755	11,165	9,480	7,415	7,555	110,370	286,962
1985	4,550	6,730	8,525	9,200	8,995	9,900	12,940	14,550	10,060	9,567	6,920	5,900	107,837	280,376
1986	7,560	7,890	9,820	9,715	9,845	10,775	14,350	20,000	10,000	9,000	7,000	7,000	122,955	319,683
1987	7,500	8,500	11,000	12,000	13,000	15,000	17,500	23,000	16,000	9,000	7,000	5,500	145,000	377,000
1988	7,000	10,000	12,000	12,000	14,000	15,000	18,000	23,000	18,000	9,700	7,500	8,000	154,200	400,920
1989	8,500	11,000	14,000	14,000	15,000	17,000	20,000	35,000	20,000	9,000	7,000	8,000	178,500	464,100
1990	8,000	12,000	13,000	13,000	13,000	16,000	21,000	25,000	21,000	9,700	8,000	9,000	168,700	438,620
1991 /1	6,000	10,500	14,000	14,000	14,000	17,000	32,700	38,687	27,118	21,032	n/a	n/a	n/a	n/a
1980-90 Average	7,070	8,476	10,432	10,514	11,399	13,627	17,549	23,461	15,328	10,194	7,182	7,452	142,684	370,978



/1 The Visitors Information Center (located in Hallidie Plaza) installed electronic door counters August 1991.
/2 The total number of visitors is based on 2.6 persons per party.
Source: San Francisco Convention & Visitors Burreau; Economics Research Associates

Table 3
FINE ARTS ADMISSION REPORT, 1980-1990

De Young Museum

Year	Visitors	Annual % Change	Free	Paid	Revenues Collected
1980	356,528	--	126,454	230,074	$266,811
1981	680,550	91%	156,914	523,636	$695,351
1982	507,374	-25%	162,873	344,501	$487,949
1983	673,041	33%	194,889	478,152	$814,552
1984	602,874	-10%	98,222	504,652	$869,042
1985	247,642	-59%	64,443	183,199	$410,671
1986	637,577	157%	173,464	464,113	$1,210,009
1987	362,238	-43%	147,523	214,715	$703,375
1988	413,056	14%	215,398	197,658	$723,868
1989	305,072	-26%	140,427	164,645	$602,583
1990	401,382	32%	192,688	208,694	$763,113
Annual Avg.	471,576		152,118	319,458	$686,120

Palace of Legion of Honor

Year	Visitors	Annual % Change	Free	Paid	Revenues Collected
1980	194,239	--	77,675	116,564	$130,750
1981	303,083	56%	84,910	218,173	$294,880
1982	177,239	-42%	64,730	112,509	$182,593
1983	186,374	5%	78,967	107,407	$170,947
1984	131,810	-29%	56,440	75,370	$116,854
1985	147,601	12%	69,448	78,153	$171,600
1986	159,934	8%	69,705	90,229	$240,549
1987	170,699	7%	83,518	87,181	$278,696
1988	159,359	-7%	83,169	76,190	$283,067
1989	163,865	3%	71,820	92,045	$340,849
1990	160,481	-2%	67,090	93,391	$348,299
Annual Avg.	177,699		73,407	104,292	$232,644

Source: The Fine Arts Museum of San Francisco; Economics Research Associates

Table 4

NATIONAL PARK SERVICE ANNUAL PUBLIC USE REPORT, 1981-1985 (NUMBER OF VISITS)

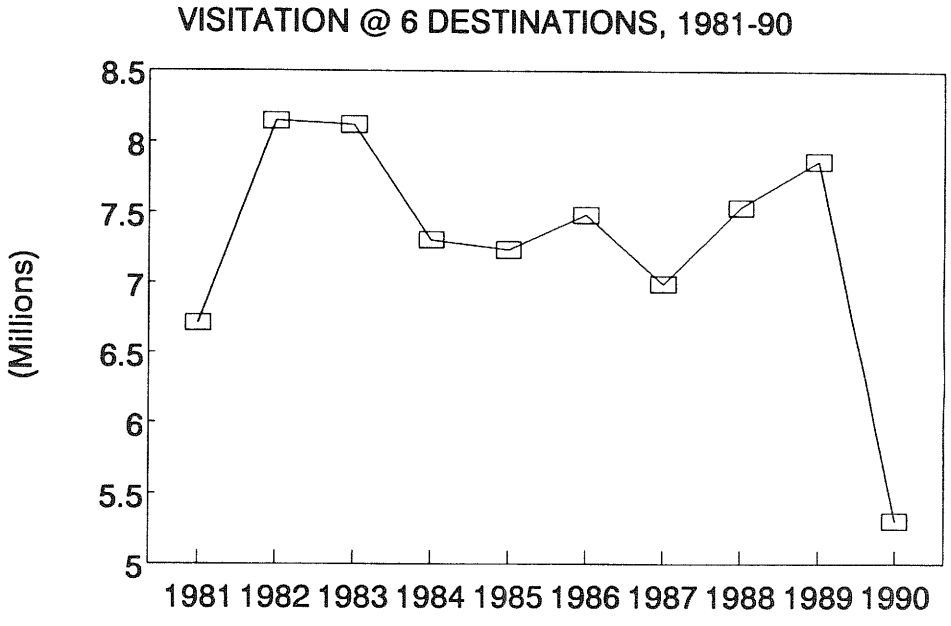
To all GGNRA Sites

Destination	1981	1982	1983	1984	1985	1981-85 Annual Avg.
Marin Headlands	2,138,391	1,884,608	2,074,756	1,178,890	1,452,312	1,745,791
Stinson Beach	1,666,786	1,368,684	1,348,356	1,462,024	1,388,220	1,446,814
Alcatraz	567,024	569,337	568,781	557,921	658,403	584,293
Historic Ships	304,920	226,322	208,217	240,419	566,604	309,296
Maritime Museum	196,678	207,186	202,901	231,170	208,219	209,231
Aquatic Park	5,783,672	5,718,695	2,198,376	3,577,290	4,049,155	4,265,438
Fort Mason	1,647,247	2,266,389	2,882,230	2,213,062	2,776,114	2,357,008
Baker Beach *	946,582	754,730	778,742	611,256	676,460	753,554
Land's End *	2,355,898	2,481,713	2,595,164	2,078,050	2,044,134	2,310,992
Cliff House *	880,000	880,000	960,000	893,256	932,956	909,242
Cliff House Vis. Ctr. *	109,967	90,893	209,997	94,517	91,538	119,382
Ocean Beach *	1,621,000	3,131,502	3,047,218	3,020,340	3,050,426	2,774,097
Fort Funston *	799,824	808,107	529,797	608,130	441,012	637,374
Fort Point	1,073,265	1,215,873	961,394	1,176,135	1,075,004	1,100,334
Muir Woods	1,270,676	1,173,930	1,173,337	1,226,310	1,383,221	1,245,495
TOTAL GGNRA	21,361,930	22,777,969	19,739,266	19,168,770	20,793,778	20,768,343
TOTAL (Six Starred Sites)	6,713,271	8,146,945	8,120,918	7,305,549	7,236,526	7,504,642
Cliff House Area	989,967	970,893	1,169,997	987,773	1,024,494	1,028,625
As Percent of Six Sites	15%	12%	14%	14%	14%	14%

Source: Golden Gate National Recreation Area, National Park Service; Economics Research Associates

Table 5
NATIONAL PARK SERVICE ANNUAL PUBLIC USE REPORT, 1981-1991
To Six GGNRA Sites *

Year	Total Number of Visitors	Annual % Change
1981	6,713,271	--
1982	8,146,945	21%
1983	8,120,918	0%
1984	7,305,549	-10%
1985	7,236,526	-1%
1986	7,483,778	3%
1987	6,992,550	-7%
1988	7,538,225	8%
1989	7,867,119	4%
1990	5,306,365	-33%
Jan-Oct 1991	6,289,283	
1981-90 Annual Avg	7,271,125	



* Total number of visitors reflects visitation at Baker Beach, Fort Funston, Ocean Beach, Lands End, Cliff House and Cliff House Visitors Center.

Source: Golden Gate National Recreation Area, National Park Service; Economics Research Associates

Table 6

NATIONAL PARK SERVICE ANNUAL PUBLIC USE REPORT, 1981-1991

Six GGNRA Sites Versus Cliff House Site

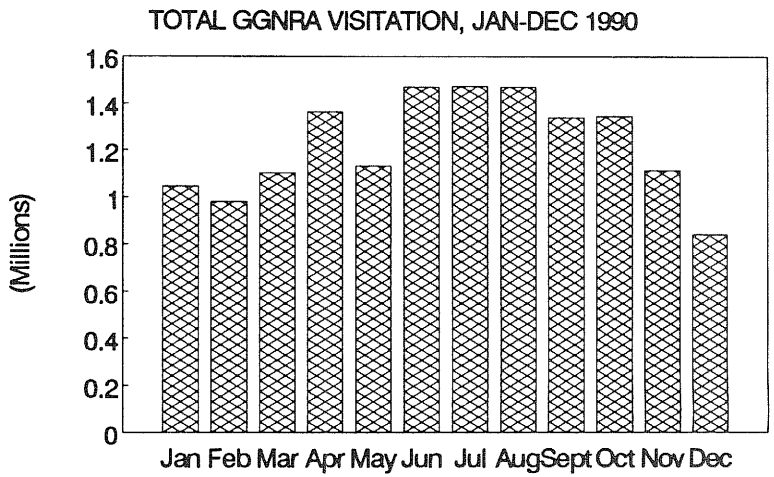
Year	Total Number of Visitors	Cliff House Number of Visitors
1981	6,713,271	989,967
1982	8,146,945	970,893
1983	8,120,918	1,136,929
1984	7,305,549	1,022,777
1985	7,236,526	1,013,114
1986	7,483,778	1,047,729
1987	6,992,550	978,957
1988	7,538,225	1,055,352
1989	7,867,119	1,101,397
1990	5,306,365	742,891
Jan-Oct 1991	6,289,283	880,500
1981-90 Annual Avg	7,271,125	994,591

Total number of visitors reflects visitation at Baker Beach, Fort Funston, Ocean Beach, Lands End, Cliff House and Cliff House Visitors Center.

Source: Golden Gate National Recreation Area, National Park Service; Economics Research Associates

Table 7
NATIONAL PARK SERVICE ANNUAL PUBLIC USE REPORT, JANUARY TO DECEMBER 1990
To all GGNRA Sites

Month	No. of Rec. Visits	No. of Non-Rec. Visits	No. of Total Visits
Jan	1,043,598	2,885	1,046,483
Feb	979,342	2,885	982,227
Mar	1,098,731	2,885	1,101,616
Apr	1,361,166	2,885	1,364,051
May	1,131,377	2,885	1,134,262
Jun	1,468,856	2,885	1,471,741
Jul	1,471,350	2,885	1,474,235
Aug	1,468,567	2,885	1,471,452
Sept	1,336,655	2,885	1,339,540
Oct	1,341,237	2,885	1,344,122
Nov	1,110,429	2,885	1,113,314
Dec	838,905	2,885	841,790
TOTAL	14,650,213		14,684,833



Source: Golden Gate National Recreation Area, National Park Service; Economics Research Associates

Table 8

NATIONAL PARK SERVICE MONTHLY PUBLIC USE REPORT, JANUARY TO OCTOBER 1991, BY DESTINATION

To Six GGNRA Sites

Destination	No. Hours Per Person	Jan. 1991 # of Visits	Jan. 1991 Visitor Hrs. Total	Feb. 1991 # of Visits	Feb. 1991 Visitor Hrs. Total	March 1991 # of Visits	March 1991 Visitor Hrs. Total	Apr. 1991 # of Visits	Apr. 1991 Visitor Hrs. Total
Baker Beach	3.5	73,440	257,040	43,020	150,570	34,292	120,022	74,100	259,350
Ft. Funston	2.5	31,532	78,830	50,768	126,920	30,240	75,600	52,200	130,500
Ocean Beach	3.5	206,529	722,852	186,861	654,014	275,373	963,806	285,373	998,806
Lands End	3.5	137,358	480,753	138,816	485,856	130,680	457,380	189,552	663,432
Cliff House Vis. Ctr.	0.5	7,232	3,616	7,331	3,666	6,741	3,371	7,894	3,947
Cliff House Rest.	1.0	71,598	71,598	64,780	64,780	77,070	77,070	78,070	78,070
Total		527,689	1,614,689	491,576	1,485,805	554,396	1,697,248	687,189	2,134,105
Year-to-date		527,689	1,614,689	1,019,265	3,100,494	1,573,661	4,797,742	2,260,850	6,931,846

Destination	May 1991 # of Visits	May 1991 Visitor Hrs. Total	June 1991 # of Visits	June 1991 Visitor Hrs. Total	Jul. 1991 # of Visits	Jul. 1991 Visitor Hrs. Total	Aug. 1991 # of Visits	Aug. 1991 Visitor Hrs. Total
Baker Beach	79,000	276,500	34,800	121,800	42,600	149,100	56,800	198,800
Ft. Funston	37,766	94,415	44,200	110,500	38,800	97,000	44,950	112,375
Ocean Beach	275,373	963,806	346,500	1,212,750	346,500	1,212,750	346,500	1,212,750
Lands End	144,582	506,037	199,986	699,951	156,078	546,273	173,838	608,433
Cliff House Vis. Ctr.	8,104	4,052	8,949	4,475	8,284	4,142	10,122	5,061
Cliff House Rest.	77,070	77,070	84,000	84,000	84,000	84,000	84,000	84,000
Total	621,895	1,921,880	718,435	2,233,476	676,262	2,093,265	716,210	2,221,419
Year-to-date	2,882,745	8,853,726	3,601,180	11,087,201	4,277,442	13,180,466	4,993,652	15,401,885

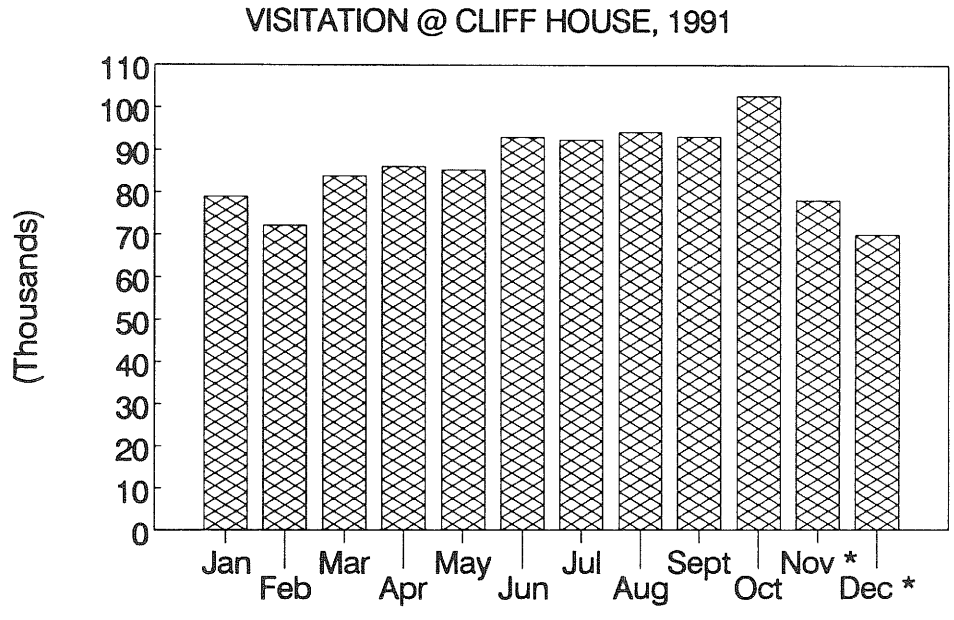
Destination	Sept. 1991 # of Visits	Sept. 1991 Visitor Hrs. Total	Oct. 1991 # of Visits	Oct. 1991 Visitor Hrs. Total	Total Jan.-Oct. # of Visits	Total Jan.-Oct. Visitor Hrs. Total	Avg. Daily # of Visits	Avg. Daily Visitor Hrs. Total
Baker Beach	33,000	115,500	46,870	164,045	517,922	1,812,727	1,693	5,924
Ft. Funston	36,000	90,000	56,802	142,005	423,258	1,058,145	1,383	3,458
Ocean Beach	270,300	946,050	357,989	1,252,962	2,897,298	10,140,543	9,468	33,139
Lands End	156,720	548,520	142,005	497,018	1,569,615	5,493,653	5,129	17,953
Cliff House Vis. Ctr.	9,135	4,568	4,235	2,118	78,027	39,014	255	127
Cliff House Rest.	84,000	84,000	98,575	98,575	803,163	803,163	2,625	2,625
Total	589,155	1,788,638	706,476	2,156,722	6,289,283	19,347,244	20,553	63,226
Year-to-date	5,582,807	17,190,523	6,289,283	19,347,244				

SOURCE: Golden Gate National Recreation Area, National Park Service; Economics Research Associates

Table 9

ESTIMATED VISITATION TO CLIFF HOUSE AREA
JANUARY TO DECEMBER, 1991 *

Month	No. of Total Visits
Jan	78,830
Feb	72,111
Mar	83,811
Apr	85,964
May	85,174
Jun	92,949
Jul	92,284
Aug	94,122
Sept	93,134
Oct	102,810
Nov *	78,000
Dec *	70,000
TOTAL	1,029,189



* Data are not available for November and December. For analysis purposes, we estimated that visitation during these months approximates the general trend shown on Table 7.

Source: Golden Gate National Recreation Area, National Park Service; Economics Research Associates

Table 10
SUMMARY OF PARKING UTILIZATION SURVEY, JANUARY 1992

Types of Parking	Total No. of Spaces	Utilization Weekend (11am-3pm)	Weekday (3pm-7pm)
On- and off-street parking	726	499	183
On- and off-street parking as % of total	100%	69%	25%
Tour bus parking	6-7	3	1
Handicap parking	5	2	1

Source: DKS Associates; Economics Research Associates

Table 11
PEDESTRIAN ACTIVITY AT THE CLIFF HOUSE ENTRANCE, JANUARY 1992

Time of Week	15-Minute Average	Daily Estimate (day=8 hrs)	Weekly Estimate	Annual Estimate
Weekend	209	6,688	13,376	695,552
Weekday	68	2,176	10,880	565,760
TOTAL	277	--	24,256	1,261,312

Source: DKS Associates; Economics Research Associates

Table 12
GGNRA REVENUES FROM CONCESSIONAIRES, FY 1985-1990 /1
(In Current Dollars)

Name of Concessionaire	1985	1986	1987	1988	1989	1990	1989 In Percent
Louie's	n/a	27,905	29,909	35,939	34,494	37,327	6%
Cliff House	356,359	380,800	403,513	399,873	396,387	213,718	70%
Seal Rock Gift Shop	92,943	97,212	100,194	n/a	94,655	90,467	17%
Giant Camera	3,355	n/a	10,592	9,903	7,113	7,064	1%
Musee Mechanique	n/a	n/a	36,601	38,251	36,242	33,283	6%
TOTAL	n/a	n/a	580,809	n/a	568,890	381,859	100%

/1 Fiscal year beginning and ending months differ for each business. Revenues are from building and franchise fees.

Source: GGNRA; Economics Research Associates

2

Traffic and Circulation

SUTRO HISTORIC DISTRICT

Traffic and Circulation

prepared for

EDAW
and Golden Gate National Recreation Area

by

DKS Associates
February 1992

EXECUTIVE SUMMARY

The Sutro Historic District, located in the Richmond District of San Francisco, is primarily a tourist destination. Traffic and circulation throughout the area is controlled by the large number of pedestrians, tour buses and limited access to the area. The only major roadways that lead into the area are Geary Boulevard and Great Highway. While the intersections and parking lot entrances technically operate at acceptable levels, there are several other aspects of the overall circulation picture. The report describes the measurable aspects of transportation in the project area in addition to providing insight to the other circulation elements.

Pedestrians face safety hazards at several locations. The most noticeable is when people cross Point Lobos Avenue, in the crosswalk, from the parking lot to the sidewalk on the north side of the road. The sharp curve and limited sight distance for vehicles coming up the hill from Great Highway to Point Lobos Avenue makes it difficult to see people crossing the street. The other area where pedestrian safety is a concern is the Sutro Baths area. Many of the walkways and pathways do not have handrails, are not paved, are steep and are often slippery. Because of these factors and the limited lighting after dark, many accidents occur, particularly when there is no park officer patrolling the area.

Cars and buses usually try to park as close to the Cliff House as possible. Because of this, buses will often stack up on weekends waiting for a bus parking space. People then get off the bus, take pictures and often get on the bus again within a few minutes. This leads to both buses and people congregating one small area next to the Cliff House. Cars will often continue past the Cliff House in search of a close parking space, and then make a U-turn in the middle of the street and circle back. This circulation pattern leads to vehicles coming up the hill on Great Highway facing not only pedestrian conflicts but vehicles making U-turns as well.

1. Setting

BACKGROUND

The Sutro Historic District is located in the Richmond of San Francisco, north of Golden Gate Park and west of the Presidio. It is bounded by the Pacific Ocean to the north and west, Balboa Street to the south, and 48th Avenue and El Camino del Mar to the east. Access to the project area is provided by several major arterials, including Great Highway to the south and Balboa Street and Geary Boulevard to the east.

REGIONAL ACCESS

Primary access is provided via US 101 and Interstate 280 (I-280). Figure 1 shows the Sutro Historic District and its proximity to the regional roadway network. The nearest access to US 101 from the Sutro Historic District is the Doyle Drive/State Route (SR) 1 interchange for traffic to and from the north, located approximately three and one-half miles northeast of the project area. For traffic to and from the south, the nearest access to US 101 is the Fell Street and Gough Street interchange, located about four and one-half mile east of the project area.

US 101 is a north-south eight-lane freeway which is discontinuous in the City of San Francisco. Van Ness Avenue and Lombard Street carry US 101 through traffic between the Fell Street and Doyle Drive interchanges.

Additional freeway access is provided by I-280, which runs between San Francisco and San Jose, generally along the western Peninsula. Vehicles using I-280 access the freeway via SR 1 and join I-280 at the SR1/Alemany Boulevard interchange, located five miles south of the project vicinity. Because I-280 is typically less congested than US 101, vehicles from western San Francisco areas will often use it for all or part of their Peninsula trips.

State Route 1, which generally runs north-south along the coast, also provides regional access. Because it is typically a two-lane highway with steep grades and sharp curves, SR 1 is not used by trucks and other vehicles that desire the shortest travel time.

LOCAL ACCESS

Local access to the Sutro Historic District is provided via Great Highway and Geary Boulevard, two major arterials. Collector roadways including Balboa Street, Cabrillo Street and Fulton Street provide access from the east and connect to Great Highway south of the project area. The local roadways in the area, commonly referred to as "the avenues," connect the collector roadways to one another and to Geary Boulevard.

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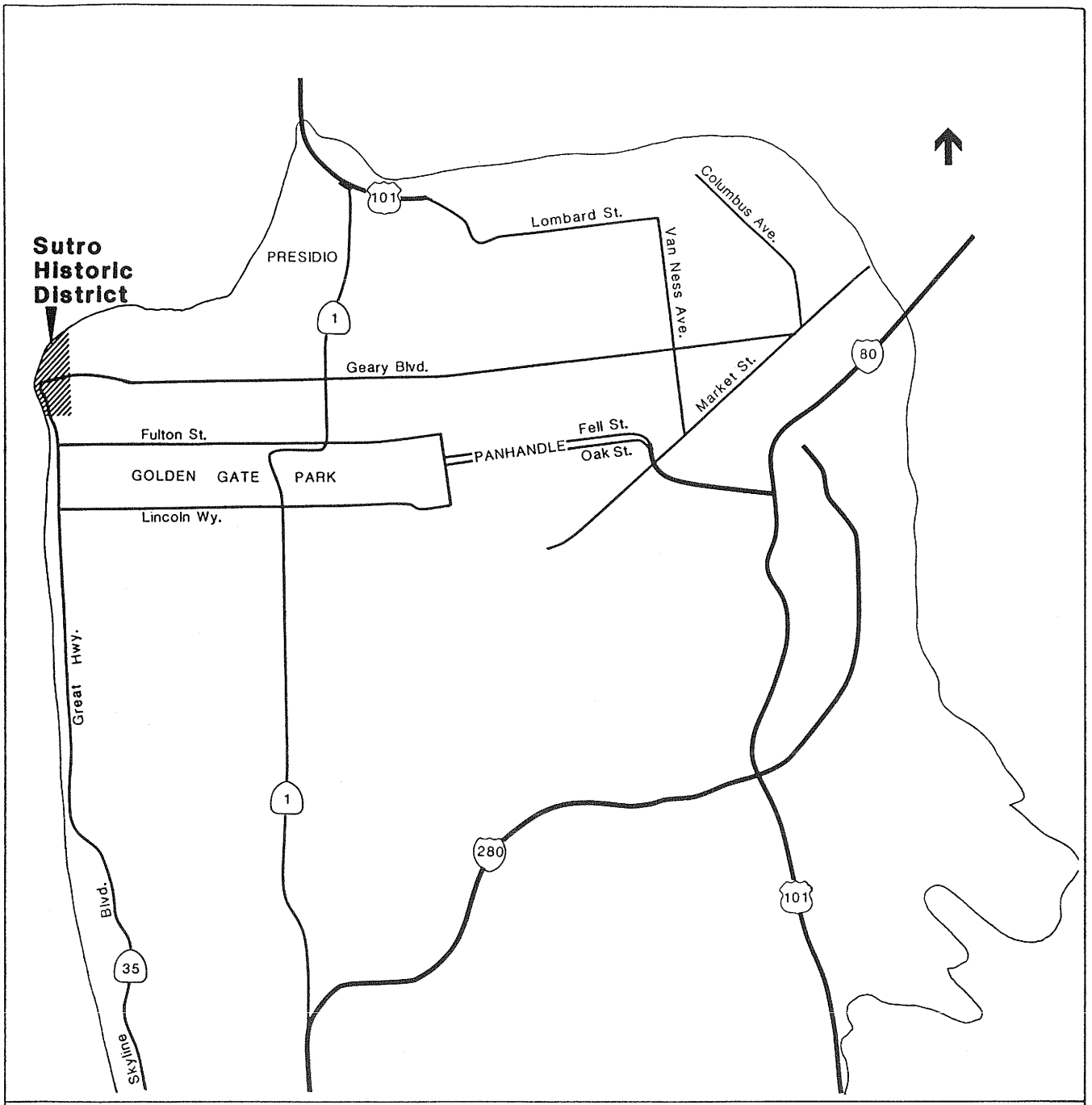

Figure 1
REGIONAL NETWORK

Great Highway is a four-lane arterial roadway that runs north-south between Skyline Boulevard and Point Lobos Avenue. It is the only major access roadway to the Sutro Historic District from the south. The posted speed limit on Great Highway is 30 miles per hour (mph), and on the curve where it joins Point Lobos Avenue it is 20 mph.

Geary Boulevard is a four-lane arterial roadway extending east-west from Market Street in downtown San Francisco to Point Lobos Avenue. Point Lobos Avenue is the only access roadway from the east leading into the project area, and also provides access points to the off-street parking areas. The speed limit on Geary Boulevard is 25 mph.

Balboa Street, Cabrillo Street and Fulton Street are four-lane collector roadways. Each of these streets run east-west, connecting downtown San Francisco to the Sunset District, terminating at Great Highway. The speed limits on these roadways is 25 mph.

Because of the topography of Sutro Heights Park, no local streets provide access directly into the area. The collector roadways noted above connect to the two arterial roadways (Geary Boulevard/Point Lobos Avenue and Great Highway), which are the only connections to the area. The local roadways (i.e., 48th Avenue) run north-south, connecting collector roadways.

ON AND OFF-STREET PARKING

Both on and off-street parking was surveyed during two separate periods, once on a weekday afternoon and once during a midday weekend period. Figure 2 shows the location of both on-street and off-street parking in the area. Of the 240 on-street parking spaces surveyed, an average of 168 spaces (70 percent) were occupied during the weekend survey and 82 (34 percent) were occupied during weekday afternoon survey. For the 342 off-street parking spaces, the average occupancy was 226 spaces (66 percent) during the weekend survey, but only 58 spaces (17 percent) during the weekday afternoon survey. Summary tables of the parking utilization surveys are included in the appendix.

When examining the parking utilization in the Sutro Historic District, it is important to consider that this is a tourist destination with a relatively quick turnover rate. The surveys were conducted in January 1992, whereas peak tourist activity typically occurs in the spring and summer months. No adjustments were made to the parking utilization rates as prior spring and summer parking data is not available for comparison. Also, parking locations closer to the Cliff House are generally occupied more frequently than others.

The highest on-street parking utilization occurs on El Camino del Mar and 48th Avenue. Point Lobos Avenue and Great Highway have a slightly lower parking occupancy rate. This holds true during both weekday and weekend conditions but is particularly noticeable on weekends. The turnover factor and the parking restrictions for the marked stalls are probably the reasons for this occurrence; visitors who wish to spend more than a few minutes in the area are willing to park

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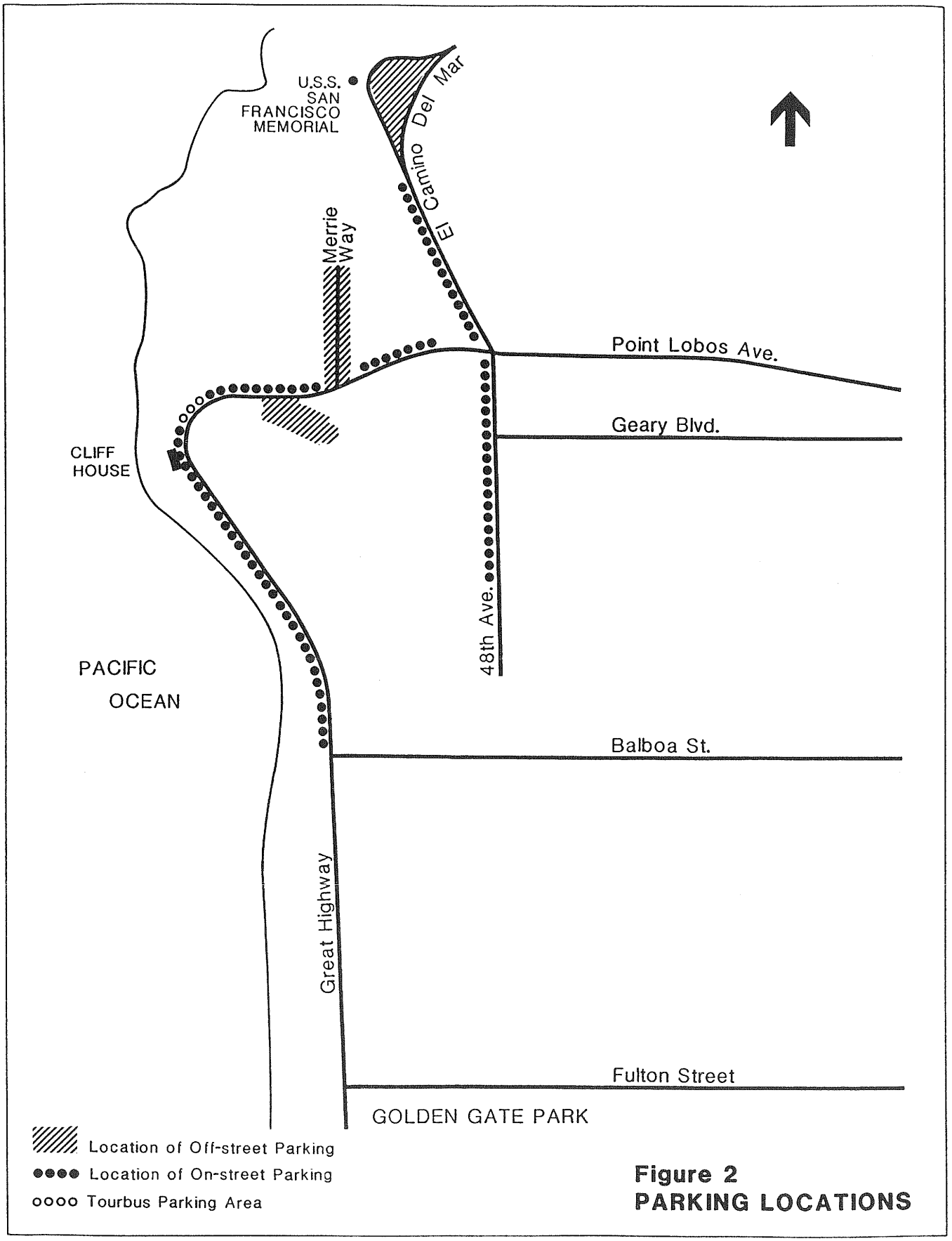

Figure 2
PARKING LOCATIONS

slightly further away. Most of the stalls are restricted to two-hour parking between 7:00 A.M. and 6:00 P.M. Also, El Camino del Mar leads to the USS San Francisco memorial, additional sightseeing locations and an entrance to Fort Miley.

There are three off-street parking locations (see Figure 2). On weekdays, the lot at the El Camino del Mar cul-de-sac had an average 33 percent occupancy rate, which is the highest of the three lots. However, this only amounts to 16 spaces of 48 marked spaces and 2 spaces of 35 unmarked spaces being filled. The Merrie Way parking lot averaged 14 percent utilization and the lot across the street from Merrie Way had 24 percent occupancy.

On weekends, the lot off of Point Lobos Avenue across the street from Merrie Way was 92 percent occupied. The other two lots were each 67 percent full on average. One reason for the Point Lobos parking lot nearing capacity rather than the Merrie Way parking lot is related to the traffic circulation patterns. Many vehicles come west on Point Lobos Avenue, look for on-street parking, don't find it near the Cliff house and don't want to venture too far down the hill on Great Highway. They then turn around and look again, and eventually wind up in the Point Lobos parking lot now on their right. The Merrie Way parking lot is slightly further up the hill from this lot and requires a left hand turn across the traffic stream.

PEDESTRIAN ACTIVITY AND SIDEWALKS

Pedestrian activity in the area is oriented towards the Cliff House and adjacent buildings. Pedestrian counts were taken at four locations on both a weekday afternoon and on a weekend midday. The appendix includes a summary table of the pedestrian surveys.

The pedestrian activity was about three times greater during the weekend survey than on the weekday afternoon survey. The highest concentration of pedestrians was recorded during the weekend survey at the Cliff house entrance, where on average there were just over 200 people every fifteen minutes. A little over 150 people every fifteen minutes were counted on the sidewalk just west of the Merrie Way parking lot. During both the weekday and weekend surveys, the number of pedestrians walking uphill and downhill was balanced during each fifteen period.

Twenty foot sidewalks currently exist along the north side of Point Lobos Avenue. Twelve foot sidewalks exist along the west side of Great Highway, between the Cliff House and Balboa Street. A 25 foot crosswalk across Point Lobos Avenue connects the parking lot on the south side of Point Lobos Avenue to the 20 foot sidewalk. However, as no other form of traffic control exists at this location, pedestrians often must use caution in this crosswalk; the nearby curve joining Great Highway and Point Lobos Avenue is steep and has a limited sight distance for eastbound vehicles.

TRANSIT SERVICE

Transit service in the project vicinity is provided by buses run by the San Francisco Municipal Railway (Muni). The 18-46th Avenue, the 31-Balboa and the 38-Geary are the primary routes serving the area.

The 18-46th Avenue route runs between the Palace of the Legion of Honor and Stonestown, serving the Richmond and Sunset Districts of San Francisco. It runs through the Sutro Historic District along Point Lobos Avenue and Great Highway. Buses run at 15 minute headways during peak periods and 20 minute headways during the rest of the day. On weekends the 18-46th Avenue runs at 20 minute headways. No late night service is provided on this route.

The 31-Balboa Street route runs between the Ferry Building in downtown San Francisco and the Sutro Historic District. It runs adjacent to the Sutro Historic District along Balboa Street. Buses run at 15 minute headways during peak periods and 20 minute headways during the rest of the day, and on weekends the 31-Balboa runs at 20 minute headways. The 31-Balboa has no late night service.

The 38-Geary and 38L-Geary connect the Sutro Historic District to the Transbay Terminal in downtown San Francisco. Bus service operates 24 hours a day, every day. Buses run at half-hour headways overnight, fifteen minute headways during the day and 5 to 10 minute headways during peak periods. On weekends, buses average ten minute headways, with buses terminating at either Fort Miley Hospital, 48th Avenue at Point Lobos Avenue, or La Playa at Cabrillo Street.

The only planned change to transit service in the area is a bus turnaround facility near the northeast corner of Cabrillo Street and La Playa, where the 31-Balboa terminates. The turnaround facility would be built pending the outcome of a lawsuit filed by MUNI against the now-bankrupt previous developer of the Ocean Beach Housing Development. The turnaround would allow improvements in air and noise quality in the area, as buses would queue off-street. However, even if the turnaround is not built, MUNI is planning to convert the existing 31-Balboa line from diesel to electric buses, which would also result in an improvement in air and noise quality in the area.[1]

2. Transportation Impacts

On weekdays, the traffic P.M. peak hour would be one hour between 4:00 and 6:00 P.M. This represents the time period when tourist and adjacent street traffic peaks. For weekends, the peak hour would be one hour between 11:30 A.M. and 1:30 P.M. for the purposes of this report, four intersections were analyzed during both weekday and weekend conditions:

- Balboa Street/Great Highway
- Point Lobos Avenue/Point Lobos Avenue Parking Lot Entrance
- Point Lobos Avenue/Merrie Way Parking Lot Entrance
- Point Lobos Avenue/48th Avenue/El Camino del Mar

Of these, only the intersection of Point Lobos Avenue and 48th Avenue/El Camino del Mar is signalized. The two parking lot entrances were analyzed as three-legged unsignalized intersections, as they essentially operate as such. The Balboa Street and Great Highway intersection was analyzed as a four-way unsignalized intersection, with the eastbound leg coming from the parking area west of Great Highway.

Turning movement counts at each study area intersection were conducted in January 1992 on a weekday afternoon and on a Saturday midday peak period. Because these counts were conducted in January, and tourist season peaks in the spring and summer months, the traffic volumes were increased by 20 percent to account for seasonal differences.[2] The 20 percent figure is consistent with previous traffic studies in the Sutro Historic District area. Increasing the traffic volumes represents a worst case condition (peak tourist season) for traffic analysis. Traffic levels of service and intersection operation improves as the volume of tourist traffic decreases during winter months.

Currently, (after the seasonal adjustment) all of the study area intersections operate at acceptable levels of service on both weekdays and weekends. Table 1 summarizes the LOS for each intersection. The intersection of 48th Avenue/El Camino del Mar and Point Lobos Avenue operates at LOS A during both weekday and weekend conditions. The minor street left turn movements from the parking lots onto the arterial roadways operate at LOS E (or LOS F on weekends), but overall the intersections function acceptably. The minor street left turn movement on the major roadway will typically operate at a lower LOS than other movements at an unsignalized intersection, but generally affects a small percentage of the intersection traffic.

Table 1
Intersection Capacity Analysis[1]

Intersection	1992 Existing Weekday LOS	1992 Existing Weekend LOS
Great Highway and Balboa Street	A/E[2]	B/F
Point Lobos Avenue and Point Lobos Parking Lot	A/D	B/F
Point Lobos Avenue and Merrie Way Parking Lot	A/D	A/F
Point Lobos Avenue and 48th Avenue/El Camino del Mar	0.41 A[3]	0.47 A

[1]Based on January 1992 counts increased by 20 percent to represent summer conditions.

[2]Unsignalized intersection levels of service reflect the capacity of left-turning movements from the major street onto the minor street (the first letter), and from the minor street onto the major street (the second letter). It is based on the excess capacity available to make the indicated movement.

[3]Shows volume-to-capacity ratio and corresponding level of service for signalized intersections.

Source: DKS Associates

Analysis Methodology

The traffic level of service for the signalized intersection was analyzed using the methods outlined in *Transportation Research Board Circular 212*.[3] Level of service (LOS) is a common measure of traffic service that uses letters A through F to indicate the amount of congestion and delay. The level of service concept was developed to correlate numerical traffic volumes to subjective descriptions of traffic performance at intersections, which are the controlling bottlenecks of traffic flow. LOS A indicates free flow conditions, while LOS B and C signify stable conditions with acceptable delays. LOS D is typically considered acceptable for peak hour periods in urban areas, with average delays in the range of 25-40 seconds. LOS E is approaching capacity and LOS F represents conditions at or above capacity, with average delays over 60 seconds. The appendix includes the detailed calculation sheets for both signalized and unsignalized intersection LOS analysis, and tables providing definitions for levels of service for signalized and unsignalized intersections.

Signalized intersection levels of service are determined by volume-to-capacity (V/C) ratios, which in turn indicate the volume of "critical" traffic (e.g. conflicting movements compared to the theoretical capacity).[4] Existing V/C ratios cannot theoretically be greater than 1.00 because this

implies that the volume exceeds the capacity, which is not possible. For the analysis of future conditions, however, a V/C ratio greater than 1.00 should be interpreted as an indication of the relation between traffic *demand* and capacity rather than the actual volume served by this intersection.

Traffic levels of service for the unsignalized intersections were evaluated using the methodology outlined in the 1985 *Highway Capacity Manual*.[5] At unsignalized intersections each traffic movement that must yield to another movement is evaluated separately and assigned a level of service. The level of service is based on the relative ability of turning traffic to find adequate gaps in conflicting traffic flows. The *Highway Capacity Manual* methodology results in a separate LOS for turns for individual movements, unlike the planning method of *Circular 212* used for signalized intersections, which produces a single LOS for the entire intersection.

Signal Warrant Analysis

Unsignalized intersections that are congested for parts of the day are often considered candidates for a traffic signal. The Caltrans' *Traffic Manual* specifies requirements, or warrants that should be met before a traffic signal should be considered for installation.[6] Each of the unsignalized intersections analyzed in this report were tested for a peak-hour signal warrant. The peak hour warrant is intended for application where traffic conditions are such that for one hour of the day minor street traffic suffers undue delay in entering or crossing the major street.

None of the unsignalized intersections currently satisfy a peak hour warrant, either on weekdays or weekends. While other factors, such as pedestrian safety, accident history and sight distance are used when determining the need for traffic signals, the peak hour warrant is a good benchmark that conditions exist requiring further evaluation.

Potential Changes in Sutro Area Traffic

The development of the remaining parcel of the Ocean Beach Housing Development, known as Parcel 4, would increase traffic volumes in the project vicinity. According to the most recent Ocean Beach traffic study, the housing project would add approximately 25 P.M. peak hour trips onto Point Lobos Avenue, 35 P.M. peak hour trips onto Great Highway and 35 P.M. peak hour trips onto Balboa Street.[7] The additional traffic would result in little change to area traffic conditions. However, the impact to parking and pedestrian safety would have to be further evaluated. Also, the addition of driveways to access the Parcel 4 site would have to be reviewed with respect to traffic on Balboa Street.

Endnotes

1. DKS Associates, *Revised Ocean Beach Parcel Number 4 Traffic Study*, letter report to Barbara Sahm, City of San Francisco Department of City Planning, May 22, 1991.

2. DKS Associates, *Revised Ocean Beach Parcel Number 4 Traffic Study*, letter report to Barbara Sahm, City of San Francisco Department of City Planning, May 22, 1991. The 20 percent seasonal difference in traffic is based on counts conducted by the City during the summer of 1989 and counts conducted by Taldan Investment Company during the winter of 1990 at the same roadway locations.

3. Transportation Research Board, *Circular 212*, 1980.

4. Transportation Research Board, *Circular 212*, 1980.

5. Transportation Research Board, Special Report 209 Highway Capacity Manual, Chapter 10, 1985.

6. Caltrans, *Traffic Manual*, Chapter 9, 1990.

7. DKS Associates, *Revised Ocean Beach Parcel Number 4 Traffic Study*, letter report to Barbara Sahm, City of San Francisco Department of City Planning, May 22, 1991.

Appendix

ON-STREET PARKING UTILIZATION

PARKING TYPE / LOCATION

Time	Standard # Occ. Spaces	Standard % Spaces Occ.	White # Occ. Spaces	White % Spaces Occ.	Handicap # Occ. Spaces	Handicap % Spaces Occ.	Yellow # Occ. Spaces	Yellow % Spaces Occ.	Tour Bus # Occ. Spaces	Tour Bus % Spaces Occ.	Pt. Lobos # Occ. Spaces	Pt. Lobos % Spaces Occ.	El Camino # Occ. Spaces	El Camino % Spaces Occ.	48th Ave. # Occ. Spaces	48th Ave. % Spaces Occ.	Illegal # Occ. Spaces
11:00 AM Weekend	61	42%	4	67%	4	80%	4	100%	2	33%	0	0%	15	83%	17	55%	14
11:30 AM Weekend	79	54%	3	50%	4	80%	0	0%	1	17%	0	0%	15	83%	24	77%	6
12:00 PM Weekend	96	67%	6	100%	2	40%	0	0%	3	50%	0	0%	15	83%	23	74%	6
12:30 PM Weekend	104	71%	4	67%	2	40%	4	100%	1	17%	0	0%	17	94%	26	84%	9
01:00 PM Weekend	114	79%	0	0%	0	0%	2	50%	1	17%	2	8%	17	94%	25	81%	4
01:30 PM Weekend	121	84%	4	67%	3	60%	4	100%	1	17%	5	20%	16	89%	23	74%	5
02:00 PM Weekend	130	90%	4	67%	2	40%	4	100%	0	0%	20	80%	16	89%	31	100%	3
02:30 PM Weekend	140	97%	4	67%	1	20%	4	100%	0	0%	23	92%	18	100%	27	87%	2
03:00 PM Weekend	145	100%	4	67%	1	20%	4	100%	1	17%	23	92%	12	67%	28	90%	3
Spaces 240	145		6		5		4		6		25		18		31		
Average 70%	110	76%	4	61%	2	42%	3	72%	1	19%	8	32%	16	87%	25	80%	6
03:00 PM Weekday	50	34%	0	0%	2	40%	0	0%	1	14%	0	0%	11	61%	26	84%	6
03:30 PM Weekday	54	37%	0	0%	1	20%	4	100%	1	14%	1	4%	10	56%	24	77%	3
04:00 PM Weekday	49	34%	0	0%	1	20%	4	100%	0	0%	1	4%	11	61%	27	87%	3
04:30 PM Weekday	54	37%	0	0%	2	40%	4	100%	1	14%	1	4%	10	56%	27	87%	7
05:00 PM Weekday	33	23%	6	100%	2	40%	4	100%	7	100%	1	4%	10	56%	20	65%	8
05:30 PM Weekday	41	29%	6	100%	1	20%	4	100%	4	57%	0	0%	10	56%	18	58%	4
06:00 PM Weekday	33	23%	6	100%	1	20%	4	100%	4	57%	0	0%	11	61%	11	35%	4
06:30 PM Weekday	32	22%	6	100%	0	0%	4	100%	4	57%	0	0%	9	50%	10	32%	4
07:00 PM Weekday	34	23%	6	100%	0	0%	4	100%	3	43%	0	0%	2	11%	10	32%	3
Spaces 241	145		6		5		4		7		25		18		31		
Average 34%	42	29%	3	56%	1	22%	4	89%	3	40%	0	2%	9	52%	19	62%	5

Standard Spaces are marked stalls along Pt. Lobos (south of the Cliff House) and Great Highway.
Unmarked spaces are located on Pt. Lobos (east of Merrie Way), 48th Ave and El Camino Del Mar.
Illegal spaces include red zones, cars parked at public bus stops and other illegally parked vehicles.
Cars are permitted to park in tour bus spaces on weekdays during the PM peak time period.

OFF-STREET PARKING UTILIZATION

		PARKING TYPE / LOCATION													
		Merrie Way				El Camino del Mar						Pt. Lobos			
		Unmarked		Handicap		Marked		Handicap		Unmarked		Marked		Handicap	
Time		# Occ. Spaces	% Spaces Occ.	# Occ. Spaces	% Spaces Occ.	# Occ. Spaces	% Spaces Occ.	# Occ. Spaces	% Spaces Occ.	# Occ. Spaces	% Spaces Occ.	# Occ. Spaces	% Spaces Occ.	# Occ. Spaces	% Spaces Occ.
11:00 AM	Weekend	55	28%	0	0%	19	40%	0	0%	3	9%	43	81%	2	100%
11:30 AM	Weekend	72	36%	1	50%	22	46%	0	0%	4	11%	52	98%	2	100%
12:00 PM	Weekend	96	48%	0	0%	25	52%	0	0%	2	6%	52	98%	2	100%
12:30 PM	Weekend	99	50%	0	0%	33	69%	0	0%	6	17%	49	92%	0	0%
01:00 PM	Weekend	121	61%	1	50%	38	79%	0	0%	11	31%	49	92%	0	0%
01:30 PM	Weekend	176	88%	0	0%	36	75%	0	0%	11	31%	49	92%	0	0%
02:00 PM	Weekend	190	95%	0	0%	39	81%	0	0%	15	43%	48	91%	1	50%
02:30 PM	Weekend	195	98%	0	0%	40	83%	0	0%	25	71%	47	89%	1	50%
03:00 PM	Weekend	193	97%	0	0%	38	79%	1	50%	31	89%	49	92%	1	50%
Spaces	342	200		2		48		2		35		53		2	
Average	66%	133	67%	0	11%	32	67%	0	6%	12	34%	49	92%	1	50%
03:00 PM	Weekday	54	27%	1	50%	34	71%	0	0%	6	17%	16	30%	0	0%
03:30 PM	Weekday	41	21%	0	0%	27	56%	0	0%	6	17%	19	36%	0	0%
04:00 PM	Weekday	42	21%	0	0%	22	46%	0	0%	5	14%	14	26%	0	0%
04:30 PM	Weekday	34	17%	0	0%	16	33%	0	0%	1	3%	15	28%	0	0%
05:00 PM	Weekday	36	18%	0	0%	23	48%	0	0%	2	6%	15	28%	0	0%
05:30 PM	Weekday	21	11%	0	0%	13	27%	0	0%	1	3%	11	21%	0	0%
06:00 PM	Weekday	16	8%	0	0%	2	4%	0	0%	0	0%	7	13%	0	0%
06:30 PM	Weekday	9	5%	0	0%	3	6%	0	0%	0	0%	9	17%	0	0%
07:00 PM	Weekday	4	2%	0	0%	2	4%	0	0%	0	0%	10	19%	0	0%
Spaces	342	200		2		48		2		35		53		2	
Average	17%	29	14%	0	6%	16	33%	0	0%	2	7%	13	24%	0	0%

El Camino Del Mar Parking Lot is located at the cul-de-sac north of Pt. Lobos Avenue
Pt. Lobos parking lot is opposite Merrie Way parking lot on the south side of Pt. Lobos Avenue

PEDESTRIAN ACTIVITY

Time	LOCATION: Cliff House Entrance			Tour Bus Stop		Pt. Lobos Ave. at Merrie Way				Pt. Lobos Ave. at El Camino del Mar		
	Uphill Northbound	Downhill Southbound	Total	# Buses	# People	Uphill Eastbound	Downhill Westbound	Crossing Street	Total	Uphill Eastbound	Downhill Westbound	Total
11:30 AM - 11:45 AM Weekend	138	148	286	1	13	72	60	36	168	10	5	15
11:45 AM - 12:00 PM Weekend	77	79	156	1	15	37	31	16	84	7	20	27
12:00 PM - 12:15 PM Weekend	106	120	226	3	153	54	44	54	152	14	22	36
12:15 PM - 12:30 PM Weekend	108	103	211	1	27	45	48	45	138	30	30	60
12:30 PM - 12:45 PM Weekend	135	134	269	1	28	64	56	64	184	15	23	38
12:45 PM - 01:00 PM Weekend	64	87	151	1	28	57	65	57	179	21	13	34
01:00 PM - 01:15 PM Weekend	91	83	174	1	26	77	56	77	210	24	24	48
01:15 PM - 01:30 PM Weekend	88	110	198	1	28	62	91	62	215	13	16	29
Total	807	864	1671	10	318	468	451	411	1330	134	153	287
15 minute average	101	108	209	1	40	59	56	51	166	17	19	36
04:00 PM - 04:15 PM Weekday	5	9	14	0	0	25	19	5	49	2	6	8
04:15 PM - 04:30 PM Weekday	5	10	15	0	0	27	27	15	69	12	9	21
04:30 PM - 04:45 PM Weekday	13	20	33	0	0	33	22	7	62	22	10	32
04:45 PM - 05:00 PM Weekday	57	53	110	0	0	36	27	16	79	2	7	9
05:00 PM - 05:15 PM Weekday	50	46	96	0	0	22	20	11	53	1	6	7
05:15 PM - 05:30 PM Weekday	53	63	116	0	0	14	7	4	25	8	3	11
05:30 PM - 05:45 PM Weekday	52	53	105	0	0	14	7	7	28	9	9	18
05:45 PM - 06:00 PM Weekday	23	32	55	0	0	12	9	4	25	10	4	14
Total	258	286	544	0	0	183	138	69	390	66	54	120
15 minute average	32	36	68	0	0	23	17	9	49	8	7	15

Automobiles park in the tour bus spaces during the weekday PM peak period.
Pedestrians crossing Pt. Lobos Avenue were not counted in the uphill or downhill count, to avoid double counting.

Table 2
Level of Service Definitions
Signalized Intersections

Level of Service	Vehicle Delay (secs.)	Volume to Capacity Ratio	Description
A	≤5.00	0.00-0.59	**Free Flow/Insignificant Delays:** No approach phase is fully utilized by traffic and no vehicle waits longer than one red indication.
B	5.1-15.0	0.60-0.69	**Stable Operation/Minimal Delays:** An occasional approach phase is fully utilized. Many drivers begin to feel somewhat restricted within platoons of vehicles.
C	15.1-25.0	0.70-0.79	**Stable Operation/Acceptable Delays:** Major approach phases fully utilized. Most drivers feel somewhat restricted.
D	25.1-40.0	0.80-0.89	**Approaching Unstable/Tolerable Delays:** Drivers may have to wait through more than one red signal indication. Queues may develop but dissipate rapidly, without excessive delays.
E	40.1-60.0	0.90-0.99	**Unstable Operation/Significant Delays:** Volumes at or near capacity. Vehicles may wait though several signal cycles. Long queues form upstream from intersection.
F	≥60.0	N/A	**Forced Flow/Excessive Delays:** Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report No.209, Washington D.C., 1985.

Table 3
Level of Service Definitions
Unsignalized Intersections

Level of Service	Expected Delay	Reserve Capacity (Vehicles/Hour)
A	Little or no delay	$\geq$400
B	Short traffic delay	300-399
C	Average traffic delays	200-299
D	Long traffic delays	100-199
E	Very long traffic delays	0-99
F	Extreme delays potentially affecting other traffic movements in the intersection	$\leq$ 0

Source: *Highway Capacity Manual*, Special Report 209, Transportation Research Board Washington, D.C., 1985.

1985 HCM: UNSIGNALIZED INTERSECTIONS Page-1

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IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET.. 30

PEAK HOUR FACTOR..... .89

AREA POPULATION..... 750000

NAME OF THE EAST/WEST STREET..... Balboa Street

NAME OF THE NORTH/SOUTH STREET..... Great Highway

NAME OF THE ANALYST..... MES

DATE OF THE ANALYSIS (mm/dd/yy)..... 01-29-1992

TIME PERIOD ANALYZED..... 1992 Weekday PM Peak

OTHER INFORMATION.... Sutro Historic District, 4:45 - 5:45 PM

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: NORTH/SOUTH

CONTROL TYPE EASTBOUND: STOP SIGN

CONTROL TYPE WESTBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	18	61	17	76
THRU	5	19	452	661
RIGHT	8	50	71	0

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	2	3	3
LANE USAGE	L + TR	L + TR		

ADJUSTMENT FACTORS Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS					
	EB	5.50	5.00	0.00	5.00
	WB	5.50	5.00	0.00	5.00
MAJOR LEFTS					
	SB	5.50	5.00	0.00	5.00
	NB	5.50	5.00	0.00	5.00
MINOR THROUGHS					
	EB	6.50	6.00	0.00	6.00
	WB	6.50	6.00	0.00	6.00
MINOR LEFTS					
	EB	7.00	6.50	0.00	6.50
	WB	7.00	6.50	0.00	6.50

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Balboa Street
NAME OF THE NORTH/SOUTH STREET.... Great Highway
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekday PM Peak
OTHER INFORMATION.... Sutro Historic District, 4:45 - 5:45 PM

CAPACITY AND LEVEL-OF-SERVICE Page-3

MOVEMENT	FLOW-RATE v(pcph)	POTEN-TIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M	SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET						
EB LEFT	22	108	83	83	60	E
THROUGH	6	148	130	130	124	D
RIGHT	10	940	940	940	930	A
MINOR STREET						
WB LEFT	75	124	106	106	30	E
THROUGH	23	156	138	> 138	> 114 >	D
RIGHT	62	976	976	> 365 976	> 279 914 >C	A
MAJOR STREET						
SB LEFT	94	640	640	640	546	A
NB LEFT	21	537	537	537	516	A

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Balboa Street
NAME OF THE NORTH/SOUTH STREET.... Great Highway
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekday PM Peak
OTHER INFORMATION.... Sutro Historic District, 4:45 - 5:45 PM

1985 HCM: UNSIGNALIZED INTERSECTIONS Page-1

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IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET.. 30

PEAK HOUR FACTOR..... .9

AREA POPULATION..... 750000

NAME OF THE EAST/WEST STREET..... Balboa Street

NAME OF THE NORTH/SOUTH STREET..... Great Highway

NAME OF THE ANALYST..... MES

DATE OF THE ANALYSIS (mm/dd/yy)..... 01-29-1992

TIME PERIOD ANALYZED..... 1992 Weekend Peak Hr

OTHER INFORMATION.... Sutro Historic District, 12:30 - 1:30 PM

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: 4-LEG

MAJOR STREET DIRECTION: NORTH/SOUTH

CONTROL TYPE EASTBOUND: STOP SIGN

CONTROL TYPE WESTBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	26	89	19	65
THRU	6	6	722	605
RIGHT	11	85	85	66

NUMBER OF LANES AND LANE USAGE

	EB	WB	NB	SB
LANES	3	2	3	3
LANE USAGE	L + TR	L + TR		

ADJUSTMENT FACTORS Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	0	0	0

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS					
	EB	5.50	5.00	0.00	5.00
	WB	5.50	5.00	0.00	5.00
MAJOR LEFTS					
	SB	5.50	5.00	0.00	5.00
	NB	5.50	5.00	0.00	5.00
MINOR THROUGHS					
	EB	6.50	6.00	0.00	6.00
	WB	6.50	6.00	0.00	6.00
MINOR LEFTS					
	EB	7.00	6.50	0.00	6.50
	WB	7.00	6.50	0.00	6.50

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Balboa Street
NAME OF THE NORTH/SOUTH STREET.... Great Highway
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekend Peak Hr
OTHER INFORMATION.... Sutro Historic District, 12:30 - 1:30 PM

CAPACITY AND LEVEL-OF-SERVICE Page-3

MOVEMENT	FLOW-RATE v(pcph)	POTEN-TIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M	SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET						
EB LEFT	32	95	72	72	41	E
THROUGH	7	115	98	98	91	E
RIGHT	13	927	927	927	914	A
MINOR STREET						
WB LEFT	109	95	77	77	-31	F
THROUGH	7	115	98	> 98	> 91	> E
RIGHT	104	876	876	> 576 876	> 465 772	>A A
MAJOR STREET						
SB LEFT	79	449	449	449	370	B
NB LEFT	23	535	535	535	512	A

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Balboa Street
NAME OF THE NORTH/SOUTH STREET.... Great Highway
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekend Peak Hr
OTHER INFORMATION.... Sutro Historic District, 12:30 - 1:30 PM

1985 HCM: UNSIGNALIZED INTERSECTIONS Page-1

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IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET.. 30

PEAK HOUR FACTOR..... .95

AREA POPULATION..... 750000

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue

NAME OF THE NORTH/SOUTH STREET..... Pt. Lobos Parking Lot

NAME OF THE ANALYST..... MES

DATE OF THE ANALYSIS (mm/dd/yy)..... 01-29-1992

TIME PERIOD ANALYZED..... 1992 Weekday PM Peak

OTHER INFORMATION.... Sutro Historic District, 4:30 - 5:30 PM

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	23	2	--
THRU	428	746	0	--
RIGHT	32	0	24	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	2	2	1	--

ADJUSTMENT FACTORS Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	-----	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS	NB	5.50	5.00	0.00	5.00
MAJOR LEFTS	WB	5.50	5.00	0.00	5.00
MINOR LEFTS	NB	7.00	6.50	0.00	6.50

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue
NAME OF THE NORTH/SOUTH STREET.... Pt. Lobos Parking Lot
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekday PM Peak
OTHER INFORMATION.... Sutro Historic District, 4:30 - 5:30 PM

CAPACITY AND LEVEL-OF-SERVICE Page-3

MOVEMENT	FLOW-RATE v(pcph)	POTEN-TIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M	SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET						
NB LEFT	2	153	149	149	147	D
				670	640	A
RIGHT	28	945	945	945	917	A
MAJOR STREET						
WB LEFT	27	726	726	726	699	A

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue
NAME OF THE NORTH/SOUTH STREET.... Pt. Lobos Parking Lot
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekday PM Peak
OTHER INFORMATION.... Sutro Historic District, 4:30 - 5:30 PM

1985 HCM: UNSIGNALIZED INTERSECTIONS Page-1

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET.. 30

PEAK HOUR FACTOR..... .7

AREA POPULATION..... 750000

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue

NAME OF THE NORTH/SOUTH STREET..... Pt. Lobos Parking Lot

NAME OF THE ANALYST..... MES

DATE OF THE ANALYSIS (mm/dd/yy)..... 01-29-1992

TIME PERIOD ANALYZED..... 1992 Weekend Peak Hr

OTHER INFORMATION.... Sutro Historic District, 12:00 - 1:00 PM

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE NORTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	0	50	78	--
THRU	568	592	0	--
RIGHT	85	0	62	--

NUMBER OF LANES

	EB	WB	NB	SB
LANES	2	2	1	--

ADJUSTMENT FACTORS Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	0.00	90	20	N
SOUTHBOUND	-----	---	---	-

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	0	0	0
SOUTHBOUND	---	---	---

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS	NB	5.50	5.00	0.00	5.00
MAJOR LEFTS	WB	5.50	5.00	0.00	5.00
MINOR LEFTS	NB	7.00	6.50	0.00	6.50

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue
NAME OF THE NORTH/SOUTH STREET.... Pt. Lobos Parking Lot
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekend Peak Hr
OTHER INFORMATION.... Sutro Historic District, 12:00 - 1:00 PM

CAPACITY AND LEVEL-OF-SERVICE Page-3

MOVEMENT	FLOW-RATE v(pcph)	POTEN-TIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M	SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET						
NB LEFT	123	95	83	83	-40	F
				137	-83	F
RIGHT	97	740	740	740	643	A
MAJOR STREET						
WB LEFT	79	430	430	430	352	B

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue
NAME OF THE NORTH/SOUTH STREET.... Pt. Lobos Parking Lot
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekend Peak Hr
OTHER INFORMATION.... Sutro Historic District, 12:00 - 1:00 PM

1985 HCM: UNSIGNALIZED INTERSECTIONS Page-1

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET.. 30

PEAK HOUR FACTOR..... .96

AREA POPULATION..... 750000

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue

NAME OF THE NORTH/SOUTH STREET..... Merrie Way Parking Lot

NAME OF THE ANALYST..... MES

DATE OF THE ANALYSIS (mm/dd/yy)..... 01-29-1992

TIME PERIOD ANALYZED..... 1992 Weekday PM Peak

OTHER INFORMATION.... Sutro Historic District, 4:00 - 5:00 PM

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	41	~~694~~ 0	--	29
THRU	455	694	--	0
RIGHT	0	48	--	46

NUMBER OF LANES

	EB	WB	NB	SB
LANES	2	2	--	2

ADJUSTMENT FACTORS Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	-----	---	---	-
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	---	---	---
SOUTHBOUND	0	0	0

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS	SB	5.50	5.00	0.00	5.00
MAJOR LEFTS	EB	5.50	5.00	0.00	5.00
MINOR LEFTS	SB	7.00	6.50	0.00	6.50

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue
NAME OF THE NORTH/SOUTH STREET.... Merrie Way Parking Lot
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekday PM Peak
OTHER INFORMATION.... Sutro Historic District, 4:00 - 5:00 PM

CAPACITY AND LEVEL-OF-SERVICE Page-3

MOVEMENT	FLOW-RATE v(pcph)	POTEN-TIAL CAPACITY c_p (pcph)	ACTUAL MOVEMENT CAPACITY c_M (pcph)	SHARED CAPACITY c_{SH} (pcph)	RESERVE CAPACITY $c_R = c_{SH} - v$	LOS
MINOR STREET						
SB LEFT	33	155	147	147	114	D
RIGHT	53	808	808	808	755	A
MAJOR STREET						
EB LEFT	47	518	518	518	471	A

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue
NAME OF THE NORTH/SOUTH STREET.... Merrie Way Parking Lot
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekday PM Peak
OTHER INFORMATION.... Sutro Historic District, 4:00 - 5:00 PM

1985 HCM: UNSIGNALIZED INTERSECTIONS Page-1

****

IDENTIFYING INFORMATION

AVERAGE RUNNING SPEED, MAJOR STREET.. 30

PEAK HOUR FACTOR..... .82

AREA POPULATION..... 750000

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue

NAME OF THE NORTH/SOUTH STREET..... Merrie Way Parking Lot

NAME OF THE ANALYST..... MES

DATE OF THE ANALYSIS (mm/dd/yy)..... 01-29-1992

TIME PERIOD ANALYZED..... 1992 Weekend Peak Hr

OTHER INFORMATION.... Sutro Historic District, 12:30 - 1:30 PM

INTERSECTION TYPE AND CONTROL

INTERSECTION TYPE: T-INTERSECTION

MAJOR STREET DIRECTION: EAST/WEST

CONTROL TYPE SOUTHBOUND: STOP SIGN

TRAFFIC VOLUMES

	EB	WB	NB	SB
LEFT	72	0	--	89
THRU	659	478	--	0
RIGHT	0	96	--	86

NUMBER OF LANES

	EB	WB	NB	SB
LANES	2	2	--	2

ADJUSTMENT FACTORS Page-2

	PERCENT GRADE	RIGHT TURN ANGLE	CURB RADIUS (ft) FOR RIGHT TURNS	ACCELERATION LANE FOR RIGHT TURNS
EASTBOUND	0.00	90	20	N
WESTBOUND	0.00	90	20	N
NORTHBOUND	-----	---	---	-
SOUTHBOUND	0.00	90	20	N

VEHICLE COMPOSITION

	% SU TRUCKS AND RV'S	% COMBINATION VEHICLES	% MOTORCYCLES
EASTBOUND	0	0	0
WESTBOUND	0	0	0
NORTHBOUND	---	---	---
SOUTHBOUND	0	0	0

CRITICAL GAPS

		TABULAR VALUES (Table 10-2)	ADJUSTED VALUE	SIGHT DIST. ADJUSTMENT	FINAL CRITICAL GAP
MINOR RIGHTS	SB	5.50	5.00	0.00	5.00
MAJOR LEFTS	EB	5.50	5.00	0.00	5.00
MINOR LEFTS	SB	7.00	6.50	0.00	6.50

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue
NAME OF THE NORTH/SOUTH STREET.... Merrie Way Parking Lot
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekend Peak Hr
OTHER INFORMATION.... Sutro Historic District, 12:30 - 1:30 PM

CAPACITY AND LEVEL-OF-SERVICE Page-3

MOVEMENT	FLOW-RATE v(pcph)	POTEN-TIAL CAPACITY c (pcph) p	ACTUAL MOVEMENT CAPACITY c (pcph) M	SHARED CAPACITY c (pcph) SH	RESERVE CAPACITY c = c - v R SH	LOS
MINOR STREET						
SB LEFT	119	105	93	93	-27	F
RIGHT	115	843	843	843	727	A
MAJOR STREET						
EB LEFT	97	565	565	565	468	A

IDENTIFYING INFORMATION

NAME OF THE EAST/WEST STREET..... Pt. Lobos Avenue
NAME OF THE NORTH/SOUTH STREET.... Merrie Way Parking Lot
DATE AND TIME OF THE ANALYSIS..... 01-29-1992 ; 1992 Weekend Peak Hr
OTHER INFORMATION.... Sutro Historic District, 12:30 - 1:30 PM

Sutro Historic Plan
1992 Weekday PM Peak Hour
4:30 - 5:30 PM

DKS ASSOCIATES
TRACS 4.2
2/3/92 11:20:51

INTERSECTION CAPACITY CALCULATION

INTERSECTION 1

48/El Camino DM
& Pt. Lobos Ave.

```
                    TOTAL VOLUMES                                  /\          LANE CONFIGURATION
                                                                  /__\
                 203     14     23                                 ||             1   0   2   0   0
                   |      |      |                                 ||             |   |   |   |   |
                   |      |      |                                 ||             |   |   |   |   |
                <--|      |      |-->                              ||         <--| <-|   |   |-> |-->
             A           V          A                              ||       A       V   V   V       A
             |                      |                                        |                       |
        94  -----                   -----      9   |\  |    0 -----                           ----- 1
                                                   | \ |          A                            A
       363  ----->                 <-----    554   |  \|    0 ----->                         <----- 0

        19  -----                   -----     22            2 ----->                         <----- 2
             |                      |
Pt. Lobos Ave.  V                   V                       0 ----->                         <----- 0
                        A                                       V                              V
                <--|    |     |-->                           1 -----                           ----- 0
                   |    |     |                                   |                              |
                   |    |     |                                   V                              V
                  28    2     2                                          A   A   A
                                                             <--| <-|   |   |-> |-->
                                                                |   |   |   |   |
                    48/El Camino DM                             |   |   |   |   |
                                                                0   0   1   0   1
```

SIGNAL OPERATION

	NORTH/SOUTH	EAST/WEST
SIGNAL CODE	1/1	1/1
SIGNAL TYPE	Single Phase	Single Phase
MINIMUM GREEN	0 Seconds	0 Seconds
CYCLE LENGTH	0 Seconds	

STREET	DIRECTION	CRITICAL MOVEMENT	TOTAL APPROACH VOLUME	CRITICAL VOLUME PER LANE	BASIC CAPACITY PER LANE	CAPACITY ADJUSTED FOR YELLOW TIME LOSS	TRAFFIC V/C RATIO	MINIMUM GREEN G/C RATIO	CRITICAL V/C RATIO	MINIMUM LEFT TURN LANE LENGTH (FT PER LANE)
48/El Camino DM	Northbound	Left	32	28	1500	1500	0.02			0
	Southbound	Right	240	203	1500	1500	0.14			0
	Subtotal	North-South					0.16	0.00	0.16	
Pt. Lobos Ave.	Eastbound	Left	476	94	1500	1500	0.06			0
	Westbound	Through	585	288	1500	1500	0.19			0
	Subtotal	East-West					0.25	0.00	0.25	
	TOTAL		1333	613					0.41	
							SERVICE LEVEL		A	

Sutro Historic Plan
1992 Weekend Peak Hour
12:30 - 1:30 PM

DKS ASSOCIATES
TRACS 4.2
2/3/92 11:21:56

INTERSECTION CAPACITY CALCULATION

INTERSECTION 1

48/El Camino DM
& Pt. Lobos Ave.

```
                    TOTAL VOLUMES                          /\          LANE CONFIGURATION
                                                          /__\
                  153     10     47                        ||            1   0   2   0   0
                    |      |      |                        ||            |   |   |   |   |
                    |      |      |                        ||            |   |   |   |   |
                 <--|      |      |-->                     ||         <--| <-|   |   |-> |-->
              A           V           A                   ||      A       V   V   V       A
              |                       |                              |                       |
        260  -----                   -----      22   |\  |   0 -----                       ----- 1
                                                     | \ |       A                         A
        418  ----->                 <-----     481   |  \|   0 ----->                     <----- 0

         19  -----                   -----      17           2 ----->                     <----- 2
              |                       |
Pt. Lobos Ave.  V                     V                      0 ----->                     <----- 0
                         A                                      V                           V
                 <--|     |     |-->                         1 -----                       ----- 0
                    |     |     |                                |                           |
                    |     |     |                                V                           V
                   31     9     8                                     A   A   A
                                                             <--| <-|   |   |-> |-->
                                                                |   |   |   |   |
                    48/El Camino DM                             |   |   |   |   |
                                                                0   0   1   0   1
```

SIGNAL OPERATION

	NORTH/SOUTH	EAST/WEST
SIGNAL CODE	1/1	1/1
SIGNAL TYPE	Single Phase	Single Phase
MINIMUM GREEN	0 Seconds	0 Seconds
CYCLE LENGTH	0 Seconds	

STREET	DIRECTION	CRITICAL MOVEMENT	TOTAL APPROACH VOLUME	CRITICAL VOLUME PER LANE	BASIC CAPACITY PER LANE	CAPACITY ADJUSTED FOR YELLOW TIME LOSS	TRAFFIC V/C RATIO	MINIMUM GREEN G/C RATIO	CRITICAL V/C RATIO	MINIMUM LEFT TURN LANE LENGTH (FT PER LANE)
48/El Camino DM	Northbound	Left	48	31	1500	1500	0.02			0
	Southbound	Right	210	153	1500	1500	0.10			0
	Subtotal	North-South					0.12	0.00	0.12	
Pt. Lobos Ave.	Eastbound	Left	697	260	1500	1500	0.17			0
	Westbound	Through	520	272	1500	1500	0.18			0
	Subtotal	East-West					0.35	0.00	0.35	
	TOTAL		1475	716					0.47	
							SERVICE LEVEL		A	

3

Wetlands, Wildlife and Archaeological Components

SUTRO HISTORIC DISTRICT
ENVIRONMENTAL ASSESSMENT

WETLANDS, WILDLIFE, AND
ARCHAEOLOGICAL COMPONENTS

NATIONAL PARK SERVICE
Contract No. CX-8140-1-0023

Prepared For:

EDAW, Inc.
753 Davis St.
San Francisco, CA 94111

Prepared By:

BioSystems Analysis, Inc.
3152 Paradise Drive, Building 39
Tiburon, CA 94920

August 1993

J-747

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APPENDIX A. WETLAND DATA FORMS

APPENDIX B. WILDLIFE SPECIES LIST

APPENDIX C. WILDLIFE-HABITAT RELATIONSHIPS (WHR) DATA BASE SUMMARY SPECIES LIST

Figure 1. Sutro Baths site showing location of wetlands and sampling sites 1-3

1.0 WETLANDS COMPONENT

1.1 INTRODUCTION

Wetlands are transitional habitats between upland terrestrial areas and deeper aquatic habitats such as rivers and lakes (Cowardin et al. 1979). Swamps, marshes, bogs, fens and estuaries are all defined as wetlands, as are seasonally-saturated or inundated areas. Wetlands create habitat for a variety of waterfowl, fish, and other birds and wildlife, and provide flood storage, erosion control, ground water discharge and recharge, and pollution and sediment attenuation. Wetlands also offer open space and recreational opportunities.

In 1987, the U.S. Army Corps of Engineers developed a Wetland Delineation Manual (Manual) to specify the procedures for identifying and delineating wetlands and to establish the indicators and criteria necessary to make a positive wetland determination. The Manual identifies wetlands based on the presence of three diagnostic environmental characteristics: hydrophytic (wetland) vegetation, hydric (wetland) soils, and wetland hydrology (Environmental Laboratory 1987). Evidence of a minimum of one positive indicator from each of these parameters is generally required to make a positive wetland determination. The Manual defines hydrophytic vegetation as macrophytic plant life found in areas where the frequency and duration of inundation or soil saturation is sufficient to exclude those species not typically adapted for life in saturated soil conditions. The vegetation criterion is satisfied if greater than fifty percent of the dominant plant species have an indicator status of facultative (FAC), facultative wetland (FACW), or obligate (OBL). The indicator status of a species corresponds to the estimated probability of that species occurring in wetlands versus non wetlands and is assigned on a regional level (Reed 1988). Hydric soils are soils that are "saturated, flooded, or ponded long enough to develop anaerobic conditions in the upper part" (U.S.D.A. Soil Conservation Service 1987). Soil colors are typically used in the field as evidence of hydric soils. Soil profiles are compared to standardized Munsell Soil Color Charts (Kollmorgen Corporation 1975) to determine soil matrix color and the color of any mottles present. Hydric soils are typically distinguished by the presence of a soil matrix with a low chroma color and the presence of bright mottles. Wetland hydrology is defined as permanent or periodic inundation or soil saturation to the surface at some time during the growing season. Hydrology is observed in the field directly as inundation or soil saturation or by the presence of hydrologic indicators including drift lines, water marks, surface scouring, and changes in vegetation.

1.2 METHODS

1.2.1 Preliminary Data Sources

Wetlands were preliminarily identified by reviewing the National Wetlands Inventory (NWI) map of the project site (U.S. Fish and Wildlife Service 1985), the Soil Survey of San Mateo County, Eastern Part, and San Francisco County, California (U.S.D.A. Soil Conservation Service 1991), and a site analysis of the Sutro Bath ruins prepared by Insley (1988). The NWI categorizes wetlands based on the classification scheme developed by Cowardin et al. (1979). This scheme

divides wetlands into four systems: palustrine (vegetated freshwater), riverine (rivers and streams), lacustrine (lakes and deep water ponds), and estuarine (estuaries). Systems may be further categorized by habitat, substrate, vegetation, water regime, water chemistry, soils, and modifiers such as draining, excavating, or impoundment. The Soil Conservation Service maps the distribution of soils on a county-wide basis and publishes soil descriptions and maps in a Soil Survey. Soil Surveys are used to identify different soil types within the project site, determine their distribution, and determine the potential presence of hydric (wetland) soils.

1.2.2 Field Investigations

BioSystems Analysis, Inc. (BioSystems) conducted a Routine Onsite Determination of wetlands on the 70-acre Sutro Historic District site on 29 January and 6 February 1992. In conjunction with the delineation, we performed a functional analysis of wetland resources and recommended measures to restore and enhance wetland habitat. Wetlands were identified and delineated based on the presence of the three diagnostic environmental characteristics: hydrophytic vegetation, hydric soils, and wetland hydrology. A Routine Onsite Data Form was prepared for each sampling station (Figure 1; see Appendix A for forms). Paired samples were taken at each station in wetland and adjacent upland areas. Two additional sample points were established in areas identified as potential sites of a historic spring (see Appendix A, forms SHD-1 and SHD-2). Soil borings were taken to a minimum depth of 18 inches.

Adamus et al. (1987) define wetland functions as the physical, chemical, and biological characteristics of a wetland, while values are the attributes that make a wetland beneficial to society. A qualitative assessment of wetland function and value was performed in the field based on prior knowledge of freshwater wetland systems and professional opinion of the functions and values of site wetlands. Recommendations for enhancing wetland functions and values were based on this assessment.

1.3 RESULTS

1.3.1 Preliminary Data Sources

The NWI identifies two wetland areas within the project site: the remnant baths and aquarium structure and a wetland fringing a portion of the baths. The remanent baths, now a large pool, and the relic aquarium structure are categorized as palustrine unconsolidated bottom, permanently flooded, diked/impounded (PUBHh) wetlands and the wetland fringing the large pool is categorized as a palustrine emergent, temporarily flooded, diked/impounded (PEMAh). In a site analysis of the Sutro Baths ruins, Insley (1988) roughly defined wetland boundaries and reported the occurrence of 24 plant species.

Two soil types are mapped within the project site by the San Mateo/San Francisco County Soil Conservation Service (1991): the Sirdrak series and the Rock-Outcrop-Orthents Complex. There are no hydric soils mapped within the project site. Project site soils are described in more detail below.

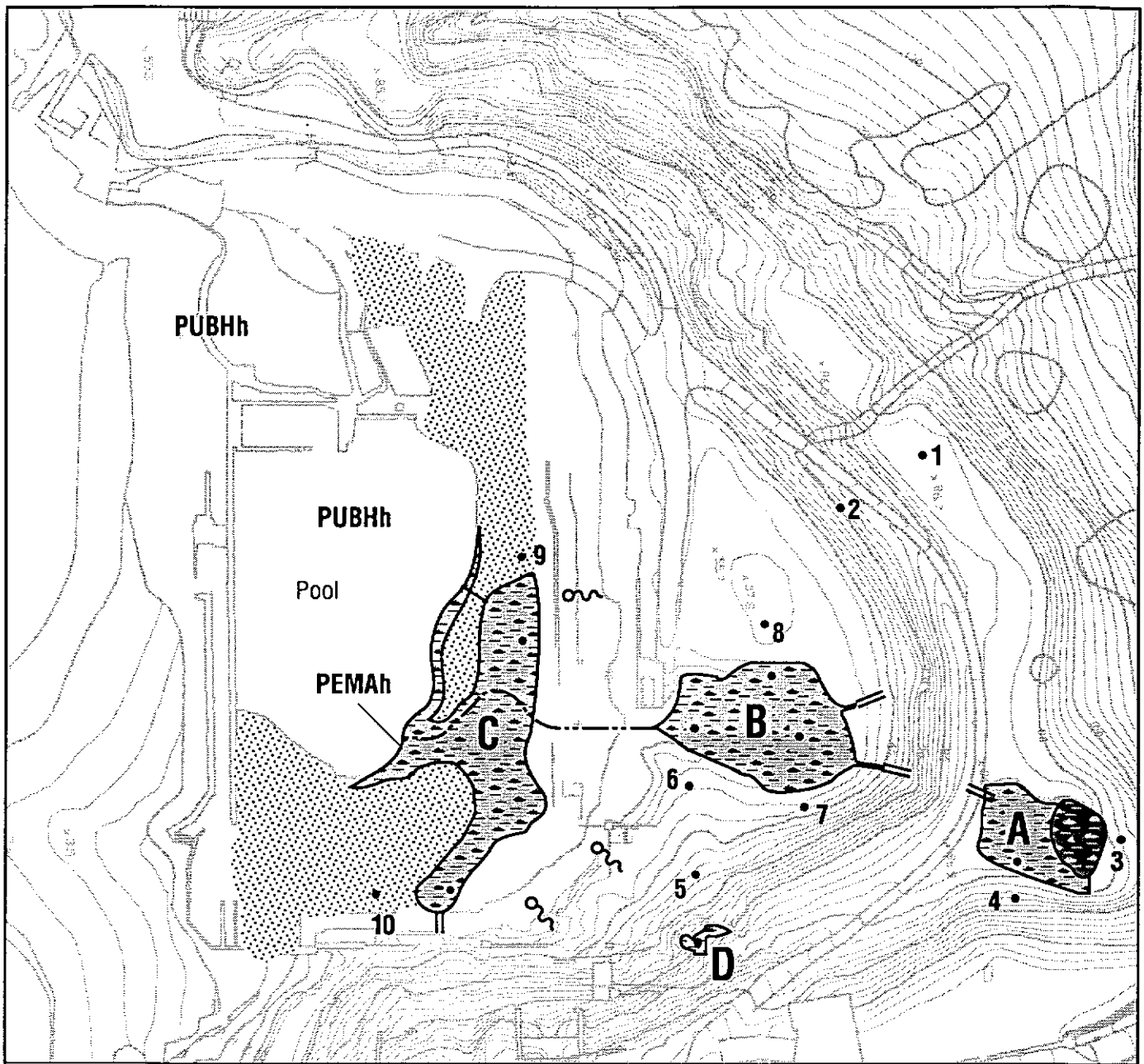

Figure 1. Sutro Baths site showing location of wetlands and sampling sites.

Emergent wetland

Riparian wetland

Coastal strand / ruins

•1 Soil boring

Seep

Seep channel

Culvert / drainpipe

NWI Classifications:

PUBHh Palustrine unconsolidated bottom permanently flooded diked/impounded wetland

PEMAh Palustrine emergent temporarily flooded diked/impounded wetland

Sirdrak Series

The Sirdrak series consists of coastal dune sands that are very deep and somewhat excessively drained. Sirdrak sand, 5 to 50 percent slopes comprises most of the project site. In a representative profile, the surface layer, from 0 to 9 inches, is a very dark grayish brown (10 YR 4/3) sand with many very fine roots. The subsoil from 9 to 17 inches is a very dark grayish brown sand with few fine roots. From 17 to 28 inches, the subsoil is a dark yellowish brown (10 YR 4/4) sand. Sirdrak sands are highly erodible and subject to soil blowing.

Rock-Outcrop-Orthents Complex

The Rock-Outcrop-Orthents Complex is an even mixture of rock outcrops and orthents found on steep cliff faces and bluffs along the Pacific Coast. These areas typically separate beaches and ocean from more inland coastal terraces and mountainous uplands. Rock outcrops are exposures of sandstone, shale, and basic igneous rock and comprise 45 percent of this complex. The Orthents component is a conglomeration of mixed alluvium, loamy shallow soils, and pockets of windblown sand. It also comprises 45 percent of the complex. The remaining 10 percent of this complex consists of small areas of Miramar, Scarper, and Sirdrak soils, typic argiustolls, and urban land. The Rock-Outcrop-Orthents Complex is mapped primarily along steep rocky escarpments within the project site.

1.3.2 Field Investigations

One of the unique natural features of the Sutro Historic District site is the presence of a number of freshwater seeps in the area once occupied by Sutro Baths (Figure 1). Seeps are areas of groundwater discharge and typically contain permanently moist or wet soils and wetland plants such as rushes and sedges (Holland 1986). Seeps on the Sutro Baths site were once used to supply freshwater to one of the baths. Today, seep areas support a number of wetlands that have become established among the ruins. Four marshes (A,B,C, and D,) were identified and delineated within the Sutro Baths site, an 8.5 acre cove between the Cliff House and Lands End (Figure 1). Three of the marshes (A,B, and C) occur along a seep that originates in the southeastern portion of the ruins. The fourth marsh (D) is supported by a small isolated seep situated in the hillside to the south. Three additional seeps flow into C near the base of the slope (Figure 1). No wetlands were found on the Lands End, Sutro Heights, or Sutro Meadows portions of the site. No wetlands were found at sampling points 1 and 2 (Figure 1) in the vicinity of what may have been a historic spring.

The configuration and persistence of marshes on the Sutro Baths site is the result of both natural and man-made features. Marshes A and B are situated in depressions bounded by steep hillsides on their eastern and southern edges, more gently rising topography to the north, and by roads or paths to the west (Figure 1). Water is channeled from A to B through a drainpipe, emerging from the hillside below through two concrete culvert-like structures. From B, water flows along the surface in a narrow channel. The channel cascades through an opening in the bluff which was once the site of the grand stairway. At the base of the slope, the channel becomes more diffuse, forming a marsh (C) that fringes the relic walls of the bathhouse. This marsh also is

fed by several other seeps (Figure 1) that originate in the hillsides above. The continual supply of water from these seeps appears to be critical in sustaining C, as wetland vegetation persists only a short distance from seep outflows. The channel meanders through marsh C before finally reaching the remnant baths where it mixes with seawater to form a large brackish pool. Marsh D is a small isolated marsh fed by a seep that originates in the hillside above marsh A.

Each marsh supports a distinct complement of native and exotic plant species. Marsh A is a small, emergent marsh bordered along its northeastern edge by a stand of willow (*Salix* sp.). The emergent portion of the marsh supports herbaceous species including cattail (*Typha* sp.), rush (*Juncus* sp. and *Scirpus* sp.), monkey flower (*Mimulus guttatus*), watercress (*Rorippa nasturtium-aquatica*), rabbitfoot grass (*Polypogon monspeliensis*), curly dock (*Rumex crispus*), and horsetail (*Equisetum arvense*). This portion was inundated with about 1 to 2 inches of water during our surveys. The willow stand is situated on a small rise that is inundated only under extreme conditions (i.e., winter storms). A soil boring in this portion of the wetland (Figure 1) revealed soil colors indicative of hydric soils (i.e., low chroma matrix; Appendix A) and a water table less than 6 inches deep. Understory in this portion of the wetland is sparse and includes rush, horsetail, and blackberry (*Rubus* sp.).

Marsh B is a larger, emergent marsh overgrown with invasive species such as nasturtium (*Tropaeolum majus*) and calla lily (*Zantedeschia aethiopica*). Marsh B also supports rush, umbrella sedge (*Cyperus* sp.), monkey flower, horsetail, plantain (*Plantago* sp.), curly dock, and water-cress. Portions of marsh B were inundated at the time of the survey and we observed water flowing from both culverts into the marsh. Soil borings taken in three separate locations in marsh B (Figure 1) produced profiles indicative of hydric soils (Appendix A). The narrow portion of the seep connecting marshes B and C is dominated by watercress. Monkey flower and brass buttons (*Cotula coronipifolia*) are also present.

The upper portion of marsh C is dominated by rushes and silverweed (*Potentilla egedii* var. *grandis*). The lower portion of the marsh bordering the pool supports a few species more tolerant of saline conditions including salt grass (*Distichlis spicata*), brass buttons and silverweed, although watercress and monkey flower dominate at the confluence of the seep and the pool where salinities are reduced by freshwater. Two soil borings taken in this marsh (Figure 1) revealed saturation and colors indicative of hydric soils (Appendix A). Marsh D is dominated by calla lily and nasturtium. A soil boring in this marsh (Figure 1) revealed soil saturation and soils of low chroma matrix with mottling (Appendix A).

1.3.3 Wetland Functions and Values

Wetlands within the Sutro Baths site provide several valuable functions. Wetlands along seeps may improve water quality by filtering out nutrients and chemical and organic wastes and by reducing sediment loads to surrounding coastal waters. Seeps also provide a source of freshwater to wildlife inhabiting the park. Insley (1988) observed an abundance of migratory songbirds in seep areas and waterfowl are prevalent in the brackish pool.

Insley (1988) noted the value of the Sutro Baths site as an educational resource because of its high exposure to public view. The site offers an excellent opportunity to educate the public about the function and values of wetland because wetland areas can be seen from existing roads and trails. Park users could have a first hand look at wetland systems, their ecology, and functions.

1.4 RECOMMENDATIONS

Wetlands within the Sutro Baths site, degraded by decades of human manipulation and use, need enhancement or restoration. Insley (1988) noted that "water is the most significant element on the site." Therefore, the following recommendations are proposed to enhance, restore, and preserve wetland resources on site, while increasing public awareness and education of the importance of wetlands.

1) ***Access into marsh areas should be restricted.*** Presently there are no barriers to keep park users out of marsh areas. Uncontrolled access results in trampling of marsh vegetation, illegal harvesting of wetland plants, and deposition of litter. To protect marsh areas, fences or other physical barriers should be erected along roads and trails to deter users from entering marsh areas.

2) ***Seep channels should be protected.*** A wooden footbridge should span the seep channel where it crosses existing trails to prevent bank erosion and trampling of seep vegetation. The portion of the seep draining Marsh B is particularly vulnerable to erosion from foot traffic. Another portion of the seep susceptible to erosion from site use is that portion flowing from Marsh C to the bath ruins.

3) ***Invasive plant species should be removed from wetland areas.*** Several exotic species inhabit the wetlands on site. Removing these invasive plants and replanting with native marsh species would significantly enhance wetland resources.

4) ***The pool edge should be enhanced for waterfowl.*** The pool could be enhanced for waterfowl by planting native wetland species that provide food and cover.

5) ***A comprehensive list of site flora should be compiled.*** Plant species identified in this report do not represent an inclusive list of all plant species on the site. Such a list is essential for resource management planning and would facilitate the identification and removal of exotic species.

6) ***Interpretive signs should be placed near wetland areas.*** Interpretive signs placed near wetland areas would provide an excellent tool for educating the public on the importance of wetlands. Signs could also identify wetland functions and values and detail wetland restoration efforts to remove exotics and replant with native wetland vegetation.

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2.0 WILDLIFE COMPONENT

2.1 INTRODUCTION

BioSystems Analysis, Inc. (BioSystems), conducted a wildlife resource evaluation of the Sutro Historic District, which contains the ruins of the Sutro Baths, Lands End, and Sutro Heights Park. The objective of our study was to determine significant wildlife features, sensitive wildlife areas, and opportunities for wildlife habitat enhancement. This report summarizes site visits and existing data on the wildlife in the project area and provides baseline information on wildlife resources for program-level planning.

2.2 METHODS

2.2.1 Literature Review

BioSystems conducted a search of the California Natural Diversity Database (CNDDB) to determine the potential for special-status species to occur in the project area. Special-status species include species listed as threatened or endangered by the U.S. Fish and Wildlife Service (USFWS) or the California Department of Fish and Game (CDFG), candidates for federal listing, and California species of special concern. In addition, we used the Wildlife-Habitat Relationships (WHR) database system to generate a list of vertebrate wildlife species that may occur on the project site. We reviewed National Park Service (NPS) documents pertaining to wildlife resources in the Golden Gate National Recreation Area (GGNRA), as well as other reports and documents.

2.2.2 Interviews and Site Visits

We conducted site visits on 17 January, 4 and 6 February, and 3 March 1992. The site visits were general habitat assessments. Wildlife field surveys were beyond the scope of this project, but we kept a list of wildlife species observed on site visits. We contacted local species experts to determine the biological significance of the project area to wildlife. Contacts included Allen Fish of the Golden Gate Raptor Observatory, Steve Bailey of the California Academy of Sciences, Dr. Gordon Chan of the College of Marin, and the Golden Gate Audubon Society.

2.3 RESULTS

The Sutro Historic District provides valuable habitat for wildlife in an urban landscape. Habitat types found in the project area include rocky shoreline, coastal bluffs, large stands of Monterey cypress, scattered Monterey pine, central dune scrub, freshwater seeps, a brackish pool, and urban parkland. The wildlife habitat map, adapted from vegetation types outlined for the study area by Joe McBride, depicts physical and vegetation features important to wildlife.

The remnant baths are one of the most important features of the site; they provide a permanent source of brackish water. This unique habitat element provides a bathing area for seabirds and

waterfowl close to the coast. The only similar habitat in the urban areas of San Francisco is at Lake Merced (Bailey pers. comm.). The tufted duck (*Aythya fuligula*) is occasionally sighted in the baths, as are other species of diving ducks. The tufted duck is an irregular winter migrant along the coast of California.

Coastal bluffs, Monterey cypress stands, and ruderal (disturbed) areas provide habitat for common wildlife such as resident and migratory songbirds, raccoons (*Procyon lotor*), striped skunks (*Mephitis mephitis*), and Virginia opossums (*Didelphis virginiana*). The woodland areas of Lands End attract migratory birds flying south across the Golden Gate, including a number of raptor species. Songbirds may use the area as a resting site during migration; migrating raptors probably do not spend much time there, as they tend to move quickly through urban areas (Allen Fish pers. comm.). Freshwater seeps and associated small wetlands provide a source of fresh water and cover for songbirds and other wildlife; they may also provide breeding habitat for amphibians.

The project area also includes rocky shoreline and intertidal habitats and offers unique opportunities for viewing marine mammals and seabirds. Seal Rocks provide important roosting sites for brown pelicans (*Pelecanus occidentalis*) and haul out areas for California sea lions (*Zalophus californicus*) and northern (Steller's) sea lions (*Eumetopias jubatus*) (GGNRA 1991). Intertidal areas at Lands End and Sutro Bath Rock display sparse marine life because of water turbulence and high soil erosion (Chan 1974 as cited in GGNRA 1991 and pers. comm.). We observed anemones, mussels, limpets, and barnacles in the wave catch basin and the rocks that form the sea wall.

A colony of California ground squirrels (*Spermophilus beecheyi*) inhabits the ruderal vegetation around the baths. This population may be genetically isolated due to the patchy distribution of suitable habitat within the surrounding urban setting. Although this species has no legal protection, the ground squirrels are a popular tourist attraction and may be a focus of public attention during the planning process.

A list of wildlife species potentially occurring in the project area was compiled from numerous sources (Appendix B). We derived parts of the species list from two reports cited in Royston, Hanamoto, Beck, and Abbey (1975). To our knowledge, the information in these reports was not based on field surveys. Instead, many species in these reports were probably listed by range and habitat information and may not actually occur in the Sutro project area. Species identified as having been observed by BioSystems' biologists were observed while we were conducting site visits; we did not conduct field surveys for wildlife species. It should be noted that this list is not exhaustive, and the presence of species in the project area cannot be confirmed without field surveys. Moreover, it is possible for almost any migratory species found along the California coast to be observed in the Sutro area at some time during its migration (Hopkins pers. comm.).

The WHR database search resulted in a summary list of 289 potential wildlife species (Appendix C). This list was based on the following search criteria: (1) San Francisco County and (2) closed-cone pine-cypress, coastal scrub, residential-park, barren, marine shoreline and intertidal, and lacustrine habitat types.

Special Status Species

The CNDDB search results for the San Francisco North quadrangle included two special status species that have been reported on or near the project area. The bumblebee scarab beetle (*Lichnanthe ursina*), a category 2 candidate for federal listing as threatened or endangered, has been found on the sand dunes near the Cliff House (CNDDB 1992). Specimens of this beetle have been collected from dunes along the coast from April to August, with a peak in May and June (Carlson 1980). Habitat for this species is coastal sand dunes; specimens have also been collected in inland Los Angeles County (Carlson 1980).

In addition, the California red-legged frog (*Rana aurora draytonii*), a federal category 2 candidate and California species of special concern, has been reported from several locations in Golden Gate Park and Lands End (CNDDB 1992). Red-legged frogs range from the coast to the northern Sierra Nevada foothills. They are found in slow-moving streams and pools (usually at least 1 meter, or 3 feet, deep), freshwater marshes, or coastal estuaries; they breed between January and July, with a peak in February (Stebbins 1966). Red-legged frogs are typically associated with permanent water bodies surrounded by willows or emergent aquatic vegetation, but they can also occur in ephemeral pools if the water remains long enough for breeding and larvae development (approximately 20 weeks). Mature frogs disperse from aquatic habitats after rains and may inhabit damp woods and meadows far from water (Stebbins 1966). Because the small freshwater seeps and associated marshes in the project area are shallow and highly disturbed, they represent marginal habitat for red-legged frogs. Springtime surveys should be conducted before disturbing wetlands.

The American peregrine falcon (*Falco peregrinus*), a federal and state endangered species, has been documented in Sutro Heights Park. A peregrine was observed perched in a snag above the artificial cliff on several occasions in November 1989 (Fish 1989). This perch site offers a wide view of potential prey such as pigeons, shorebirds, and ducks flying along the cliffs near the Cliff House (Fish 1989).

Other special-status species potentially occurring in the project area include the common loon (*Gavia immer*), double-crested cormorant (*Phalacrocorax auritus*), brown pelican, Barrow's goldeneye (*Bucephala islandica*), bufflehead (*Bucephala albeola*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*Accipiter cooperii*), merlin (*Falco columbarius*), long-billed curlew (*Numenius americanus*), California gull (*Larus californicus*), elegant tern (*Sterna elegans*), yellow warbler (*Dendroica petechia brewsteri*), saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*), Townsend's western big-eared bat (*Plecotus townsendii townsendii*), and northern (Steller's) sea lion. The brown pelican is a state and federal endangered species, the northern sea lion is a federal threatened species, and the rest are state species of special concern. Both the elegant tern and the big-eared bat are also category 2 candidates for federal listing as threatened or endangered. For many of the California species of special concern, only breeding habitat, rookeries, or nesting colonies are of concern (see Appendix B).

2.3 CONCLUSIONS

The Sutro Historic District provides diverse habitats for wildlife and offers unique opportunities for public wildlife viewing and interpretation. Wildlife constraints to the comprehensive design planning process are primarily limited to the area around the Sutro Baths ruins and are complementary to wetland conservation issues. The primary issues that could restrict the design process are bumblebee scarab beetle habitat, wetland conservation for red-legged frogs and other wildlife, maintenance of the historic brackish pool for seabirds and waterfowl, and disturbance of diving ducks (such as the ring-necked duck *Aythya collaris*) using the brackish pool.

The endangered brown pelican is unlikely to be affected by the project or project-related activities. No pelican roost sites will be disturbed, nor will pelican foraging habitat. For similar reasons, we feel the northern (Steller's) sea lion will also not be adversely affected. The four special-status raptor species (peregrine falcon, merlin, sharp-shinned hawk, and Cooper's hawk) are unlikely to be adversely affected because none of them is likely to nest in the project area and project-related activities are not likely to significantly reduce the prey base in the long run.

There is no breeding habitat in the project area for long-billed curlews, California gulls, elegant terns, common loons, double-crested cormorants, buffleheads, goldeneyes, or yellow warblers. Wintering or non-breeding habitat for these species is not likely to be degraded, so adverse impacts are unlikely. The project area does not provide adequate breeding habitat for the saltmarsh common yellowthroat, nor does it provide good wintering habitat. It may, however, support at least wintering or migrating individuals once the project is completed if restored wetlands provide low, dense cover within 3 feet of water. The big-eared bat is more likely to find suitable foraging habitat than roosting sites in the Sutro Historic District. Adverse impacts to this species are not likely.

2.4 RECOMMENDATIONS

We recommend the following:

- Surveys and consultation with species experts should be conducted for bumblebee scarab beetles, California red-legged frogs, and Townsend's western big-eared bats before suitable habitat for these species is disturbed.

- If the final design plan calls for removal of forest trees (e.g., Monterey cypress), surveys for raptors and other birds which may be nesting there should be conducted prior to removal of any trees.

- If the final design plan calls for any disruption of the marine environment, potential impacts to marine plants, vertebrates, and invertebrates should be assessed.

- A management plan for feral cat control should be established. Feral cats represent one of the most significant wildlife threats.

- The remnant baths should be maintained as brackish pools for seabirds and waterfowl.

- The freshwater seeps and associated wetland vegetation, which provide fresh water and cover for wildlife, should be maintained.

- Exotic plant species should be replaced with native vegetation wherever feasible.

- Snags (standing dead trees) should be maintained. They provide important habitat features for birds (e.g., perch sites for peregrines and nesting habitat for cavity-nesting species).

- The use of chemical pesticides in Sutro Heights Park should be reduced and monitored.

- A study should be undertaken to investigate the feasibility of establishing interpretive tidepools in the historic aquarium pool. Because the natural intertidal invertebrate fauna in the project area is depauperate, an artificial tidepool probably would require intensive maintenance (Chan pers. comm.).

- Interpretive signs describing unique wildlife features of the site, including marine mammals, seabirds, and the bumblebee scarab beetle, should be provided. Telescopes could be mounted on the observation platform for visitors to observe marine mammals and seabirds.

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3.0 ARCHAEOLOGICAL COMPONENT

3.1 INTRODUCTION

BioSystems' cultural resources staff conducted a literature and records search to determine if known or potential prehistoric and ethnographic cultural resources are present in the Sutro Historic District. The focus of the archaeological assessment was to obtain records relating to known prehistoric and ethnographic cultural resources within the proposed historic district.

3.2 METHODS

A literature search and review was conducted of records on file at the Northwest Information Center of the California Archaeological Inventory at Sonoma State University, Rohnert Park, and at the Golden Gate National Recreation Area, Division of Management and Planning Offices at Fort Mason. BioSystems also consulted with the Golden Gate National Recreation Area archaeologist Martin Mayer regarding known prehistoric and historic site locations within the Sutro Historic District.

3.3 RESULTS

A systematic cultural resources survey of the Sutro Historic District has not been undertaken by the National Park Service. While several reports identify the locations of prehistoric resources (Christopher et al. 1982, Holman et al. 1977, Jones 1901, Kelly 1976a, Kelly 1976b, King 1967a, King 1967b, Mayer 1980a, Miller 1975, Nichols 1979, Pilling 1949) these reports are for specific sites located along the cliff areas north of the Cliff House and Sutro Baths. It is not known how many cultural resources are located within the Sutro Historic District.

A National Register property, the Point Lobos Archaeological District, is located within the boundaries of the Sutro Historic District (Kelly 1976b). The western boundary of the district, from the intersection of Merrie Way and Point Lobos Avenue, follows Merrie Way northerly for approximately 1000 feet then turns northwest to a point 1600 feet southwest of Point Lobos Rock. From there the boundary follows the low tide level southerly to a point west and below the Cliff House. From this point, the boundary continues in an easterly direction up the cliff (east) to Point Lobos Avenue and follows Point Lobos Avenue to its intersection with Merrie Way. The district is located on parcels 01-110 and 01-115 which are now part of the Golden Gate National Recreation District.

Within the Point Lobos Archaeological District are three previously recorded prehistoric properties. They are site CA-SFR-5, CA-SFR-21 and CA-SFR-24. Subsurface exploration of these sites was undertaken in 1976 (Holman et al. 1977). The primary objective of the exploration was to delineate site boundaries and provide information regarding the preservation of the sites. The general locations of the properties were confirmed during a field visit on January 30, 1992. A description of each property is as follows:

CA-SFR-5 - This is a large shell midden located on the cliff to the north of Sutro Baths. Two small deposits were noted on the north side of the cove while the majority of the site covers the edge of the terrace above and north of the Sutro Bath ruins (Holman et al. 1977: Map 1). Forty-six three-inch auger bores were hand excavated to determine the site boundaries. The midden was found at depths of 20 to 150 centimeters below the ground surface and is overlain by gravel fill. The site is thought to have extended no more than 10 meters inland (east) of cliff face. Materials recovered from the auger bores included mussel shell and two chert flakes. Deer, sea otter, stellar sea lion bone and fire-cracked rock were also noted. A charcoal and ash lens was noted in bore 15 at a depth of 43 to 55 centimeters. The profile of the midden in the exposed cliff face was conspicuous during the field visit.

CA-SFR-21 - The archaeological deposit is located on the south side of the cove above the Sutro Bath ruins, north of the Cliff House and under the ruins of the entrance to Sutro Baths. Three subsurface units and 15 auger bores were excavated at the site by Holman et al. (1977: Map 2). Maximum depth of the deposit, based on observations from the excavation units in the southern end of the site was suggested to be 140 to 150 centimeters. Molluscan remains recovered include mussel, clam, oyster, limpet, and chiton. Other faunal remains retained include stellar sea lion, California sea lion, sea otter, northern fur seal and deer. Six chert and two obsidian flakes were collected. A large hearth was found intact in Unit Two. Other matrix constituents include fire-cracked rock, charcoal and ash. Subsurface exploration suggested the site measured approximately 21 meters east/west by 10 meters north/south.

Bank stabilization by the National Park Service was completed in 1980 (Mayer 1980a). Sand and screened midden were used to fill sandbags which were placed against the midden at the bottom of the slope. Portions of the sandbag wall are still visible. Within the draft report are references to a archaeological excavation conducted as part of the bank stabilization. No report of this excavation is included in documents on file with the Golden Gate National Recreation Area.

CA-SFR-24 - The site is located on a small graded terrace below and to the north of the northernmost edge of CA-SFR-5. It is not clear from the report (Holman et al. 1977:12-13) how much work was completed at the site nor its size. They do indicate however that the midden may be a remnant of a larger site or has been redeposited. During the field visit, midden was visible along a the terrace but is overlain with at least 30 centimeters of fill. Miller (1975) suggests that this is part of CA-SFR-5. Records on file at the Northwest Information Center combined CA-SFR-24 with CA-SFR-5.

Another site, CA-SFR-20 (Nichols 1979) may lie within the boundaries of the northernmost edge of the Sutro Historic District. This site, also known as Nelson 396, has never been relocated.

The Point Lobos Archaeological District was listed in the National Register of Historic Places on November 7, 1976. The district qualified under criteria a and d (36 CFR 60.4) for National Register evaluation. The contributing historic properties are considered significant and are

associated with events that have made a significant contribution to the broad patterns of our history [36 CFR 60.14 (a)] and have yielded, or may likely to yield, information important in prehistory [36 CFR 60.4(d)].

The results of the literature search and field visit confirmed the presence of three prehistoric archaeological sites within the boundaries of the Sutro Historic District. While the general locations of the sites could be extrapolated from existing literature, the exact boundaries of the sites are not known. Based on the literature examined, a systematic archaeological reconnaissance for prehistoric sites has not been conducted within the boundaries of the Sutro Historic District.

3.4 RECOMMENDATIONS

The three sites which are on the National Register, are protected under Section 106 of the National Historic Preservation Act from any undertaking which could alter the characteristics of the sites. These sites, CA-SFR-5, CA-SFR-21 and CA-SFR-21, must be considered in any planning which may potentially result in an effect to historic properties. The sites are significant under criteria a and d (36 CFR 60.4) for National Register evaluation. Implementation of the Comprehensive Plan could be considered an undertaking it results in effects on historic properties [36 CFR 800.9 (a)]. Such activities might include landscaping, building trails, increased pedestrian access to the sites or other ground disturbing activities.

No systematic archaeological reconnaissance has been conducted within the boundaries of the Sutro Historic District. Potential conflicts between as yet uninventoried historic properties and development of facilities could be avoided if an inventory and evaluation of historic properties is completed prior to the design phase. An inventory may also required for Section 106 of the National Historic Preservation Act of 1966 (as amended) compliance.

While doing the literature search for the prehistoric and ethnographic component of the Design Plan a number of references were located regarding historic archaeology conducted within the Sutro Historic District. These have been primarily in the Sutro Heights area (Delgado n.d., 1978, 1979, 1981; Kelly 1976a, 1976b, 1980a, 1980b; Kelly and Delgado 1980; Mayer 1980b, 1980c). The potential effects of the Comprehensive Plan on known or potential historic period properties should be considered. Records indicate that none of the historic period archaeological sites have been assigned state trinomials by the Northwest Information Center. Formal recordation of historic properties is typically a prerequisite for State Office of Historic Preservation project review.

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APPENDIX A.

WETLAND DATA FORMS

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-1 Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1. Acacia		7. Raphanus sativus	UPL
2. Albizia	UPL	8. Avena fatua	UPL
3.		9. Marah fabaceus	UPL
Saplings/shrubs		Woody vines	
4. Lavatera	UPL	10.	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 0. Other indicators: —.

Hydrophytic vegetation: Yes ____ No ✓. Basis: Less than 50% of the dominant species are OBL, FACW and FAC.

Soil

Series and phase: Rock-outcrop-Orthents on hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: —; Matrix color: 10 yr 3/3. Sand

Gleyed: Yes ____ No ✓ Other indicators: —.

Hydric soils: Yes ____ No ✓; Basis: No positive hydric soil indicators present

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: —.

Saturated soils: Yes ____; No ✓. Depth to saturated soil: —.

Other indicators: —.

Wetland hydrology: Yes ____; No ✓. Basis: No positive hydrology indicators present

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-2 Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Juncus	
2.		8. Galium	
3.		9. Lobularia maritima	UPL
Saplings/shrubs		Woody vines	
4.		10. Rubus	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 0. Other indicators: Less than 50% of the dominant specie

Hydrophytic vegetation: Yes ____ No ✓. Basis: are OBL, FACW and FAC.

Soil

Series and phase: Rock-outcrop-Orthents hydric soils list? Yes____; No ✓.

Mottled: Yes____; No ✓. Mottle color: —; Matrix color: 10YR 5/4 sand

Gleyed: Yes____ No ✓ Other indicators: —.

Hydric soils: Yes____ No ✓; Basis: No positive hydric soil indicators present

Hydrology

Inundated: Yes____; No ✓. Depth of standing water: —.

Saturated soils: Yes____; No ✓. Depth to saturated soil: —.

Other indicators: —.

Wetland hydrology: Yes____; No ✓. Basis: No positive hydrology indicators present

Atypical situation: Yes____; No ✓.

Normal Circumstances? Yes ✓ No____.

Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-3W Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Equisetum arvense	FAC
2.		8. Scirpus	
3.		9.	
Saplings/shrubs		Woody vines	
4. Salix		10. Rubus	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 100. Other indicators: —.

Hydrophytic vegetation: Yes ✓ No ____. Basis: More than 50 % of the dominant species are OBL, FACW and FAC.

Soil

Series and phase: Sirdrak Sand On hydric soils list? Yes ____; No ✓.

Mottled: Yes ✓; No ____. Mottle color: 10 yr 3/6; Matrix color: 10 yr 3/2

Gleyed: Yes ____ No ✓ Other indicators: —.

Hydric soils: Yes ✓ No ____; Basis: Low chroma matrix with mottling

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: —.

Saturated soils: Yes ✓; No ____. Depth to saturated soil: < 6".

Other indicators: Topographic depression fed by permanent seep

Wetland hydrology: Yes ✓; No ____. Basis: Visual observation of soil saturation

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland _____.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-3U Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1. Albizia		7. Raphanus sativus	UPL
2.		8. Marah fabaceus	UPL
3.		9. Senecio mikanioides	UPL
Saplings/shrubs		Woody vines	
4.		10.	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 0. Other indicators: —.

Hydrophytic vegetation: Yes ____ No ✓. Basis: Less than 50% of the dominant sp. are OBL, FACW and FAC.

Soil

Series and phase: Sirdrak sand On hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: —; Matrix color: 10YR 3/3 sand

Gleyed: Yes ____ No ✓ Other indicators: —.

Hydric soils: Yes ____ No ✓; Basis: No positive hydric soil indicators present

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: —.

Saturated soils: Yes ____; No ✓. Depth to saturated soil: —.

Other indicators: —.

Wetland hydrology: Yes ____; No ✓. Basis: No positive hydrology indicators present

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-4W Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Juncus	
2.		8. Scirpus	
3.		9. Typha	OBL
Saplings/shrubs		~~Woody vines~~	
4.		10. Mimulus guttatus	OBL
5.		11. Rorippa nasturtium-aquatica	OBL
6.		12. Equisetum arvense	FAC

% of species that are OBL, FACW, and/or FAC: 100. Other indicators: _____.

Hydrophytic vegetation: Yes ✓ No ____. Basis: More than 50% of the dominant species are OBL, FACW or FAC.

Soil

Series and phase: Sirdrak sand On hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: — ; Matrix color: 10YR 3/2 silty sand

Gleyed: Yes ____ No ✓ Other indicators: Soil saturated.

Hydric soils: Yes ✓ No ____; Basis: Peraquic moisture regime.

Hydrology

Inundated: Yes ✓; No ____. Depth of standing water: 1-6".

Saturated soils: Yes ✓; No ____. Depth to saturated soil: 0".

Other indicators: Landlocked depression fed by permanent seep.

Wetland hydrology: Yes ✓; No ____. Basis: Area inundated.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland _____.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-4U Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Raphanus sativus	UPL
2.		8. Marah fabaceus	UPL
3.		9.	
Saplings/shrubs		Woody vines	
4.		10. Rubus	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 0. Other indicators: —.

Hydrophytic vegetation: Yes ____ No ✓. Basis: Less than 50% of the dominant species are OBL, FACW, or FAC.

Soil

Series and phase: Sirdrak sand On hydric soils list? Yes____; No ✓.

Mottled: Yes____; No ✓. Mottle color: —; Matrix color: 10 YR 4/3 sand

Gleyed: Yes____ No ✓ Other indicators: —.

Hydric soils: Yes____ No ✓; Basis: No positive hydric soil indicators present

Hydrology

Inundated: Yes____; No ✓. Depth of standing water: —.

Saturated soils: Yes____; No ✓. Depth to saturated soil: —.

Other indicators: —.

Wetland hydrology: Yes____; No ✓. Basis: No positive hydrology indicators present

Atypical situation: Yes____; No ✓.

Normal Circumstances? Yes ✓ No____.

Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-5W Section: _____

Vegetation (list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)). Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Zantedeschia aethiopica	OBL
2.		8. Tropaeolum majus	UPL
3.		9.	
Saplings/shrubs		Woody vines	
4.		10.	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 50. Other indicators: —.

Hydrophytic vegetation: Yes ✓ No ____. Basis: wetland determination based on positive indicators of hydric soils and hydrology

Soil

Series and phase: Rock-outcrop-Orthents On hydric soils list? Yes ____; No ✓.

Mottled: Yes ✓; No ____. Mottle color: 7.5 yr 3/4; Matrix color: 10 yr 2/1

Gleyed: Yes ✓ No ____ Other indicators: —.

Hydric soils: Yes ✓ No ____; Basis: Low chroma matrix with Mottling.

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: —.

Saturated soils: Yes ✓; No ____. Depth to saturated soil: 18" in soil boring hole saturated through profile.

Other indicators: topographic depression.

Wetland hydrology: Yes ✓; No ____. Basis: Visual observation of soil saturation.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland ____.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-5U Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Senecio mikanioides	UPL
2.		8.	
3.		9.	
Saplings/shrubs		Woody vines	
4.		10.	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 0. Other indicators: —.

Hydrophytic vegetation: Yes ____ No ✓. Basis: Less than 50% of the dominant species are OBL, FACW, and FAC.

Soil

Series and phase: Rock-outcrop-Orthents On hydric soils list? Yes____; No____.

Mottled: Yes ✓; No____. Mottle color: 10 YR 5/1; Matrix color: 10 YR 3/3

Gleyed: Yes____ No ✓ Other indicators: —.

Hydric soils: Yes____ No ✓; Basis: No positive hydric soils indicators present

Hydrology

Inundated: Yes____; No ✓. Depth of standing water: —.

Saturated soils: Yes____; No ✓. Depth to saturated soil: —.

Other indicators: —.

Wetland hydrology: Yes____; No ✓. Basis: No positive hydrology indicators present

Atypical situation: Yes____; No ✓.

Normal Circumstances? Yes ✓ No____.

Wetland Determination: Wetland_____; Nonwetland ✓.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-6W Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Juncus	
2.		8. Mimulus guttatus	OBL
3.		9. Raphanus sativus	UPL
Saplings/shrubs		~~Woody vines~~	
4.		10. Equisetum arvense	FAC
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 67. Other indicators: —.

Hydrophytic vegetation: Yes ✓ No ____. Basis: More than 50% of the dominant species are OBL, FACW and FAC.

Soil

Series and phase: Rock-outcrop-Orthents On hydric soils list? Yes____; No ✓.

Mottled: Yes____; No ✓. Mottle color: —; Matrix color: 2.5Y 3/2 sand

Gleyed: Yes____ No ✓ Other indicators: —.

Hydric soils: Yes ✓ No____; Basis: Peraquic moisture regime

Hydrology

Inundated: Yes ✓; No____. Depth of standing water: 3"

Saturated soils: Yes ✓; No____. Depth to saturated soil: 0"

Other indicators: Depression fed by permanent seep.

Wetland hydrology: Yes ✓; No____. Basis: Area inundated.

Atypical situation: Yes____; No ✓.

Normal Circumstances? Yes ✓ No____.

Wetland Determination: Wetland ✓; Nonwetland____.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-6W Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Senecio mikanioides	UPL
2.		8.	
3.		9.	
Saplings/shrubs		Woody vines	
4.		10.	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 0. Other indicators: _____.

Hydrophytic vegetation: Yes ____ No ✓. Basis: Less than 50% of the dominant species are OBL, FACW or FAC.

Soil

Series and phase: Rock-Outcrop-Orthents On hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: — ; Matrix color: 10 yr 3/3

Gleyed: Yes ____ No ✓ Other indicators: — .

Hydric soils: Yes ____ No ✓; Basis: No positive hydric soil indicators present.

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: — .

Saturated soils: Yes ____; No ✓. Depth to saturated soil: — .

Other indicators: — .

Wetland hydrology: Yes ____; No ✓. Basis: No positive hydrologic indicators present.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-7W Section: _____

Vegetation (list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)). Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Tropaeolum majus	UPL
2.		8. Zantedeschia aethiopica	OBL
3.		9. Mimulus guttatus	OBL
Saplings/shrubs		~~Woody vines~~	
4.		10. Juncus	
5.		11. Equisetum arvense	FAC
6.		12. Rorippa nasturtium-aquatica	OBL

% of species that are OBL, FACW, and/or FAC: 80. Other indicators: —.

Hydrophytic vegetation: Yes ✓ No ____. Basis: More than 50% of the dominant species are OBL, FACW, and FAC.

Soil

Series and phase: Rock-outcrop-Orthents On hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: —; Matrix color: 10 yr 3/1.

Gleyed: Yes ✓ No ____ Other indicators: —.

Hydric soils: Yes ✓ No ____; Basis: Low chroma matrix; peraquic moisture regime.

Hydrology

Inundated: Yes ✓; No ____. Depth of standing water: 3".

Saturated soils: Yes ✓; No ____. Depth to saturated soil: 0".

Other indicators: Depression fed by permanent seep.

Wetland hydrology: Yes ✓; No ____. Basis: Visual observation of inundation

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland ____.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-7W Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Senecio mikanioides	UPL
2.		8.	
3.		9.	
Saplings/shrubs		Woody vines	
4.		10.	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 0. Other indicators: _____.

Hydrophytic vegetation: Yes ____ No ✓. Basis: Less than 50% of the dominant species are OBL, FACW and FAC.

Soil

Series and phase: Rock-Outcrop-Orthents On hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: — ; Matrix color: 10 yr 3/3

Gleyed: Yes ____ No ✓ Other indicators: —.

Hydric soils: Yes ____ No ✓; Basis: No positive hydric soil indicators present

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: —.

Saturated soils: Yes ____; No ✓. Depth to saturated soil: —.

Other indicators: —.

Wetland hydrology: Yes ____; No ✓. Basis: No positive hydrology indicators present

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-8W Section: _____

Vegetation (list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)). Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Juncus	
2.		8. Raphanus sativus	UPL
3.		9. Cyperus	
Saplings/shrubs		Woody vines	
4.		10. Mimulus guttatus	OBL
5.		11. Equisetum arvense	FAC
6.		12.	

% of species that are OBL, FACW, and/or FAC: 100. Other indicators: —.

Hydrophytic vegetation: Yes ✓ No ____. Basis: More than 50% of the dominant species are OBL, FACW, and FAC.

Soil

Series and phase: Rock-outcrop-Orthents On hydric soils list? Yes ____; No ✓.

Mottled: Yes ✓; No ____. Mottle color: 7.5 yr 3/4; Matrix color: 10 yr 3/2

Gleyed: Yes ____ No ✓ Other indicators: peraquic moisture regime

Hydric soils: Yes ✓ No ____; Basis: Low chroma matrix with mottling

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: —.

Saturated soils: Yes ✓; No ____. Depth to saturated soil: saturated throughout profile

Other indicators: Depression fed by permanent seep.

Wetland hydrology: Yes ✓; No ____. Basis: Visual observation of soil saturation.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland _____.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-8U Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Juncus	
2.		8. Raphanus sativus	UPL
3.		9. Oxalis pes-caprae	UPL
Saplings/shrubs		Woody vines	
4.		10. Rubus	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 0. Other indicators: —.

Hydrophytic vegetation: Yes ____ No ✓. Basis: Less than 50% of the dominant specie are OBL, FACW, and FAC.

Soil

Series and phase: Rock-outcrop-Orthents on hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: —; Matrix color: 10 yr 4/3 sand

Gleyed: Yes ____ No ✓ Other indicators: —.

Hydric soils: Yes ____ No ✓; Basis: No positive hydric soils indicators present

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: —.

Saturated soils: Yes ____; No ✓. Depth to saturated soil: —.

Other indicators: —.

Wetland hydrology: Yes ____; No ✓. Basis: No positive hydrology indicators present

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-9W Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Juncus	
2.		8. Scirpus	
3.		9. Potentilla egedii var. grandis	OBL
Saplings/shrubs		Woody vines	
4.		10. Raphanus sativus	UPL
5.		11. Polypogon monspeliensis	FACW+
6.		12.	

% of species that are OBL, FACW, and/or FAC: 67. Other indicators: _____.

Hydrophytic vegetation: Yes ✓ No ____. Basis: More than 50% of the dominant species are OBL, FACW, or FAC.

Soil

Series and phase: Rock-Outcrop-Orthents On hydric soils list? Yes____; No____.

Mottled: Yes ✓; No____. Mottle color: 10YR 4/6; Matrix color: 10YR 5/1 + 2.5Y 5/2

Gleyed: Yes____ No ✓ Other indicators: —.

Hydric soils: Yes ✓ No____; Basis: Low chroma matrix with mottling.

Hydrology

Inundated: Yes____; No ✓. Depth of standing water: —.

Saturated soils: Yes ✓; No____. Depth to saturated soil: Saturated throughout profile.

Other indicators: Wetland fed by several seeps.

Wetland hydrology: Yes ✓; No____. Basis: Visual observation of soil saturation.

Atypical situation: Yes____; No ✓.

Normal Circumstances? Yes ✓ No____.

Wetland Determination: Wetland ✓; Nonwetland _____.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-9U Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Lobularia maritima	UPL
2.		8. Mesembryanthemum sp.	
3.		9. Distichlis spicata	FACW
Saplings/shrubs		~~Woody vines~~	
4.		10. Cakile maritima	FACW
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 67. Other indicators: —.

Hydrophytic vegetation: Yes ✓ No ____. Basis: More than 50% of the dominant species are OBL, FACW and FAC.

Soil

Series and phase: Rock-outcrop-Orthents On hydric soils list? Yes____; No ✓.

Mottled: Yes____; No ✓. Mottle color: —; Matrix color: 10 yr 4/3 sand

Gleyed: Yes____ No ✓ Other indicators: —.

Hydric soils: Yes____ No ✓; Basis: No positive hydric soil indicators present

Hydrology

Inundated: Yes____; No ✓. Depth of standing water: —.

Saturated soils: Yes____; No ✓. Depth to saturated soil: —.

Other indicators: —.

Wetland hydrology: Yes____; No ✓. Basis: No positive hydrology indicators present

Atypical situation: Yes____; No ✓.

Normal Circumstances? Yes ✓ No____.

Wetland Determination: Wetland_____; Nonwetland ✓.

Comments: All three diagnostic environmental characteristics not present.

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-10W Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Juncus	
2.		8. Potentilla egedii var. grandis	OBL
3.		9. Raphanus sativus	UPL
Saplings/shrubs		Woody vines	
4.		10.	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 50. Other indicators: —.

Hydrophytic vegetation: Yes ✓ No ____. Basis: Wetland determination based on positive indicators of hydric soils and hydrology.

Soil

Series and phase: Rock-outcrop-Orthents On hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: —; Matrix color: 10 yr 2/2

Gleyed: Yes ____ No ✓ Other indicators: —.

Hydric soils: Yes ✓ No ____; Basis: Aquic moisture regime

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: —.

Saturated soils: Yes ✓; No ____. Depth to saturated soil: 14".

Other indicators: —.

Wetland hydrology: Yes ✓; No ____. Basis: Visual observation of soil saturation.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland ✓; Nonwetland _____.

Comments:

Determined by: S. Chamberlain

DATA FORM 1

WETLAND DETERMINATION

Applicant Name: GGNRA Application Number: _____ Project Name: Sutro Historic District

State: CA County: SF Legal Description: Township: ____ Range: ____

Date: 3-9-92 Plot No.: SHD-10U Section: _____

Vegetation [list the three dominant species in each vegetation layer (5 if only 1 or 2 layers)]. Indicate species with observed morphological or known physiological adaptations with an asterisk.

Species	Indicator Status	Species	Indicator Status
Trees		Herbs	
1.		7. Cakile maritima	FACW
2.		8. Raphanus sativus	UPL
3.		9.	
Saplings/shrubs		Woody vines	
4.		10.	
5.		11.	
6.		12.	

% of species that are OBL, FACW, and/or FAC: 50. Other indicators: _____

Hydrophytic vegetation: Yes ____ No ✓. Basis: ~~Less than or equal to 50% of the dominant~~ species are OBL, FACW, or FAC

Soil

Series and phase: ~~Rock-Outcrop-Orthents~~ On hydric soils list? Yes ____; No ✓.

Mottled: Yes ____; No ✓. Mottle color: — ; Matrix color: 2.5Y 3/3 + 10YR 3/3 sand

Gleyed: Yes ____ No ✓ Other indicators: —

Hydric soils: Yes ____ No ✓; Basis: No positive hydric soils indicators present

Hydrology

Inundated: Yes ____; No ✓. Depth of standing water: —

Saturated soils: Yes ____; No ✓. Depth to saturated soil: —

Other indicators: —

Wetland hydrology: Yes ____; No ✓. Basis: No positive hydrology indicators present.

Atypical situation: Yes ____; No ✓.

Normal Circumstances? Yes ✓ No ____.

Wetland Determination: Wetland _____; Nonwetland ✓.

Comments:

Determined by: S. Chamberlain

APPENDIX B.

WILDLIFE SPECIES LIST

Appendix B. Vertebrate and invertebrate wildlife species potentially occurring in the Sutro Historic District, San Francisco County, California.

COMMON NAME[1]	SCIENTIFIC NAME[1]	STATUS[2]	SOURCE[3]
Invertebrates			
Bumblebee scarab beetle	*Lichnanthe ursina*	FC2	G
Amphibians			
California newt	*Taricha torosa*		D
Ensatina	*Ensatina eschscholtzi*		D
California slender salamander	*Batrachoseps attenuatus*		D
Arboreal salamander	*Aneides lugubris*		D
Western toad	*Bufo boreas*		D
Pacific treefrog	*Hyla regilla*		D
California red-legged frog	*Rana aurora draytonii*	CSC, FC2	D
Reptiles			
Western fence lizard	*Sceloporus occidentalis*		D
Southern alligator lizard	*Gerrhonotus multicarinatus*		D
Northern alligator lizard	*Gerrhonotus coeruleus*		D
Rubber boa	*Charina bottae*		D
Gopher snake	*Pituophis melanoleucus*		D
Common kingsnake	*Lampropeltis getulus*		D
Western terrestrial garter snake	*Thamnophis elegans*		D
Birds			
Red-throated loon	*Gavia stellata*		C
Arctic loon	*Gavia arctica*		C
Common loon	*Gavia immer*	CSC(b)	C
Pied-billed grebe	*Podilymbus podiceps*		F
Horned grebe	*Podiceps auritus*		C
Red-necked grebe	*Podiceps grisegena*		C
Western grebe	*Aechmophorus occidentalis*		C
Clark's grebe	*Aechmophorus clarkii*		C
Pink-footed shearwater	*Puffinus creatopus*		C
Sooty shearwater	*Puffinus griseus*		C
Brown pelican	*Pelecanus occidentalis*	CE, FE	A
Double-crested cormorant	*Phalacrocorax auritus*	CSC(r)	A
Brandt's cormorant	*Phalacrocorax penicillatus*		C
Pelagic cormorant	*Phalacrocorax pelagicus*		C
Great blue heron	*Ardea herodias*		F
Great egret	*Casmerodius albus*		F
Snowy egret	*Egretta thula*		C
Cattle egret	*Bubulcus ibis*		F
Black-crowned night heron	*Nycticorax nycticorax*		C
Greater white-fronted goose	*Anser albifrons*		F
Brant	*Branta bernicla*		C
Mallard	*Anas platyrhynchos*		C
Northern pintail	*Anas acuta*		C

Appendix B. Vertebrate and invertebrate wildlife species potentially occurring in the Sutro Historic District, San Francisco County, California (cont.).

COMMON NAME[1]	SCIENTIFIC NAME[1]	STATUS[2]	SOURCE[3]
Canvasback	*Aythya valisineria*		A
Ring-necked duck	*Aythia collaris*		A
Tufted duck	*Aythya fuligula*		E
Greater scaup	*Aythya marila*		C
Lesser scaup	*Aythya affinis*		F
Black scoter	*Melanitta nigra*		C
Surf scoter	*Melanitta perspicillata*		C
White-winged scoter	*Melanitta fusca*		C
Common goldeneye	*Bucephala clangula*		C
Barrow's goldeneye	*Bucephala islandica*	CSC(b)	F
Bufflehead	*Bucephala albeola*	CSC(b)	F
Hooded merganser	*Lophodytes cucullatus*		F
Red-breasted merganser	*Mergus serrator*		C
Ruddy duck	*Oxyura jamaicensis*		A
Turkey vulture	*Cathartes aura*		C
Sharp-shinned hawk	*Accipiter striatus*	CSC(b)	C
Cooper's hawk	*Accipiter cooperii*	CSC(b)	C
Red-shouldered hawk	*Buteo lineatus*		F
Broad-winged hawk	*Buteo platypterus*		F
Red-tailed hawk	*Buteo jamaicensis*		A
American kestrel	*Falco sparverius*		C
Merlin	*Falco columbarius*	CSC	F
Peregrine falcon	*Falco peregrinus*	SE, FE	B
California quail	*Callipepla californica*		C
American coot	*Fulica americana*		A
Killdeer	*Charadrius vociferus*		C
Black oystercatcher	*Haematopus bachmani*		A
Greater yellowlegs	*Tringa melanoleuca*		C
Willet	*Catoptrophorus semipalmatus*		C
Wandering tattler	*Heteroscelus incanus*		A
Spotted sandpiper	*Actitis macularia*		A
Whimbrel	*Numenius phaeopus*		C
Long-billed curlew	*Numenius americanus*	CSC(b), F3C	C
Marbled godwit	*Limosa fedoa*		C
Ruddy turnstone	*Arenaria interpres*		C
Black turnstone	*Arenaria melanocephala*		A
Surfbird	*Aphriza virgata*		C
Sanderling	*Calidris alba*		C
Semipalmated plover	*Charadrius semipalmatus*		C
Western sandpiper	*Calidris mauri*		C
Least sandpiper	*Calidris minutilla*		C
Dunlin	*Calidris alpina*		C
Short-billed dowitcher	*Limnodromus griseus*		C
Common snipe	*Gallinago gallinago*		C
Red-necked phalarope	*Phalaropus lobatus*		
Bonaparte's gull	*Larus philadelphia*		C
Heermann's gull	*Larus heermanni*		C
Mew gull	*Larus canus*		C
Ring-billed gull	*Larus delawarensis*		C
California gull	*Larus californicus*	CSC(c)	C

Appendix B. Vertebrate and invertebrate wildlife species potentially occurring in the Sutro Historic District, San Francisco County, California (cont.).

COMMON NAME[1]	SCIENTIFIC NAME[1]	STATUS[2]	SOURCE[3]
Herring gull	*Larus argentatus*		C
Western gull	*Larus occidentalis*		A
Glaucous-winged gull	*Larus glaucescens*		C
Caspian tern	*Sterna caspia*		C
Elegant tern	*Sterna elegans*	CSC(c), FC2	C
Common tern	*Sterna hirundo*		C
Forster's tern	*Sterna forsteri*		C
Common murre	*Uria aalge*		C
Pigeon guillemot	*Cepphus columba*		C
Rock dove	*Columba livia*		A
Band-tailed pigeon	*Columba fasciata*		C
Mourning dove	*Zenaida macroura*		A
White-throated swift	*Aeronautes saxatalis*		C
Anna's hummingbird	*Calypte anna*		A
Rufous hummingbird	*Selasphorus rufus*		C
Allen's hummingbird	*Selasphorus sasin*		A
Belted kingfisher	*Ceryle alcyon*		C
Downy woodpecker	*Picoides pubescens*		B
Northern flicker	*Colaptes auratus*		A
Olive-sided flycatcher	*Contopus borealis*		B
Western wood-pewee	*Contopus sordidulus*		C
Pacific-slope flycatcher	*Empidonax difficilis*		C
Black phoebe	*Sayornis nigricans*		A
Tree swallow	*Tachycineta bicolor*		B
Violet-green swallow	*Tachycineta thalassina*		B
Northern rough-winged swallow	*Stelgidopteryx serripennis*		C
Cliff swallow	*Hirundo pyrrhonota*		C
Barn swallow	*Hirundo rustica*		B
Scrub jay	*Aphelocoma coerulescens*		B
American crow	*Corvus brachyrhynchos*		B
Common raven	*Corvus corax*		A
Chestnut-backed chickadee	*Parus rufescens*		A
Bushtit	*Psaltriparus minimus*		B
Red-breasted nuthatch	*Sitta canadensis*		C
Pygmy nuthatch	*Sitta pygmaea*		A
Brown creeper	*Certhia americana*		B
Bewick's wren	*Thryomanes bewickii*		C
Winter wren	*Troglodytes troglodytes*		C
Golden-crowned kinglet	*Regulus satrapa*		C
Ruby-crowned kinglet	*Regulus calendula*		A
Swainson's thrush	*Catharus ustulatus*		C
Hermit thrush	*Catharus guttatus*		C
American robin	*Turdus migratorius*		A
Varied thrush	*Ixoreus naevius*		F
Wrentit	*Chamaea fasciata*		C
Northern mockingbird	*Mimus polyglottos*		B
Cedar waxwing	*Bombycilla cedrorum*		C
European starling	*Sturnus vulgaris*		A
Hutton's vireo	*Vireo huttoni*		A
Warbling vireo	*Vireo gilvus*		C

Appendix B. Vertebrate and invertebrate wildlife species potentially occurring in the Sutro Historic District, San Francisco County, California (cont.).

COMMON NAME[1]	SCIENTIFIC NAME[1]	STATUS[2]	SOURCE[3]
Orange-crowned warbler	*Vermivora celata*		C
Nashville warbler	*Vermivora ruficapilla*		F
Yellow warbler	*Dendroica petechia brewsteri*	CSC(b)	C
Black-throated blue warbler	*Dendroica caerulescens*		F
Yellow-rumped warbler	*Dendroica coronata*		A
Black-throated gray warbler	*Dendroica nigrescens*		C
Townsend's warbler	*Dendroica townsendi*		C
Hermit warbler	*Dendroica occidentalis*		C
Macgillivray's warbler	*Oporornis tolmiei*		C
Saltmarsh common yellowthroat	*Geothlypis trichas sinuosa*	CSC	C
Wilson's warbler	*Wilsonia pusilla*		C
Black-headed grosbeak	*Pheucticus melanocephalus*		C
Lazuli bunting	*Passerina amoena*		C
Rufous-sided towhee	*Pipilo erythrophthalmus*		C
California towhee	*Pipilo crissalis*		A
Fox sparrow	*Passerella iliaca*		A
Song sparrow	*Melospiza melodia*		A
Lincoln's sparrow	*Melospiza lincolnii*		C
Golden-crowned sparrow	*Zonotrichia atricapilla*		A
White-throated sparrow	*Zonotrichia albicollis*		F
White-crowned sparrow	*Zonotrichia leucophrys*		A
Dark-eyed junco	*Junco hyemalis*		A
Red-winged blackbird	*Agelaius phoeniceus*		C
Western meadowlark	*Sturnella neglecta*		C
Brewer's blackbird	*Euphagus cyanocephalus*		A
Brown-headed cowbird	*Molothrus ater*		B
Hooded oriole	*Icterus cucullatus*		B
Northern oriole	*Icterus galbula*		B
Purple finch	*Carpodacus purpureus*		A
House finch	*Carpodacus mexicanus*		B
Red crossbill	*Loxia curvirostra*		F
Pine siskin	*Carduelis pinus*		B
Lesser goldfinch	*Carduelis psaltria*		C
American goldfinch	*Carduelis tristis*		C
House sparrow	*Passer domesticus*		B
Mammals			
Virginia opossum	*Didelphis virginiana*		D
Vagrant shrew	*Sorex vagrans*		D
Ornate shrew	*Sorex ornatus*		D
Trowbridge's shrew	*Sorex trowbridgii*		D
Shrew-mole	*Neurotrichus gibbsii*		D
Broad-footed mole	*Scapanus latimanus*		D
Yuma myotis	*Myotis yumanensis*		D
Long-eared myotis	*Myotis evotis*		D
Long-legged myotis	*Myotis volans*		D
California myotis	*Myotis californicus*		D
Big brown bat	*Eptesicus fuscus*		D
Red bat	*Lasiurus borealis*		D

Appendix B. Vertebrate and invertebrate wildlife species potentially occurring in the Sutro Historic District, San Francisco County, California (cont.).

COMMON NAME[1]	SCIENTIFIC NAME[1]	STATUS[2]	SOURCE[3]
Townsend's western big-eared bat	*Plecotus townsendii townsendii*	CSC, FC2	D
Brazilian free-tailed bat	*Tadarida brasiliensis*		D
Brush rabbit	*Sylvilagus bachmani*		D
Desert cottontail	*Sylvilagus audubonii*		D
Black-tailed hare	*Lepus californicus*		D
California ground squirrel	*Spermophilus beecheyi*		A
Eastern gray squirrel	*Sciurus carolinensis*		D
Western gray squirrel	*Sciurus griseus*		D
Eastern fox squirrel	*Sciurus niger*		A
Botta's pocket gopher	*Thomomys bottae*		D
Western harvest mouse	*Reithrodontomys megalotis*		D
California mouse	*Peromyscus californicus*		D
Deer mouse	*Peromyscus maniculatus*		D
Pinyon mouse	*Peromyscus truei*		D
Dusky-footed woodrat	*Neotoma fuscipes*		D
California vole	*Microtus californicus*		D
Black rat	*Rattus rattus*		D
Norway rat	*Rattus norvegicus*		D
House mouse	*Mus musculus*		D
Gray fox	*Urocyon cinereoargenteus*		D
Raccoon	*Procyon lotor*		A
Long-tailed weasel	*Mustela frenata*		D
Striped skunk	*Mephitis mephitis*		D
Feral house cat	*Felis cattus*		A
Northern sea lion	*Eumetopias jubatus*	FT	D
California sea lion	*Zalophus californianus*		D
Harbor seal	*Phoca vitulina*		D
Northern elephant seal	*Mirounga angustirostris*		D
Black-tailed deer	*Odocoileus hemionus*		D

1 Common and scientific names follow Laudenslayer et al. 1991.

2 CSC: California species of special concern, a designation given by California Department of Fish and Game (CDFG) to native taxa whose state breeding populations are of special concern because they may face extirpation.
CSC(b,r,c): only breeding habitat (b), rookery sites (r), or nesting colonies (c) are being tracked by CDFG.
CE: state-listed as endangered under the California Endangered Species Act; native taxa in serious danger of becoming extinct throughout all or a significant portion of their range.
FE: federally endangered under the federal Endangered Species Act (ESA); taxa in danger of extinction throughout all or a significant portion of their range.
FT: federally threatened under the federal ESA; taxa which are likely to become endangered in the foreseeable future throughout all or a significant portion of their range.
FC2: category 2 candidate for federal listing as threatened or endangered; taxa for which existing information indicates listing may be warranted, but for which substantial biological information to support a proposal is not currently available.
F3C: category 3C candidate for federal listing; taxa that have proven to be more abundant or widespread than previously believed and/or are not subject to any identifiable threat.

3 No specific field surveys were conducted by any of these sources. BioSystems' observations were recorded on site visits.
A = Observed by BioSystems biologists 1992.
B = Observed by Fish 1989.
C = Sutherland 1971 as cited in Royston, Hanamoto, Beck, and Abbey (1975).
D = Environmental Impact Planning Corp. 1975 as cited in Royston, Hanamoto, Beck, and Abbey (1975).
E = Steve Bailey, California Academy of Science, pers. comm.
F = Golden Gate Audubon Society, pers. comm.
G = California Natural Diversity Data Base (CNDDB).

APPENDIX C.

WILDLIFE-HABITAT RELATIONSHIPS (WHR) DATA BASE SUMMARY SPECIES LIST

CALIFORNIA DEPARTMENT OF FISH AND GAME WILDLIFE HABITAT RELATIONSHIP SYSTEM
PROGRAMMED BY IRENE TIMOSSI FOR PACIFIC GAS AND ELECTRIC COMPANY

Database Version: 08/08/89 11:48:11 02/12/92

SPECIES SUMMARY LIST

SELECTION CRITERIA:

Locations:
SAN FRANCISCO COUNTY

Habitats:

1	CLOSED-CONE PINE-CYPRESS	MED/LARGE TREE	SPARSE	10-24%	(5S)
2	CLOSED-CONE PINE-CYPRESS	MED/LARGE TREE	OPEN	25-39%	(5P)
3	CLOSED-CONE PINE-CYPRESS	MED/LARGE TREE	MODRTE	40-59%	(5M)
4	CLOSED-CONE PINE-CYPRESS	MED/LARGE TREE	DENSE	60-100%	(5D)
5	COASTAL SCRUB	SEEDLING SHRUB			(1)
6	COASTAL SCRUB	YOUNG SHRUB	SPARSE	10-24%	(2S)
7	COASTAL SCRUB	YOUNG SHRUB	OPEN	25-39%	(2P)
8	COASTAL SCRUB	YOUNG SHRUB	MODRTE	40-59%	(2M)
9	COASTAL SCRUB	YOUNG SHRUB	DENSE	60-100%	(2D)
10	COASTAL SCRUB	MATURE SHRUB	SPARSE	10-24%	(3S)
11	COASTAL SCRUB	MATURE SHRUB	OPEN	25-39%	(3P)
12	COASTAL SCRUB	MATURE SHRUB	MODRTE	40-59%	(3M)
13	COASTAL SCRUB	MATURE SHRUB	DENSE	60-100%	(3D)
14	COASTAL SCRUB	DECADENT SHRUB	SPARSE	10-24%	(4S)
15	COASTAL SCRUB	DECADENT SHRUB	OPEN	25-39%	(4P)
16	COASTAL SCRUB	DECADENT SHRUB	MODRTE	40-59%	(4M)
17	COASTAL SCRUB	DECADENT SHRUB	DENSE	60-100%	(4D)
18	RESIDENTIAL-PARK				(1)
19	BARREN				(1)
20	MARINE	INTERTIDAL	SAND		(3S)
21	MARINE	INTERTIDAL	GRAVEL/COBBLE		(3G)
22	MARINE	INTERTIDAL	RUBBLE/BOULDERS		(3R)
23	MARINE	INTERTIDAL	BEDROCK		(3B)
24	MARINE	SHORE	SAND		(4S)
25	MARINE	SHORE	GRAVEL/COBBLE		(4G)
26	MARINE	SHORE	RUBBLE/BOULDERS		(4R)
27	MARINE	SHORE	BEDROCK		(4B)
28	LACUSTRINE	LIMNETIC			(1)
29	LACUSTRINE	SUBMERGED	MUD		(2M)
30	LACUSTRINE	SUBMERGED	SAND		(2S)
31	LACUSTRINE	SHORE	MUD		(4M)
32	LACUSTRINE	SHORE	SAND		(4S)

ID	SPECIES NAME	SCIENTIFIC NAME	FAMILY	STATUS 12345678 FFCCCFBH ETETPSS	CAL SC
A001	#TIGER SALAMANDER	Ambystoma tigrinum	AMBYSTOMATIDAE		
A006	#ROUGH-SKINNED NEWT	Taricha granulosa	SALAMANDRIDAE		
A007	#CALIFORNIA NEWT	Taricha torosa	SALAMANDRIDAE		
A012	#ENSATINA	Ensatina eschscholtzi	PLETHODONTIDAE		
A014	#CALIFORNIA SLENDER SALAMANDER	Batrachoseps attenuatus	PLETHODONTIDAE		
A032	#WESTERN TOAD	Bufo boreas	BUFONIDAE		
A039	#PACIFIC TREEFROG	Hlya regilla	HYLIDAE		
A040	#RED-LEGGED FROG	Rana aurora	RANIDAE		
A043	#FOOTHILL YELLOW-LEGGED FROG	Rana boylei	RANIDAE		
A046	#BULLFROG	Rana catesbeiana	RANIDAE	8	
B002	#ARCTIC LOON	Gavia arctica	GAVIIDAE		
B003	COMMON LOON	Gavia immer	GAVIIDAE		1
B006	#PIED-BILLED GREBE	Podilymbus podiceps	PODICIPEDIDAE		
B008	#RED-NECKED GREBE	Podiceps grisegena	PODICIPEDIDAE		
B009	#EARED GREBE	Podiceps nigricollis	PODICIPEDIDAE		
B010	#WESTERN GREBE / CLARK'S GREBE	Aechmophorus occidentalis / Clarkii	PODICIPEDIDAE		
B042	#AMERICAN WHITE PELICAN	Pelecanus erythrorhynchos	PELECANIDAE		1
B043	#BROWN PELICAN	Pelecanus occidentalis	PELECANIDAE	1 3	
B044	#DOUBLE-CRESTED CORMORANT	Phalacrocorax auritus	PHALACROCORACIDAE		1
B046	#BRANDT'S CORMORANT	Phalacrocorax penicillatus	PHALACROCORACIDAE		
B047	#PELAGIC CORMORANT	Phalacrocorax pelagicus	PHALACROCORACIDAE		
B049	#AMERICAN BITTERN	Botaurus lentiginosus	ARDEIDAE		
B051	#GREAT BLUE HERON	Ardea herodias	ARDEIDAE		
B052	#GREAT EGRET	Casmerodius albus	ARDEIDAE		
B053	#SNOWY EGRET	Egretta thula	ARDEIDAE		
B057	#CATTLE EGRET	Bubulcus ibis	ARDEIDAE		
B058	GREEN-BACKED HERON	Butorides striatus	ARDEIDAE		
B059	BLACK-CROWNED NIGHT HERON	Nycticorax nycticorax	ARDEIDAE		
B062	#WHITE-FACED IBIS	Plegadis chihi	THRESKIORNITHIDAE		1
B075	#CANADA GOOSE	Branta canadensis	ANATIDAE	8	
B076	#WOOD DUCK	Aix sponsa	ANATIDAE	8	
B077	#GREEN-WINGED TEAL	Anas crecca	ANATIDAE	8	
B079	#MALLARD	Anas platyrhynchos	ANATIDAE	8	
B080	#NORTHERN PINTAIL	Anas acuta	ANATIDAE	8	
B082	#BLUE-WINGED TEAL	Anas discors	ANATIDAE	8	
B083	#CINNAMON TEAL	Anas cyanoptera	ANATIDAE	8	
B084	#NORTHERN SHOVELER	Anas clypeata	ANATIDAE	8	
B085	#GADWALL	Anas strepera	ANATIDAE	8	

B086 #EURASIAN WIGEON	Anas penelope	ANATIDAE	8
B087 #AMERICAN WIGEON	Anas americana	ANATIDAE	8
B089 #CANVASBACK	Aythya valisineria	ANATIDAE	
B090 #REDHEAD	Aythya americana	ANATIDAE	8
B091 #RING-NECKED DUCK	Aythya collaris	ANATIDAE	8
B093 #GREATER SCAUP	Aythya marila	ANATIDAE	8
B094 #LESSER SCAUP	Aythya affinis	ANATIDAE	8
B096 #HARLEQUIN DUCK	Histrionicus histrionicus	ANATIDAE	8
B097 #OLDSQUAW	Clangula hyemalis	ANATIDAE	8

ID	SPECIES NAME	SCIENTIFIC NAME	FAMILY	STATUS 12345678 FFCCCFBH ETETPSS	CAL SC
B098	#BLACK SCOTER	Melanitta nigra	ANATIDAE	8	
B099	#SURF SCOTER	Melanitta perspicillata	ANATIDAE	8	
B100	#WHITE-WINGED SCOTER	Melanitta fusca	ANATIDAE	8	
B101	#COMMON GOLDENEYE	Bucephala clangula	ANATIDAE	8	
B102	#BARROW'S GOLDENEYE	Bucephala islandica	ANATIDAE	8	1
B103	#BUFFLEHEAD	Bucephala albeola	ANATIDAE	8	
B104	#HOODED MERGANSER	Lophodytes cucullatus	ANATIDAE	8	
B105	#COMMON MERGANSER	Mergus merganser	ANATIDAE	8	
B106	#RED-BREASTED MERGANSER	Mergus serrator	ANATIDAE	8	
B107	#RUDDY DUCK	Oxyura jamaicensis	ANATIDAE	8	
B108	#TURKEY VULTURE	Cathartes aura	CATHARTIDAE		
B110	#OSPREY	Pandion haliaetus	ACCIPITRIDAE	6	1
B111	#BLACK-SHOULDERED KITE	Elanus caeruleus	ACCIPITRIDAE	5	
B113	#BALD EAGLE	Haliaeetus leucocephalus	ACCIPITRIDAE	1 3 5	
B114	#NORTHERN HARRIER	Circus cyaneus	ACCIPITRIDAE		1
B115	#SHARP-SHINNED HAWK	Accipiter striatus	ACCIPITRIDAE		1
B116	#COOPER'S HAWK	Accipiter cooperii	ACCIPITRIDAE		1
B119	#RED-SHOULDERED HAWK	Buteo lineatus	ACCIPITRIDAE		
B123	#RED-TAILED HAWK	Buteo jamaicensis	ACCIPITRIDAE		
B124	#FERRUGINOUS HAWK	Buteo regalis	ACCIPITRIDAE		1
B125	#ROUGH-LEGGED HAWK	Buteo lagopus	ACCIPITRIDAE		
B126	#GOLDEN EAGLE	Aquila chrysaetos	ACCIPITRIDAE	56	1
B127	#AMERICAN KESTREL	Falco sparverius	FALCONIDAE		
B128	#MERLIN	Falco columbarius	FALCONIDAE		1
B129	#PEREGRINE FALCON	Falco peregrinus	FALCONIDAE	1 3 5	
B131	#PRAIRIE FALCON	Falco mexicanus	FALCONIDAE	6	
B140	#CALIFORNIA QUAIL	Callipepla californica	PHASIANIDAE	8	
B143	#BLACK RAIL	Laterallus jamaicensis	RALLIDAE	45	
B144	#CLAPPER RAIL	Rallus longirostris	RALLIDAE	1 345	
B148	#COMMON MOORHEN	Gallinula chloropus	RALLIDAE	8	
B149	#AMERICAN COOT	Fulica americana	RALLIDAE	8	
B151	#BLACK-BELLIED PLOVER	Pluvialis squatarola	CHARADRIIDAE		
B154	#SNOWY PLOVER	Charadrius alexandrinus	CHARADRIIDAE		2
B156	#SEMIPALMATED PLOVER	Charadrius semipalmatus	CHARADRIIDAE		
B158	#KILLDEER	Charadrius vociferus	CHARADRIIDAE		
B162	#BLACK OYSTERCATCHER	Haematopus bachmani	HAEMATOPODIDAE		
B163	#BLACK-NECKED STILT	Himantopus mexicanus	RECURVIROSTRIDAE		
B164	#AMERICAN AVOCET	Recurvirostra americana	RECURVIROSTRIDAE		

B165	#GREATER YELLOWLEGS	Tringa melanoleuca	SCOLOPACIDAE
B166	#LESSER YELLOWLEGS	Tringa flavipes	SCOLOPACIDAE
B168	#WILLET	Catoptrophorus semipalmatus	SCOLOPACIDAE
B169	#WANDERING TATTLER	Heteroscelus incanus	SCOLOPACIDAE
B170	#SPOTTED SANDPIPER	Actitis macularia	SCOLOPACIDAE
B172	#WHIMBREL	Numenius phaeopus	SCOLOPACIDAE
B173	#LONG-BILLED CURLEW	Numenius americanus	SCOLOPACIDAE
B176	#MARBLED GODWIT	Limosa fedoa	SCOLOPACIDAE
B177	#RUDDY TURNSTONE	Arenaria interpres	SCOLOPACIDAE

ID	SPECIES NAME	SCIENTIFIC NAME	FAMILY	STATUS 12345678 FFCCCFBH ETETPSS	CAL SC
B178	#BLACK TURNSTONE	Arenaria melanocephala	SCOLOPACIDAE		
B179	#SURFBIRD	Aphriza virgata	SCOLOPACIDAE		
B181	#SANDERLING	Calidris alba	SCOLOPACIDAE		
B183	#WESTERN SANDPIPER	Calidris mauri	SCOLOPACIDAE		
B185	#LEAST SANDPIPER	Calidris minutilla	SCOLOPACIDAE		
B191	#DUNLIN	Calidris alpina	SCOLOPACIDAE		
B196	#SHORT-BILLED DOWITCHER	Limnodromus griseus	SCOLOPACIDAE		
B197	#LONG-BILLED DOWITCHER	Limnodromus scolopaceus	SCOLOPACIDAE		
B199	#COMMON SNIPE	Gallinago gallinago	SCOLOPACIDAE		
B211	#BONAPARTE'S GULL	Larus philadelphia	LARIDAE		
B212	#HEERMANN'S GULL	Larus heermanni	LARIDAE		
B213	#MEW GULL	Larus canus	LARIDAE		
B214	#RING-BILLED GULL	Larus delawarensis	LARIDAE		
B215	#CALIFORNIA GULL	Larus californicus	LARIDAE		
B216	HERRING GULL	Larus argentatus	LARIDAE		
B217	#THAYER'S GULL	Larus thayeri	LARIDAE		
B220	#WESTERN GULL	Larus occidentalis	LARIDAE		
B221	GLAUCOUS-WINGED GULL	Larus glaucescens	LARIDAE		
B229	ELEGANT TERN	Sterna elegans	LARIDAE		1
B231	#COMMON TERN	Sterna hirundo	LARIDAE		
B233	#FORSTER'S TERN	Sterna forsteri	LARIDAE		
B234	#LEAST TERN	Sterna antillarum	LARIDAE	1 3	
B237	#COMMON MURRE	Uria aalge	ALCIDAE		
B239	#PIGEON GUILLEMOT	Cepphus columba	ALCIDAE		
B244	#CASSIN'S AUKLET	Ptychoramphus aleuticus	ALCIDAE		
B247	#RHINOCEROS AUKLET	Cerorhinca monocerata	ALCIDAE		1
B250	#ROCK DOVE	Columba livia	COLUMBIDAE	8	
B251	#BAND-TAILED PIGEON	Columba fasciata	COLUMBIDAE	8	
B255	#MOURNING DOVE	Zenaida macroura	COLUMBIDAE	8	
B262	#COMMON BARN OWL	Tyto alba	TYTONIDAE		
B264	#WESTERN SCREECH OWL	Otus kennicottii	STRIGIDAE		
B265	#GREAT HORNED OWL	Bubo virginianus	STRIGIDAE		
B267	#NORTHERN PYGMY OWL	Glaucidium gnoma	STRIGIDAE		
B269	#BURROWING OWL	Athene cunicularia	STRIGIDAE		1
B273	#SHORT-EARED OWL	Asio flammeus	STRIGIDAE		1
B274	#NORTHERN SAW-WHET OWL	Aegolius acadicus	STRIGIDAE		
B277	#COMMON POORWILL	Phalaenoptilus nuttallii	CAPRIMULGIDAE		
B281	#VAUX'S SWIFT	Chaetura vauxi	APODIDAE		

B282	#WHITE-THROATED SWIFT	Aeronautes saxatalis	APODIDAE
B287	#ANNA'S HUMMINGBIRD	Calypte anna	TROCHILIDAE
B292	#ALLEN'S HUMMINGBIRD	Selasphorus sasin	TROCHILIDAE
B293	#BELTED KINGFISHER	Ceryle alcyon	ALCEDINIDAE
B294	#LEWIS' WOODPECKER	Melanerpes lewis	PICIDAE
B296	#ACORN WOODPECKER	Melanerpes formicivorus	PICIDAE
B299	#RED-BREASTED SAPSUCKER	Sphyrapicus ruber	PICIDAE
B302	#NUTTALL'S WOODPECKER	Picoides nuttallii	PICIDAE
B303	#DOWNY WOODPECKER	Picoides pubescens	PICIDAE

ID	SPECIES NAME	SCIENTIFIC NAME	FAMILY	STATUS 12345678 FFCCCFBH ETETPSS	CAL SC
B304	#HAIRY WOODPECKER	Picoides villosus	PICIDAE		
B307	#NORTHERN FLICKER	Colaptes auratus	PICIDAE		
B311	#WESTERN WOOD-PEWEE	Contopus sordioulus	TYRANNIDAE		
B320	#WESTERN FLYCATCHER	Empidonax difficilis	TYRANNIDAE		
B321	#BLACK PHOEBE	Sayornis nigricans	TYRANNIDAE		
B323	#SAY'S PHOEBE	Sayornis saya	TYRANNIDAE		
B333	#WESTERN KINGBIRD	Tyrannus verticalis	TYRANNIDAE		
B337	#HORNED LARK	Eremophila alpestris	ALAUDIDAE		
B338	#PURPLE MARTIN	Progne subis	HIRUNDINIDAE		1
B339	#TREE SWALLOW	Tachycineta bicolor	HIRUNDINIDAE		
B340	#VIOLET-GREEN SWALLOW	Tachycineta thalassina	HIRUNDINIDAE		
B341	#NORTHERN ROUGH-WINGED SWALLOW	Stelgidopteryx serripennis	HIRUNDINIDAE		
B343	#CLIFF SWALLOW	Hirundo pyrrhonota	HIRUNDINIDAE		
B344	#BARN SWALLOW	Hirundo rustica	HIRUNDINIDAE		
B346	#STELLER'S JAY	Cyanocitta stelleri	CORVIDAE		
B348	#SCRUB JAY	Aphelocoma coerulescens	CORVIDAE		
B353	#AMERICAN CROW	Corvus brachyrhvnchos	CORVIDAE	8	
B354	#COMMON RAVEN	Corvus corax	CORVIDAE		
B357	#CHESTNUT-BACKED CHICKADEE	Parus rufescens	PARIDAE		
B358	#PLAIN TITMOUSE	Parus inornatus	PARIDAE		
B360	#BUSHTIT	Psaltriparus minimus	AEGITHALIDAE		
B361	#RED-BREASTED NUTHATCH	Sitta canadensis	SITTIDAE		
B363	#PYGMY NUTHATCH	Sitta pygmaea	SITTIDAE		
B364	#BROWN CREEPER	Certhia americana	CERTHIIDAE		
B366	#ROCK WREN	Salpinctes obsoletus	TROGLODYTIDAE		
B367	#CANYON WREN	Catherpes mexicanus	TROGLODYTIDAE		
B368	#BEWICK'S WREN	Thryomanes bewickii	TROGLODYTIDAE		
B369	#HOUSE WREN	Troglodytes aedon	TROGLODYTIDAE		
B370	#WINTER WREN	Troglodytes troglodytes	TROGLODYTIDAE		
B375	#GOLDEN-CROWNED KINGLET	Regulus satrapa	MUSCICAPIDAE		
B376	#RUBY-CROWNED KINGLET	Regulus calendula	MUSCICAPIDAE		
B377	#BLUE-GRAY GNATCATCHER	Polioptila caerulea	MUSCICAPIDAE		1
B380	#WESTERN BLUEBIRD	Sialia mexicana	MUSCICAPIDAE		
B385	#SWAINSON'S THRUSH	Catharus ustulatus	MUSCICAPIDAE		
B386	#HERMIT THRUSH	Catharus guttatus	MUSCICAPIDAE		
B389	#AMERICAN ROBIN	Turdus migratorius	MUSCICAPIDAE		
B390	#VARIED THRUSH	Ixoreus naevius	MUSCICAPIDAE		
B391	#WRENTIT	Chamaea fasciata	MUSCICAPIDAE		

B393	#NORTHERN MOCKINGBIRD	Mimus polyglottos	MIMIDAE
B398	#CALIFORNIA THRASHER	Toxostoma redivivum	MIMIDAE
B404	#WATER PIPIT	Anthus spinoletta	MOTACILLIDAE
B407	#CEDAR WAXWING	Bombycilla cedrorum	BOMBYCILLIDAE
B410	#LOGGERHEAD SHRIKE	Lanius ludovicianus	LANIIDAE
B411	#EUROPEAN STARLING	Sturnus vulgaris	STURNIDAE
B417	#HUTTON'S VIREO	Vireo huttoni	VIREONIDAE
B418	WARBLING VIREO	Vireo gilvus	VIREONIDAE
B425	#ORANGE-CROWNED WARBLER	Vermivora celata	EMBERIZIDAE

ID	SPECIES NAME	SCIENTIFIC NAME	FAMILY	STATUS 12345678 FFCCCFBH ETETPSS	CAL SC
B430	#YELLOW WARBLER	Dendroica petechia	EMBERIZIDAE		1
B435	#YELLOW-RUMPED WARBLER	Dendroica coronata	EMBERIZIDAE		
B436	#BLACK-THROATED GRAY WARBLER	Dendroica nigrescens	EMBERIZIDAE		
B437	#TOWNSEND'S WARBLER	Dendroica townsendi	EMBERIZIDAE		
B460	#MACGILLIVRAY'S WARBLER	Oporornis tolmiei	EMBERIZIDAE		
B463	#WILSON'S WARBLER	Wilsonia pusilla	EMBERIZIDAE		
B475	#BLACK-HEADED GROSBEAK	Pheucticus melanocephalus	EMBERIZIDAE		
B477	#LAZULI BUNTING	Passerina amoena	EMBERIZIDAE		
B483	#RUFOUS-SIDED TOWHEE	Pipilo erythrophthalmus	EMBERIZIDAE		
B484	#BROWN TOWHEE	Pipilo fuscus	EMBERIZIDAE		
B487	#RUFOUS-CROWNED SPARROW	Aimophila ruficeps	EMBERIZIDAE		
B489	#CHIPPING SPARROW	Spizella passerina	EMBERIZIDAE		
B495	#LARK SPARROW	Chondestes grammacus	EMBERIZIDAE		
B497	#SAGE SPARROW	Amphispiza belli	EMBERIZIDAE		
B499	#SAVANNAH SPARROW	Passerculus sandwichensis	EMBERIZIDAE		1
B504	#FOX SPARROW	Passerella iliaca	EMBERIZIDAE		
B505	#SONG SPARROW	Melospiza melodia	EMBERIZIDAE		1
B506	#LINCOLN'S SPARROW	Melospiza lincolnii	EMBERIZIDAE		
B509	#GOLDEN-CROWNED SPARROW	Zonotrichia atricapilla	EMBERIZIDAE		
B510	#WHITE-CROWNED SPARROW	Zonotrichia leucophrys	EMBERIZIDAE		
B512	#DARK-EYED JUNCO	Junco hyemalis	EMBERIZIDAE		
B519	#RED-WINGED BLACKBIRD	Agelaius phoeniceus	EMBERIZIDAE		
B520	#TRICOLORED BLACKBIRD	Agelaius tricolor	EMBERIZIDAE		1
B521	#WESTERN MEADOWLARK	Sturnella neglecta	EMBERIZIDAE		
B524	#BREWER'S BLACKBIRD	Euphagus cyanocephalus	EMBERIZIDAE		
B528	#BROWN-HEADED COWBIRD	Molothrus ater	EMBERIZIDAE		
B530	#HOODED ORIOLE	Icterus cucullatus	EMBERIZIDAE		
B532	#NORTHERN ORIOLE	Icterus galbula	EMBERIZIDAE		
B536	#PURPLE FINCH	Carpodacus purpureus	FRINGILLIDAE		
B538	#HOUSE FINCH	Carpodacus mexicanus	FRINGILLIDAE		
B539	#RED CROSSBILL	Loxia curvirostra	FRINGILLIDAE		
B542	#PINE SISKIN	Carduelis pinus	FRINGILLIDAE		
B543	#LESSER GOLDFINCH	Carduelis psaltria	FRINGILLIDAE		
B545	#AMERICAN GOLDFINCH	Carduelis tristis	FRINGILLIDAE		
B546	#EVENING GROSBEAK	Coccothraustes vespertinus	FRINGILLIDAE		
B547	#HOUSE SPARROW	Passer domesticus	PASSERIDAE		
M001	#VIRGINIA OPOSSUM	Didelphis virginiana	DIDELPHIDAE		
M003	#VAGRANT SHREW	Sorex vagrans	SORICIDAE		1

M006	ORNATE SHREW	Sorex ornatus	SORICIDAE	1
M012	#TROWBRIDGE'S SHREW	Sorex trowbridgii	SORICIDAE	
M018	#BROAD-FOOTED MOLE	Scapanus latimanus	TALPIDAE	
M023	#YUMA MYOTIS	Myotis yumanensis	VESPERTILIONIDAE	
M025	#LONG-EARED MYOTIS	Myotis evotis	VESPERTILIONIDAE	
M026	#FRINGED MYOTIS	Myotis thysanodes	VESPERTILIONIDAE	
M027	#LONG-LEGGED MYOTIS	Myotis volans	VESPERTILIONIDAE	
M028	#CALIFORNIA MYOTIS	Myotis californicus	VESPERTILIONIDAE	
M031	#WESTERN PIPISTRELLE	Pipistrellus hesperus	VESPERTILIONIDAE	

ID	SPECIES NAME	SCIENTIFIC NAME	FAMILY	STATUS 12345678 FFCCCFBH ETETPSS	CAL SC
M032	#BIG BROWN BAT	Eptesicus fuscus	VESPERTILIONIDAE		
M033	#RED BAT	Lasiurus borealis	VESPERTILIONIDAE		
M034	#HOARY BAT	Lasiurus cinereus	VESPERTILIONIDAE		
M037	#TOWNSEND'S BIG-EARED BAT	Plecotus townsendii	VESPERTILIONIDAE		1
M038	#PALLID BAT	Antrozous pallidus	VESPERTILIONIDAE		1
M039	#BRAZILIAN FREE-TAILED BAT	Tadarida brasiliensis	MOLOSSIDAE		
M042	#WESTERN MASTIFF BAT	Eumops perotis	MOLOSSIDAE		1
M045	#BRUSH RABBIT	Sylvilagus bachmani	LEPORIDAE	8	1
M047	#DESERT COTTONTAIL	Sylvilagus audubonii	LEPORIDAE	8	
M051	#BLACK-TAILED HARE	Lepus californicus	LEPORIDAE	8	
M072	#CALIFORNIA GROUND SQUIRREL	Spermophilus beecheyi	SCIURIDAE		
M076	#GRAY SQUIRREL	Sciurus carolinensis	SCIURIDAE	8	
M081	#BOTTA'S POCKET GOPHER	Thomomys bottae	GEOMYIDAE		
M102	#NARROW-FACED KANGAROO RAT	Dipodomys venustus	HETEROMYIDAE		
M113	#WESTERN HARVEST MOUSE	Reithrodontomys megalotis	CRICETIDAE		1
M116	CALIFORNIA MOUSE	Peromyscus californicus	CRICETIDAE		
M117	DEER MOUSE	Peromyscus maniculatus	CRICETIDAE		1
M120	#PINYON MOUSE	Peromyscus truei	CRICETIDAE		
M127	#DUSKY-FOOTED WOODRAT	Neotoma fuscipes	CRICETIDAE		1
M134	#CALIFORNIA VOLE	Microtus californicus	CRICETIDAE		1
M139	#MUSKRAT	Ondatra zibethicus	CRICETIDAE		
M140	#BLACK RAT	Rattus rattus	MURIDAE		
M141	#NORWAY RAT	Rattus norvegicus	MURIDAE		
M142	#HOUSE MOUSE	Mus musculus	MURIDAE		
M146	#COYOTE	Canis latrans	CANIDAE	8	
M149	#GRAY FOX	Urocyon cinereoargenteus	CANIDAE	8	
M152	#RINGTAIL	Bassariscus astutus	PROCYONIDAE	5	
M153	#RACCOON	Procyon lotor	PROCYONIDAE	8	
M157	#LONG-TAILED WEASEL	Mustela frenata	MUSTELIDAE	8	
M158	#MINK	Mustela vison	MUSTELIDAE	8	
M160	#BADGER	Taxidea taxus	MUSTELIDAE	8	1
M161	#WESTERN SPOTTED SKUNK	Spilogale gracilis	MUSTELIDAE	8	1
M162	#STRIPED SKUNK	Mephitis mephitis	MUSTELIDAE	8	
M166	#BOBCAT	Felis rufus	FELIDAE	8	
M169	#NORTHERN SEA LION	Eumetopias jubatus	OTARIIDAE		
M170	#CALIFORNIA SEA LION	Zalophus californianus	OTARIIDAE		
M171	#HARBOR SEAL	Phoca vitulina	PHOCIDAE		
M173	#NORTHERN ELEPHANT SEAL	Mirounga angustirostris	PHOCIDAE	5	

M181 #MULE DEER	Odocoileus hemionus	CERVIDAE	8
R004 #WESTERN POND TURTLE	Clemmys marmorata	EMYDIDAE	
R022 #WESTERN FENCE LIZARD	Sceloporus occidentalis	IGUANIDAE	
R029 #COAST HORNED LIZARD	Phrynosoma coronatum	IGUANIDAE	
R036 #WESTERN SKINK	Eumeces skiltonianus	SCINCIDAE	
R040 #SOUTHERN ALLIGATOR LIZARD	Gerrhonotus multicarinatus	ANGUIDAE	
R048 #RINGNECK SNAKE	Diadophis punctatus	COLUBRIDAE	
R049 #SHARP-TAILED SNAKE	Contia tenuis	COLUBRIDAE	
R051 #RACER	Coluber constrictor	COLUBRIDAE	

ID	SPECIES NAME	SCIENTIFIC NAME	FAMILY	STATUS 12345678 FFCCCFBH ETETPSS	CAL SC
R053	#CALIFORNIA WHIPSNAKE	Masticophis lateralis	COLUBRIDAE		
R057	#GOPHER SNAKE	Pituophis melanoleucus	COLUBRIDAE		
R058	#COMMON KINGSNAKE	Lampropeltis getulus	COLUBRIDAE		
R061	#COMMON GARTER SNAKE	Thamnophis sirtalis	COLUBRIDAE		
R062	#WESTERN TERRESTRIAL GARTER SNAKE	Thamnophis elegans	COLUBRIDAE		
R063	#WESTERN AQUATIC GARTER SNAKE	Thamnophis couchi	COLUBRIDAE		
R076	#WESTERN RATTLESNAKE	Crotalus viridis	VIPERIDAE		

TOTAL SPECIES: 289

= this symbol next to the species name indicates that the species considers one or more special habitat elements to be essential or secondary. Please consult the Species Notes for more information.

Status Definitions:

1. FE: Federally Endangered
2. FT: Federally Threatened
3. CE: California Endangered
4. CT: California Threatened
5. CP: California Protected
6. FS: Forest Service Sensitive
7. BS: BLM Sensitive
8. H : Harvest

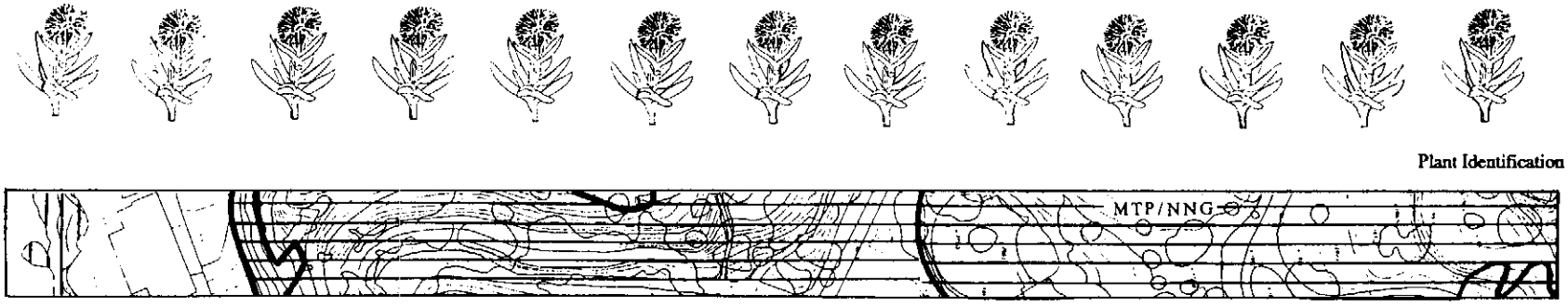
CalSC: California Special Concern

4

VEGETATION ANALYSIS

Joe McBride and Deborah Gerhard
Consulting Landscape Ecologists

Sutro Baths Vegetation Analysis



Plant Identification

Vegetation Mapping

Historical Analysis

Equisetum arvense [n] (common horsetail)				x			x																
Erigeron glaucus [n] (seaside daisy)	x				x		x																
Erophyllum staechadifolium [n] (lizard tail)	x							x															
Hordeum hystrix [e] (chest grass)											x												
Hordeum leporinum [e] (wild barley)									x	x				x	x								
Hypochoeris radicata [e] (hairy cat's ear)											x												
Heracleum lanatum [n] (cow parsnip)																			x			x	
Hordeum hystrix [e] (chest grass)																			x				
Hordeum leporinum [e] (wild barley)									x	x										x		x	

Vegetation Inventory

Sutro Baths Vegetation Analysis

Joe McBride and Deborah Gerhard
Consulting Landscape Ecologists
Albany, CA 94706 USA

1992

Introduction

The purpose of this report is to describe the vegetation of the Sutro Historic District, discuss its development since pre-settlement times, and present recommendations for the management of the vegetation by the National Park Service. The descriptions and classification of the vegetation are based on field reconnaissance conducted from December to February, 1991-92. During this period few plants were flowering which limited the complete identification of certain plant species. The discussion of the development of the vegetation since pre-settlement times was based on a number of publications describing early San Francisco vegetation, analysis of geological reports, examination of early photographs of the site, and a general understanding of the ecology of local vegetation types. Recommendations for the management of the vegetation are based on experience in these areas at The Presidio of San Francisco, in California State Parks, and on private land along the central coast of California.

Vegetation Types

The vegetation of the Sutro Historic District is comprised of a mosaic of units dominated primarily by non-native species. These units include types which were planted for erosion control and recreation as well as areas which have been invaded and dominated by weeds. A few areas of native vegetation are also present in the pattern. Although these units are dominated by native species, they support some exotic species. A classification of the vegetation types is shown in Table 1. This classification is based on origin of species (native vs. non-native), physiognomic type (scrub, grassland, marsh, etc.), and dominant species. The native types were classified

Location of Study Area

"Stony point, sand or pebble beach, lagoon, and cliff are common features of shoreline everywhere, created by the struggle of the two adversaries, land and sea. Each supports typical aggregations of living things that vary from one habitat to another."
E. S. Bakker (1971)*An Island Called California.*

and named according to the classification system used by the California Natural Diversity Data Base (Holsten, Jensen, and Holland, 1990). A list of species observed by vegetation type is presented in Table 2. The distribution of the vegetation types is shown in Figure 1. The vegetation types are described in the following paragraphs.

*Northern Foredunes - NFD**

The Northern Foredune community (NDDB Type # 21210) is found on the outer dunes on the south side of Sutro Heights. This relict area of sand dunes supports a variety of species typical of sand dunes along the central California coast. This community is dominated by a variety of succulent perennials such as sand verbena, sea-fig, dune tansy, and beach strawberry. Low shrubs such as dwarf coyote brush and mock heather also are found here. The environment of the Northern Foredune community is characterized by extremes in temperature, moisture availability, and wind velocity. Blow outs of the sandy substrate are common. The species common to this type are hardy pioneer species adapted to the harsh conditions. They are not well adapted to competition with other plants and generally are replaced by other species in locations affording some protection from the wind and more moisture. Periodic natural disturbance is necessary to maintain the community. Trampling by visitors damages the plants common to this community. Their low, often prostrate structure and their succulent tissue makes them especially vulnerable to trampling.

The small area of Northern Foredunes in the Sutro Historic District is one of the few examples left of a vegetation type that was once very extensive along the foredune now covered by the Great Highway and adjacent residential development. It is currently under threat due to the presence of aggressive exotic species such as Hottentot-fig and European beachgrass.

Descriptions of the Northern Foredune community and discussions of the ecology of this type are found in the following sources: Cooper (1936); Munz and Keck (1949, 50); Barbour, Craig, Drysdale, and Chiselin (1973); McBride and Stone (1976); Barbour and Johnson (1977); and Holland and Kiel (1990). The Northern Foredune Community is referred to as the Coastal Strand in these and other publications.

* map symbol (Fig. 1)

Sand verbena: "Outstanding are the plants called Sand verbena, found in many sandy places. They are trailing plants, one of the more common being *Abronia umbellata*, a perennial with stems about one yard long and with mostly rose-colored flowers in dense clusters." P. A. Munz (1972) *California Spring Wildflowers.*

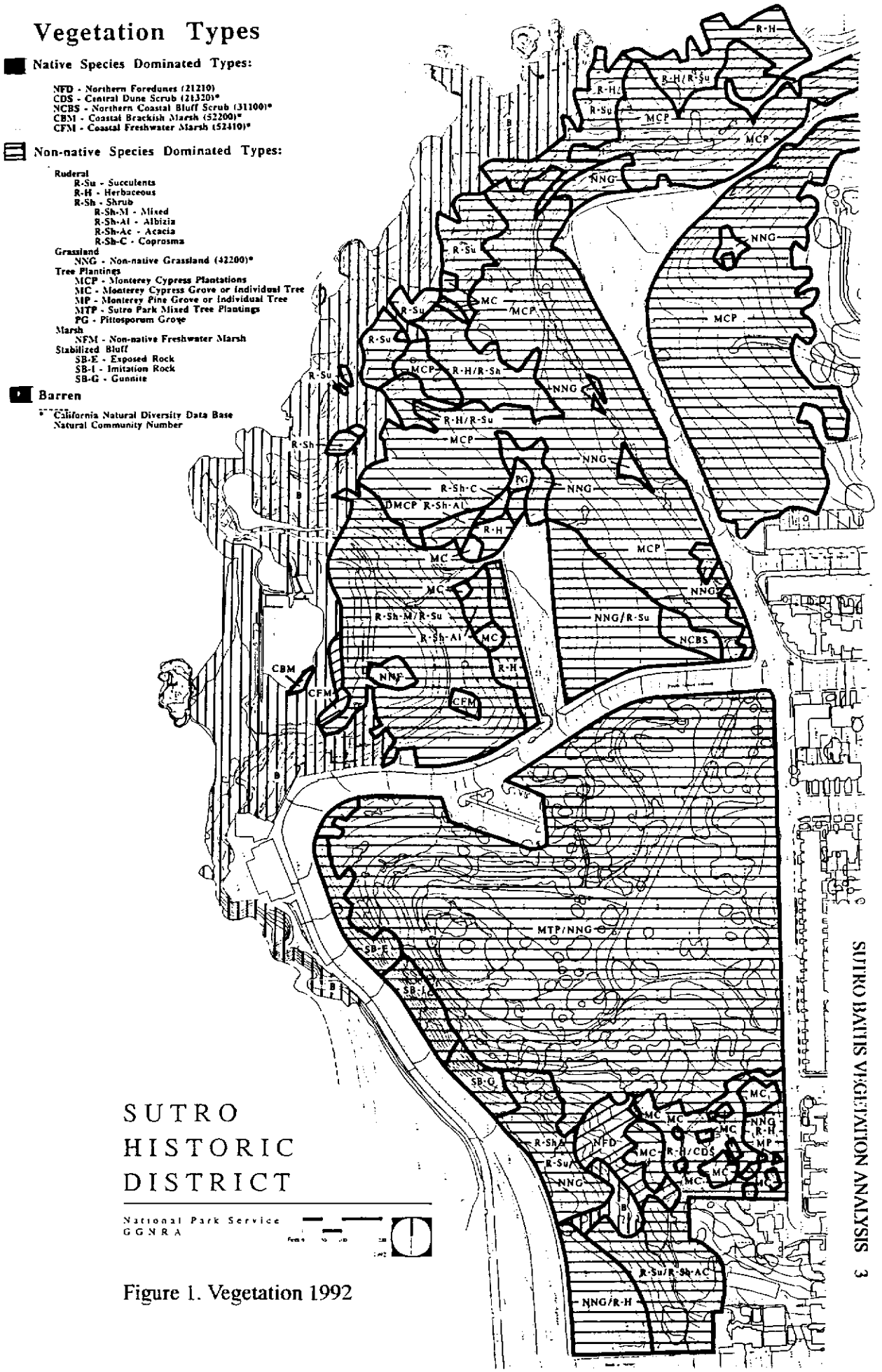


Figure 1. Vegetation 1992

*Central Dune Scrub - CDS**

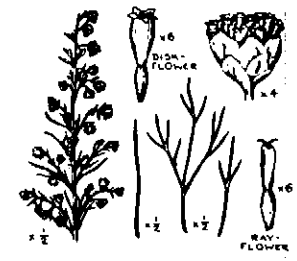
The Central Dune Scrub (NDDB Type # 21320) is found on relict sand dunes occurring at the south end of the Sutro Historic District. This community is characterized by shrub cover and areas of exposed sand. Dominant species include bush lupine, California sagebrush, and dwarf coyote brush. The Central Dune Scrub community is found on back dunes along the central California coast. This habitat is more stable than that of the northern Foredune community. Its greater distance inland from the sea affords greater wind protection and somewhat reduced salt spray. The sandy substrate which supports the community is subject to easy disturbance by pedestrians. The site has been invaded by Monterey cypress, tree mallow, and German ivy which have the potential to dominate much of the area.

The Central Dune Scrub community is described in the references listed under the Northern Foredune Community. Like the Northern Foredune Community the Central Dune Scrub is also referred to as the Coastal Strand Community in many publications.

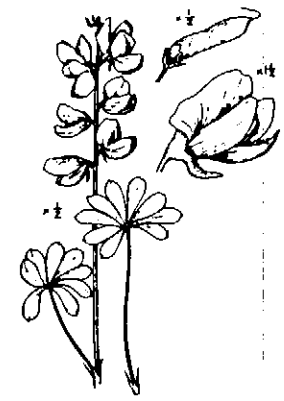
*Northern Coastal Bluff Scrub - NCBS**

The Northern Coastal Bluff Scrub Community (NDDB Type # 31100) was once an extensive plant community along the bluffs and adjacent terraces in the Sutro Historic District. It is now represented by a small area near the intersection of Point Lobos Avenue and El Camino Del Mar. The dominant species occurring on the site are bush lupine, and dwarf coyote brush. This particular unit of vegetation has developed on an area which previously supported a Monterey cypress plantation. It is not as rich from a floristic standpoint as other examples of the Northern Coastal Bluff Scrub found in the Marine Headlands. Much of the area in the Sutro Historic District mapped as Ruderal Shrub was Northern Coastal Bluff Scrub which has been invaded and dominated by non-native species.

The habitat of the Northern Coastal Bluff Scrub is characterized by exposure to high velocity winds and salt spray. The substrate for this community varies considerably. Some are characterized by a shallow mantle of clay texture soils. These are located on the escarpments and tops of the bluffs. Sand is the other common substrate. Its origin may be either former beaches or sand dunes deposited during the Flandrian transgression. Various kinds of rubble from local landslides into the sea also support the Northern Coastal Bluff Scrub Community.



California Sagebrush: "A densly bushy, gray-green, woody-based shrub 2 to 5 ft. high. Leaves are deeply divided into long thread-like filaments, somewhat lobed at time, and arranged like the palm of your hand (palmately)." R. C. Webb (1971) *A Guide to the Plants of the Pinnacles.*



Bush lupine: "A distinctly shrubby plant, 11/2 to 8 feet high, with short petioled leaves; leaflets 6 to 11, usually appressed silky on both surfaces or becoming glabrate above." H. E. McMinn (1939) *An Illustrated Manual of California Shrubs.*

The Northern Coastal Bluff Scrub is a relatively stable community which can invade adjacent grasslands in the absence of grazing. It is subject to damage by heavy seas which often slam with great force into the vegetation during severe winter storms. In addition to the direct mechanical damage to plants, these storms can cause locally severe erosion. Erosion of coastal bluffs due to the undermining of their slopes by wave action also represents a threat to the Northern Coastal Bluff Scrub Community.

The Northern Coastal Bluff Scrub is often included in the broader Northern Coastal Scrub Community used as a classification unit by several authors. Reference to characteristics and ecology of the Northern Coastal Bluff Scrub may be found in the works Munz and Keck (1949, 50); Barbour, Craig, Drysdale, and Ghiselin (1973); Elliot and Wehausen (1974); Heady *et al* (1977); and Holland and Kiel (1990).

Coastal Brackish Marsh- CBM and Coastal Freshwater Marsh - CFM**

The Coastal Brackish Marsh (NDDB Type # 52200) and the Coastal Freshwater Marsh (NDDB Type # 52410) are described in the report of BioSystems Analysis, Inc. Units of these two vegetation types are located along seeps and at the edges of ponds to the east of the Sutro Baths. Reference to native marsh communities may be found in Mason (1957); Munz and Keck (1949, 50); Barbour, Craig, Drysdale, and Ghiselin (1973); and Holland and Kiel (1990).

"Wet of damp places are not uncommon features of the earth's surface. In fiction, the three words, *bog, swamp,* and *marsh,* are used causally, often synon-ymously, along with terms inherited from dramatic fiction indigenous to the British Isles: fen, heath, and moor, where countless lovers have had misadventures in forbidding, treacherous, and often murky wastelands symbolic of death. Many aquatic habitats, however, have a wealth of life." E. S. Bakker (1971) *An Island Called California.*

Ruderal

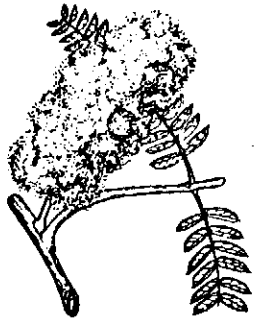
Ruderal or the weed dominated vegetation type is common throughout the Sutro Historic District. Exotic weed species have invaded native plant communities and through competition come to dominated extensive areas previously supporting native species. The success of these non-native weeds has been enhanced by disturbance of

the native communities by livestock grazing in the last century and trampling and soil disturbance cause by people hiking and climbing along the coastal bluffs. At most locations it appears that these exotic species are continuing to crowd out native species. Local areas of the Sutro Historic District are blanketed with mattress vine and albizia to the total exclusion of any native plant species. Other species such as German ivy and Hottentot-fig are serious competitors of native plants. Although the ruderal communities have for all practical purposes dominated or replaced the native communities, they are not without value. They serve an important role in erosion control often exceeding the capacity of the native species to protect the soil. They also function to provide a diversity of cover and food for wildlife.

The ruderal vegetation has been divided into three major types on the basis of dominant plant lifeform. These types are Ruderal Succulents (R-Su), Ruderal Herbaceous (R-H), and Ruderal Shrub (R-Sh). Ruderal communities are not included in the Natural Diversity Data Base Classification System. The Ruderal Succulent type covers extensive areas of steeper ground on the coastal bluff escarpment. It is dominated by Redondo creeper and Hottentot-fig. These species spread vegetatively to blanket entire areas at the expense of native species. The Ruderal Herbaceous type is characterized by sweet alyssum, wild radish, cheese weed, and tree mallow. It is best developed on old landslide surfaces and other areas of soil disturbance. The Ruderal Shrub type occurs as a mixture of albizia, acacia, mattress vine, mirror plant, German ivy, and tree mallow. At several locations the Ruderal Shrub type is dominated by a

Wild Radish: "Wild radish is an erect annual, or occasionally biennial, widely distributed in California. It is a troublesome weed in grain fields, roadsides, ditchbanks, and in cultivated crops, including orchards and vineyards..." B. B. Fischer *et al* (1985) *Growers Weed Identifi-cation Handbook.*

Hottentot Fig: "The two more conspicuous succulents that are called ice plant, but more correctly Sea Fig or Hottentot Fig, are two species with elongate, succulent leaves of triangular shape in cross section. These are the creeping, deep green, fleshy plants so widely used as roadside binders and as erosion control plants on dry slopes. We have the red-flowered one (*M. chilense*) native of South America, and a yellow-flowered one (*M. edule*) native of South Africa." E. Y. Dawson (1966) *Seashore Plants.*



Plume Albizia: "An evergreen shrub or small tree, 10 to 20 feet high, with glabrous or rusty-tomentose branchlets. Leaves 5 to 8 inches long, 4 to 6 inches wide, with 14 to 24 pinnae, each pinnea with 40 to 60 leaflets 1/4 to 3/8-inch long, the midrib nearer the upper margin, the petiole with a gland 1/2 to 1 inch from the base. Flowers greenish yellow, distinctly pedicelled, in axillary paired spikes 1 to 2 inches." H.E. McMinn and E. Maino (1963) *An Illustrated Manual of Pacific Coast Trees.*

single species. Local thickets of albizia, acacia, Himalaya berry, or mattress vine are common in the Sutro Historic District. Several of these appear to be the result of erosion control plantings.

Only a few publications are available to describe ruderal plant communities in California. Among these are Frenkel (1970), Vessel and Wong (1987), and Holland and Kiel (1990).

*Non-native Grassland - NNG**

The Non-native Grassland type (NDDB Type # 42200) occurs at several locations in the Sutro Historic District. These grassland areas are dominated by non-native species in the following genera: Avena, Festuca, Lolium, Bromus, Poa, and Hordeum. Few species of these genera could be identified at the time of the reconnaissance because it was prior to their flowering. Several broadleaf herbaceous species were also common in the Non-native grassland type. These species include sweet alyssum, wild radish, Bermuda buttercup, filaree, sow thistle, and common groundsel.

The Non-native Grassland type occurs on moderate to deeper soils characterized by a relatively high soil moisture storage capacity. This type has replaced a once extensive native grassland type found on ridge tops and better soils away from the immediate coast on the San Francisco Peninsula. The introduction of grazing livestock and inadvertent introduction of exotic grass seeds from the Mediterranean region led to the conversion of the the native grasslands. In the absence of fire and grazing the Non-native grassland community is often invaded by shrubs and trees. This tendency is in evidence in the Sutro Historic District where most areas of Non-native Grassland support either bush lupine or young Monterey cypress.

Descriptions of the characteristics and ecology of the Non-native Grassland community are found in Munz and Keck (1949, 50); Burcham (1957); Barbour, Craig, Drysdale, and Ghiselin (1973); Heady et al (1977); and Holland and Kiel (1990). The term California annual grassland is commonly used in reference to this type.

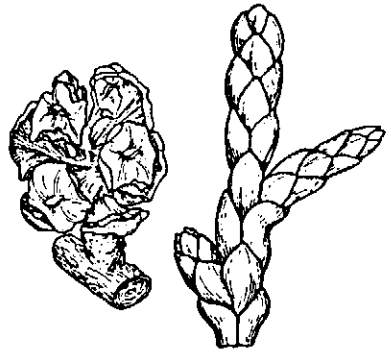
Wild oat: "Wild oat is of European origin but in California it is widely distributed in grazing land where it is well adapted and behaves like a native... The mature plant is sturdy, one to four feet tall with several stems arising from the base. The leaf blades are 3 to 10 inches long, 1/4 to 1/2 inch wide, thin and rough... The flowering part is open, large and spreading; resembling the inflorescence of the cultivated oat." B.B. Fischer *et al* (1985) *Growers Weed Identification Handbook.*

Tree Plantings

Trees have been planted for erosion control and for aesthetic purposes in the Sutro Historic District. The most dominant vegetation types derived from tree plantings are the Monterey Cypress Plantations and the Sutro Park Mixed Tree Plantings. The Monterey Cypress Plantations will be discussed in this report. The Sutro Park Mixed Tree Plantings are beyond the scope of this report and have been addressed in other reports to the National Park Service.

The Monterey Cypress Plantations were planted to control erosion of the sand on the coastal bluffs and to stabilize the margins of the bluffs. Tree cores taken from each of the major stands suggest that the trees were planted about 1919. No historic documents have been found to accurately date the plantings. The trees occur on an aerial photograph taken in 1923. In this photograph they are small in structure and have not completely formed a continuous canopy. Photographs taken around the turn of the 20th century (possibly 1896 to 1900) indicate that the plantations were not in place at that time. The original plantations extended to Point Lobos Avenue in the area southwest of the streetcar tracks. A portion of the southern edge of the plantation adjacent to Sutro Baths was killed in the 1966 fire which destroyed the Baths. A forest of snags still stand in the area that was burned.

The Monterey Cypress Plantation is a nearly pure stand of Monterey cypress. At a few location one finds Monterey pine, acacia, or pittosporum. The original tree spacing varied from 8' x 8' to 12' x 12'. A very high percentage of survival occurred in the planted trees. Between-tree competition has resulted in some recent mortality and the frequent suppression of individual trees. Mortality has occurred in recent years on the western margin of the southern portion of the plantation and below the USS San Francisco Memorial (Fig. 2). Mortality along the western margin is the result of soil erosion and the exposure of tree roots. This problem is caused by the heavy pedestrian traffic along the margin of the coastal bluffs and the high waves which occurred during the El Nino in the 1980s. Loss of trees along the margin eliminated the wind foil of trees which protects adjacent trees just inside the margin of the stand (Fig. 3). Loss of this



Monterey cypress: "A tree, 20 to 75 feet high, with horizontal branches, rope-like branchlets, and dark green foliage forming a broad spreading crown. Leaves obtuse, not glandular. Cones subglobluar, 1 to 2 inches long. Seeds reddish brown. A species of restricted distribution, native to the headlands about Carmel Bay, California, where many trees exhibit irregularly shaped and often prostrate crowns because of exposure to the strong ocean winds." H. E. McMinn and E. Maino (1963) *An Illustrated Manual of Pacific Coast Trees.*

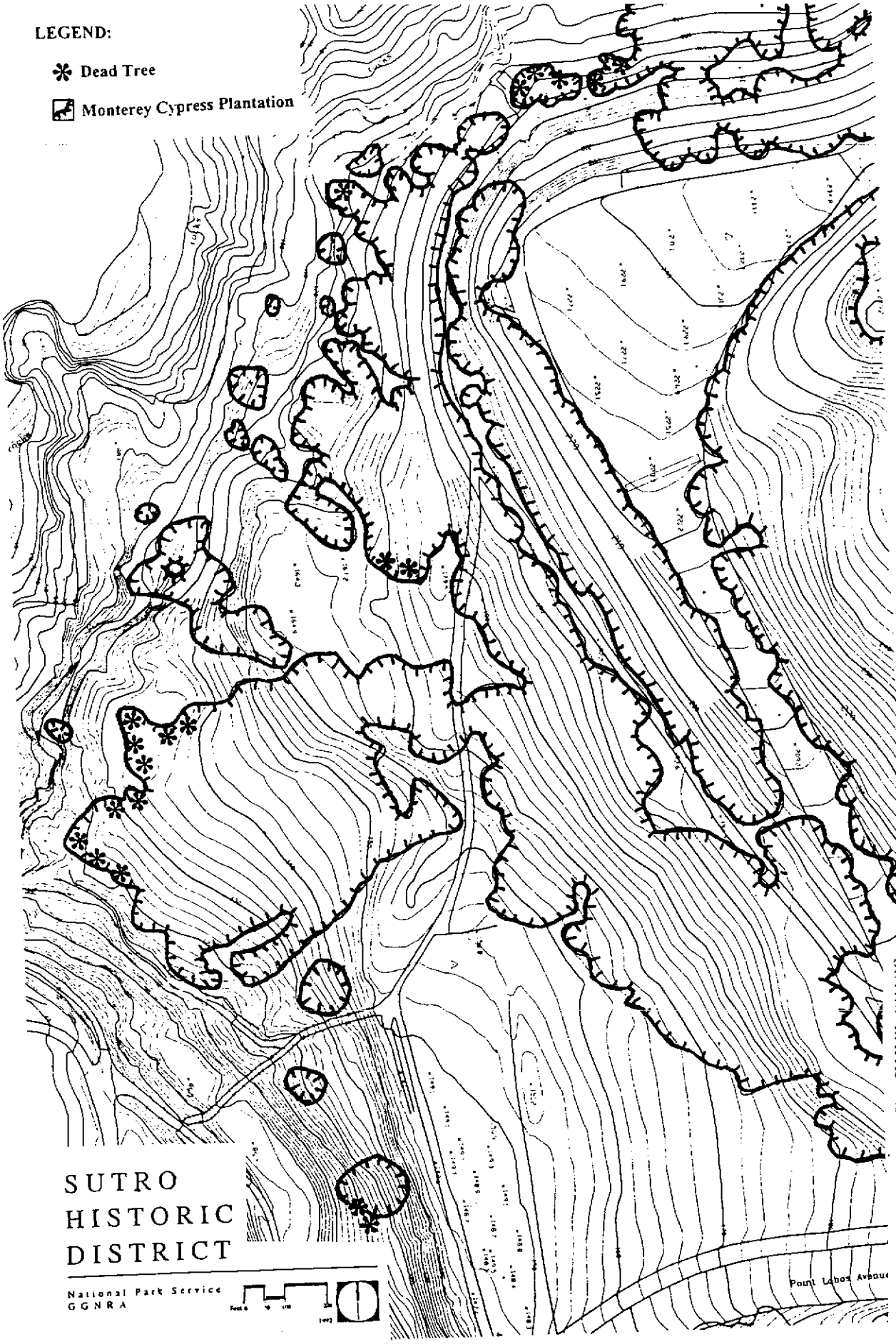


Figure 2. Recent Tree Mortality in Monterey Cypress Plantations

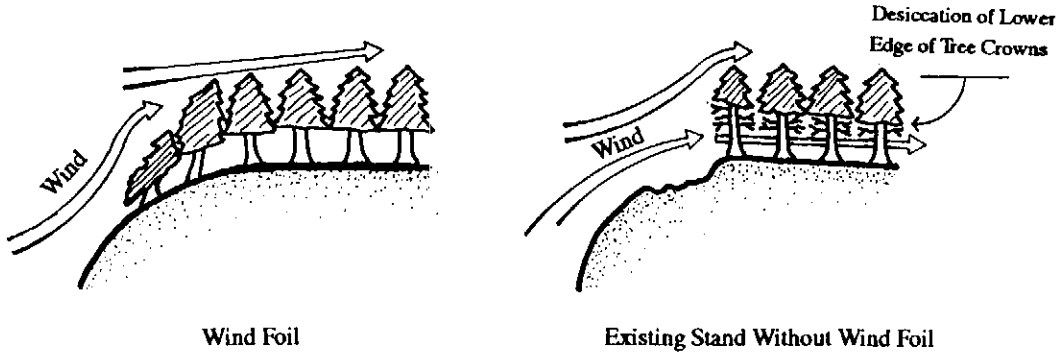


Fig. 3. Mortality due to loss of wind foil

wind foil exposed interior trees to high evaporative stress and salt spray. These exposed trees having grown up in a more interior portion of the stand are severely stressed. Tree mortality can creep into the stand as individuals on the exposed margin die and thereby expose adjacent trees in the interior of the stand. Unfortunately this process has begun along the south margin of the southern portion of the Monterey Cypress Plantation. Tree mortality below the USS San Francisco Memorial is due to the removal of trees from the slope below the parking area to enhance the view. Removal of these trees allow the wind to accelerate beneath the canopy of the trees down from the old streetcar right of way. This acceleration has heightened the desiccation of the foliage of the trees from beneath the canopy and led to tree mortality (Fig. 4).

Trees in the interior of the Monterey Cypress Plantation are in good health and are vigorous, except for the suppressed individuals. About 20% of the trees cored had evidence of heart rot. This is a common condition in Monterey cypress stands. Many trees on or near the margins of the plantation support an epiphytic algae in the genus Trentefolia. This algae blankets dead limbs of trees with a thick, felt-like, orange growth. The presence of Trentefolia presents no danger to the Monterey cypress trees as it grows only on dead branches. No evidence of harmful insect activity was noted in the Monterey Cypress Plantation.

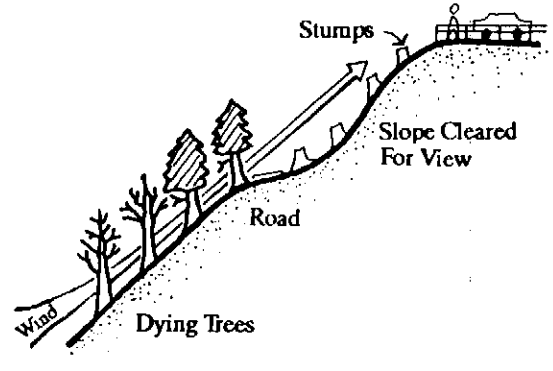


Fig. 4. Mortality due to acceleration of wind

The understory of the Monterey Cypress Plantation is generally without herbaceous cover except along the margins of the plantation or in areas of low crown density. In these locations weedy herbaceous species, non-native annual grasses, and shrubs occur. Local areas of the understory near the southwest corner of the plantation have been invaded by mattress vine and German ivy. These species are very aggressive and can spread over large areas where tree crown cover is light to moderate. Mirror plant has invaded the understory of the Monterey Cypress Plantation along its southern border. It appears that some effort in the recent past has been made to clear a portion of the mirror plant population in this portion of the plantation.

No regeneration of Monterey cypress was observed during the reconnaissance. Monterey cypress does not become established in closed canopy stands due to insufficient levels of light. In natural stands fire plays a role in regeneration by partially opening the crown canopy and eliminating the litter, to expose a mineral soil seedbed. A naturally occurring stand of this age (approximately 70 years) would not show any regeneration for several decades. Under natural conditions Monterey cypress lives 200 to 300 years.

Individual Monterey cypress trees and small groves of Monterey cypress have become established outside the margins of the original plantation. These may be highly sheared by wind and salt spray when exposed along the ocean bluffs or they can develop normal tree forms in protected areas.

Information on the characteristics and conditions of older Monterey cypress plantations in San Francisco can be found in McBride and Froelich (1984). The ecology of native stands is reviewed in Vogl *et al* (1977) and Holland and Kiel (1990).

Non-Native Freshwater Water Marsh

Two marsh areas were identified and discussed in the BioSystems Analysis, Inc. report on wetlands. They are located along the seeps and adjacent to ponds east of the Sutro Baths site. These marsh areas are classified as non-native because they are dominated by exotic species such as nasturtium, calla lily, curly dock, and mustard.

Curly dock: "Curly dock is a perennial widely distributed on waste ground and floodlands... The mature plants are 2 to 5 feet tall, with thick, fleshy taproots. The leaves are lance shaped, bluish green, and 3 to 5 inches long, with wavy or curly edges." B. B. Fischer *et al* (1985) *Growers Weed Identification Handbook.*

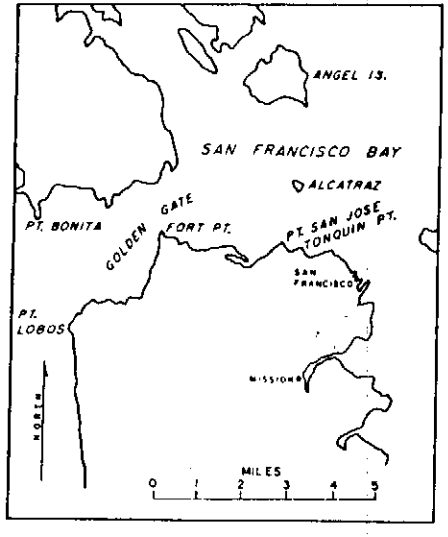
These areas support some native species typical of the Coastal Freshwater Marsh. The ecology of non-native freshwater marshes in California is not well known. Occasional reference to non-native species in California marshes may be gleaned from the references suggested above under Coastal Freshwater Marsh.

Stabilized Bluffs

The escarpment above the Great Highway opposite the Cliff House has been stabilized by the cementing of natural rock around existing rock outcrops at the northern end, by creating an imitation rock wall of cement in the central section, and by the spraying of gunnite at the southern end. In all three sections some small areas have been left open to provide growing space for plants. Some of these spaces appear to have been planted with Monterey cypress while others support mixtures of mirror plant, ice plant, acacia, various succulents, and mattress vine. Annual weeds such as wild radish are also growing in these open areas. The amount of growing space decreases from the northern to the southern end of the stabilized bluffs. Very little growing space is available in the gunnite section.

Development of Vegetation Since Pre-settlement Times

The vegetation of the Sutro Historic District has undergone significant change since pre-settlement times. The elimination of burning by Native Americans, introduction of grazing livestock and exotic plants, landscaping for recreation, tree planting for erosion control, and the use of the site for recreation have been factors in this ongoing process of vegetation change. A series of vegetation maps were prepared to summarize the effects of these factors on the vegetation. Dates for these representations of earlier vegetation were chosen by Land and Community Associates to correlate with their research into the historical development of the site. These dates are (1) Pre-settlement



Dune area on the San Francisco Peninsula as mapped by William P. Blake in the early 1850s.

[Fig. 5], (2) 1867 [Fig. 6], (3) 1888 [Fig. 7], and (4) 1910 [Fig. 8]. Sources of information for these maps are included in Appendix I. A brief description of the vegetation and the important factors influencing its development in each period is given in the following paragraphs.

Pre-settlement Vegetation

The pre-settlement vegetation was a pattern of Northern Coastal Bluff Scrub, Coastal Terrace Prairie, Northern Foredune Community, Central Dune Scrub, and Central Coast Riparian Scrub. These communities were segregated along environmental gradients controlled by substrate (sand dune vs. clay soil), proximity to the sea, and moisture availability. Periodic burning by Native Americans influenced the ecotone between the scrub and grassland types. Local habitation may have also resulted in the clearing of some portions of scrub by the indigenous people, but this impact was of limited extent.

1867 Vegetation

By 1867 the Coastal Terrace Prairie was replaced by the Non-native Grassland. This occurred as a result of heavy grazing by livestock and the inadvertent introduction of annual grass seed from the Mediterranean region. It is reasonable to assume that a slight increase in the area covered by Northern Coastal Bluff Scrub would have occurred in response to the elimination of burning by the Native Americans in the 1790s. Clearing of scrub around structures built on the north slope of Sutro Heights would have been employed to provide better forage for livestock and resulted in new areas dominated by non-native grasses.

"It was from this camp that Sergeant Jose Ortega, the pathfinder, set out with a few men to blaze a trail to Point Reyes. On November first (1769) they climbed to the top of Point Lobos from which they saw their way cut off by a great arm of the sea. Plodding to the east they climbed another height ... and were rewarded by the view of a great body of water ... They were the first Europeans to look upon the waters of San Francisco Bay." D. G. Jenkins (1951) *Opening of the Golden Gate.*

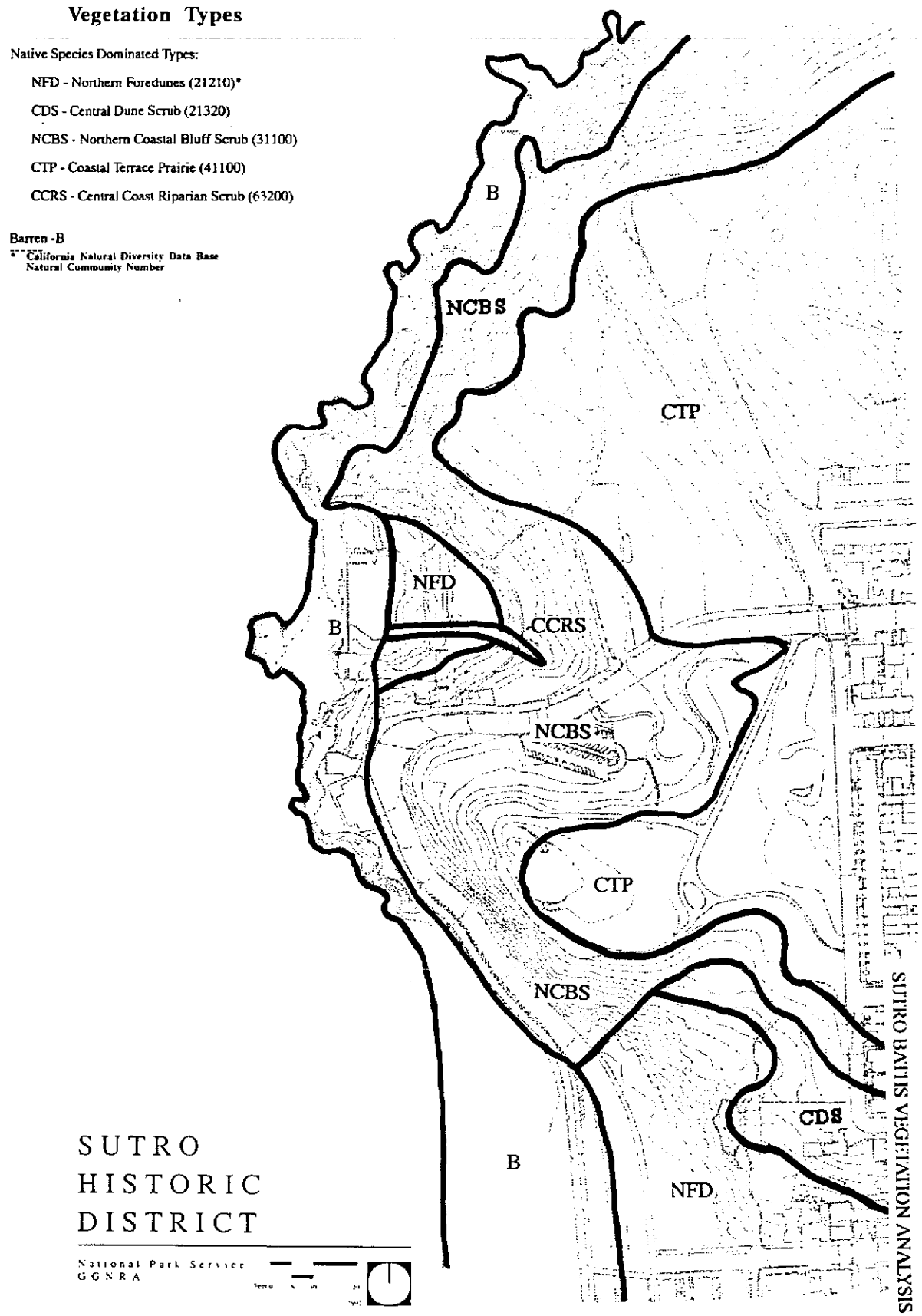


Figure 5. Pre-settlement Vegetation c. 1776

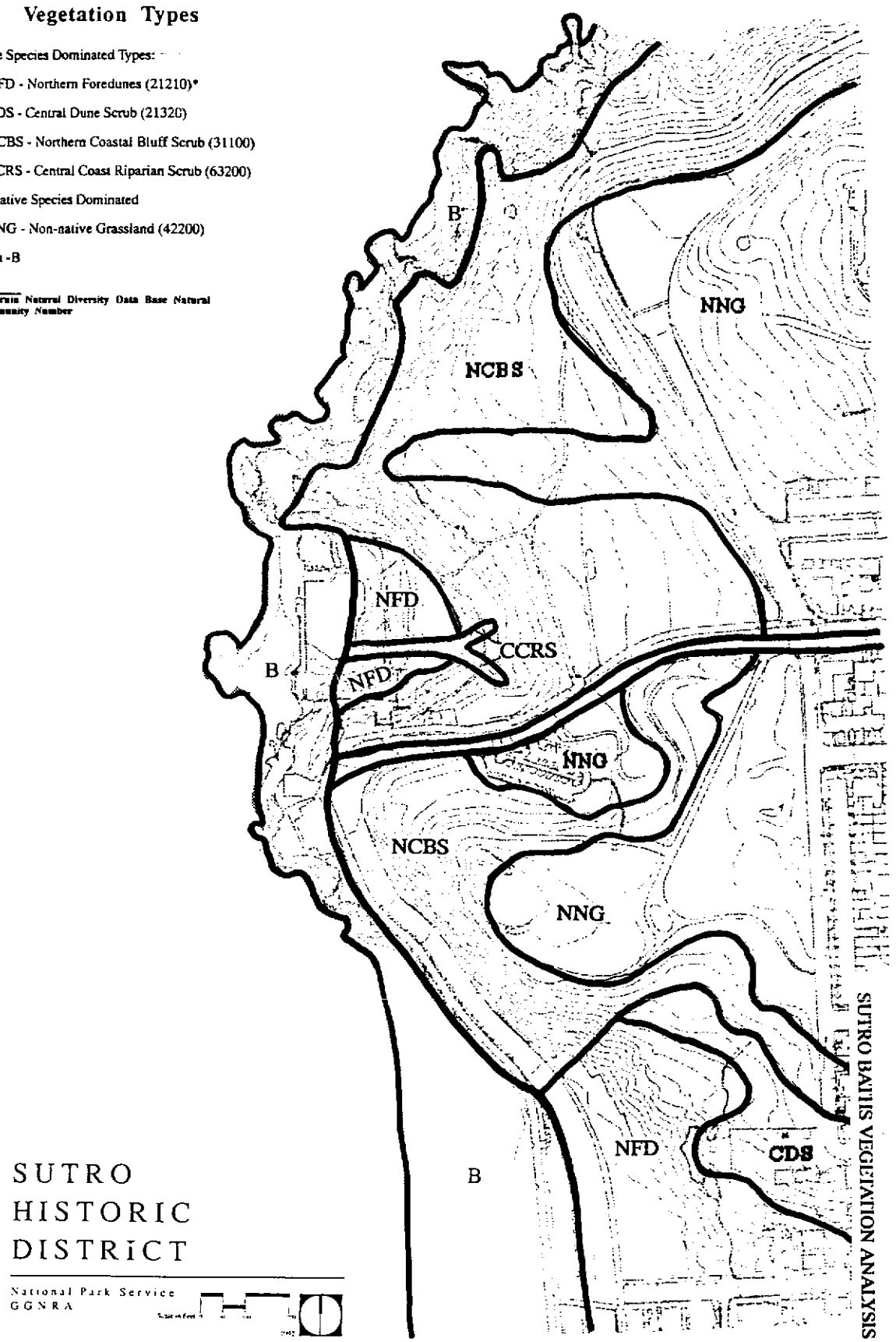


Figure 6. Vegetation c. 1867

1888 Vegetation

Development of the gardens on Sutro Heights and the area just east of the beach which would become the site of the Baths resulted in a decrease in the area of Northern Coastal Bluff Scrub, Northern Foredune Community, and Central Dune Scrub. Exotic shrubs and herbaceous species along with Monterey cypress and Monterey pine were planted in these areas for aesthetic and recreational purposes. Little change in the boundaries of scrub and grassland would have occurred in the interval between 1867 and 1888.

1910 Vegetation

By 1910 the construction and landscaping of the Baths had been completed and the site was in full operation. Development of the Baths and the site resulted in further reduction in the area of Northern Coastal Bluff Scrub. Areas of North Coast Riparian Scrub were eliminated east of the Baths and portions of the Central Dune Scrub south of Sutro Park were eliminated.

Following 1910 the major changes in the vegetation were due to the establishment of the Monterey Cypress Plantation and the invasion and dominance of native plant communities by exotic species. It is assumed that a rapid rate of invasion occurred as the residential areas were built to the east of the Sutro Historic District. Many of the common weeds making up the ruderal vegetation types present on the site today are common to gardens throughout the city. Other species, such as Hottentot-fig, Himalaya berry, and acacia, were planted at various locations for erosion control. The destruction of the Baths and the abandonment of the freshwater ponds led to the establishment of wetland vegetation types.

"San Francisco is built on the inner or eastern shore of the peninsula and at the foot of several hills of brownish sandstone, partly covered with a thick soil, and in other places by sand. Toward the Mission the sand hills are an important feature of the place, being high and steep, and covered in most places by a low growth of vegetation, prinarily shrubs and evergreen and dwarf oaks.." W. P. Blake (1857).*Location of the Study Area*

Vegetation Types

Native Species Dominated Types:

NFD - Northern Foredunes (21210)*

CDS - Central Dune Scrub (21320)

NCBS - Northern Coastal Bluff Scrub (31100)

CCRS - Central Coast Riparian Scrub (63200)

Non-native Species Dominated

NNG - Non-native Grassland (42200)

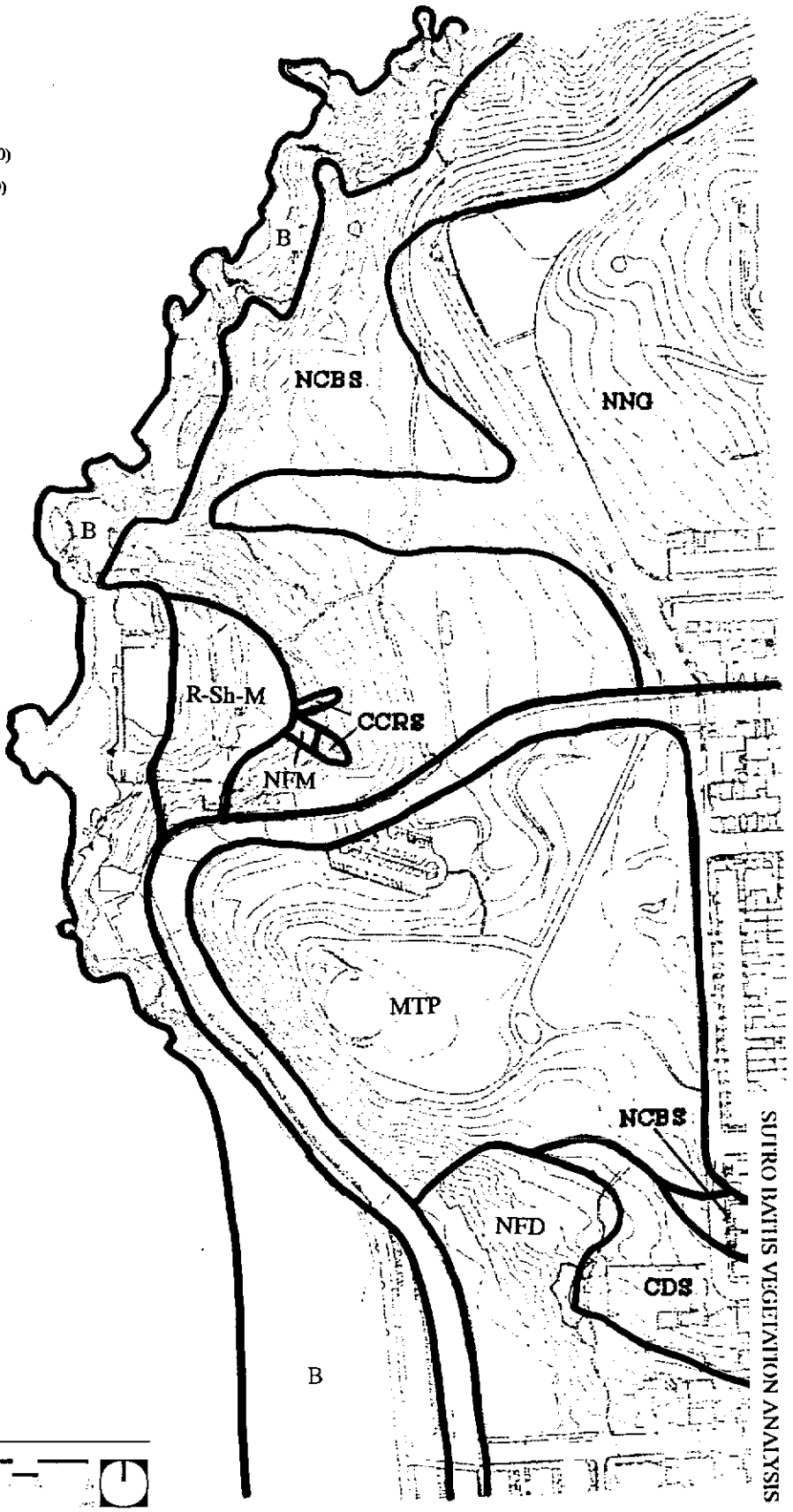
R-Sh-M - Mixed Non-native Shrubs

MTP - Sutro Park Mixed Tree Plantings

NFM - Non-native Freshwater Marsh

Barren -B

* California Natural Diversity Data Base Natural Community Number



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HISTORIC
DISTRICT

National Park Service
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Figure 7. Vegetation c. 1888

Vegetation Types

Native Species Dominated Types:

NFD - Northern Foredunes (21210)*

CDS - Central Dune Scrub (21320)

NCBS - Northern Coastal Bluff Scrub (31100)

Non-native Species Dominated

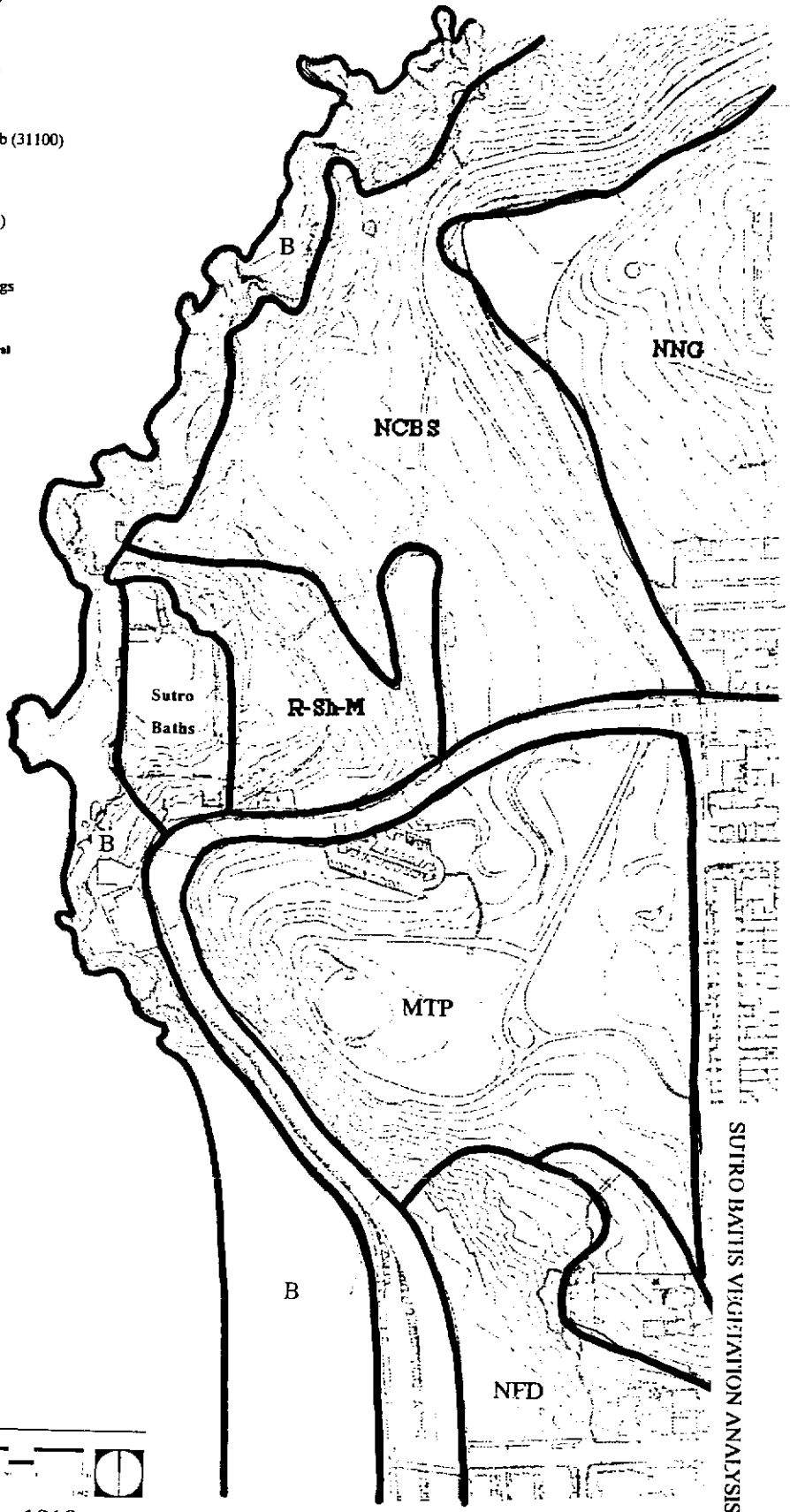
NNG - Non-native Grassland (42200)

R-Sh-M - Mixed Non-native Shrubs

MTP - Sutro Park Mixed Tree Plantings

Barren -B

* California Natural Diversity Data Base Natural Community Number



SUTRO
HISTORIC
DISTRICT

National Park Service
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Figure 8. Vegetation c. 1910

Recommendations for Management

We recommend that the vegetation in the Sutro Historic District be restored to the pattern that existed in the 1920s. During this decade the formal plantings had been completed, the Monterey Cypress Plantation was in place, and the Baths were very popular. Recommendations necessary to accomplish this restoration include the following:

1. Restore the native vegetation east of the Baths

   Restoration of this areas to the Northern Coastal Bluff Scrub and the Central Coast Riparian Scrub will provide visitors an opportunity to observe the native vegetation types which occurred on the site when the Baths were constructed. Restoration of these plant communities will also provide visitors with an opportunity to contrast native vegetation types with present day types, Occurring further to the north on coastal bluffs where exotic species have invaded both the Northern Coastal Bluff Scrub and the Central Coast Riparian Scrub.

2. Replant the Monterey Cypress Plantation between the streetcar track right of way and Point Lobos Avenue

   Re-establishment of this portion of the original plantationwill provide a more accurate sense of the site during the historic target period for restoration as well as providing an identity to the site as it is approached along Point Lobos Avenue.

3. Re-establish the wind foil margins on the seaward edge of the Monterey Cypress Plantation

   The wind foil is needed to reduce further mortality in the seaward margin of the plantation.

"But there has to be some interval of neglect, there has to be discontinuity; it is religiously and artistically essential. That is what I mean when I refer to the necessity of ruins: ruins provide the incentive for restoration, and for a return to origins. The old order has to die before there can be a born again landscape." J. B. Jackson (1980) *The Necessity for Ruins.*

4. Remove dead and suppressed trees from the Monterey Cypress Plantation

Dead and suppressed trees are hazards to visitors who walk through the stands. Dead trees are also a fire hazard in the plantation as there is evidence that branches from the dead trees have been used for fuel for fires on the site. The dead trees killed in the fire which destroyed the Baths in 1966 should not however, be removed. The dense albizia understory prevents access to these snags and they serve as reminders of the fire which destroyed the Baths.

5. Control the mirror plant, German ivy, and mattress vine which have invaded the understory of the Monterey Cypress Plantation

Competition from these plants puts unnecessary water stress on the Monterey trees. This stress should be avoided to maximize the long term health of the trees.

6. Restore the sand dune communities on the south side of Sutro Park

This site provides a unique opportunity to restore the Northern Foredune and Central Dune Scrub communites. These communites were relatively undisturbed in the 1920s and it would be fitting to included their restoration in the overall restoration plan. Once the site is restored the problem of neighbors dumping garden cuttings in this area will probably end.

7. Control soil erosion

Three specific recommendations are proposed to combat erosion problems:

(1). Install gabbions to protect the soil on the margins of the coastal bluffs.

(2). Develop a surfaced trail along the edge of the coastal bluffs and clearly mark access to this trail.

(3). Construct a boardwalk through the sand dune communities south of Sutro Park.

"In the quest for survival, success and fulfillment, the ecological view offers an invaluable insight. It shows the way for the man who would be the enzyme of the biosphere - its steward, enhancing the creative fit of man-environment, realizing man's design with nature." I. L. McHarg (1969) *Design with Nature.*

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Table 1. Vegetation Types in the Sutro Historic District

Native Species Dominated Types:

Northern Foredunes (21210)* [NFD]**
Central Dune Scrub (21320)* [CDS]**
Northern Coastal Bluff Scrub (31100)* [NCBS]**
Coastal Brackish Marsh (52200)* [CBM]**
Coastal Freshwater Marsh (52410)* [CFM]**

Non-native Species Dominated Types:

Ruderal -
- Succulents [R-Su]**
- Herbaceous [R-H]**
- Shrub [R-Sh]**
  - Mixed [R-Sh-M]**
  - Albizia [R-Sh-Al]**
  - Acacia [R-Sh-Ac]**
  - Coprosma [R-Sh-C]**

Grassland -
- Non-native Grassland (42200)* [NNG]**

Tree Plantings -
- Monterey Cypress Plantations [MCP]**
- Monterey Cypress Grove or Individual Tree [MC]**
- Monterey Pine Grove or Individual Tree [MP]**
- Sutro Park Mixed Tree Plantings [MTP]**
- Pittosporum Grove [PG]**

Marsh -
- Non-native Freshwater Marsh [NFM]**

Stabilized Bluff -
- Exposed Rock [SB-E]**
- Imitation Rock [SB-I]**
- Gunnite [SB-G]**

* California Natural Diversity Data Base Community Number
** Map symbol (Fig. 1)

Table 2. Plant species observed at the Sutro Historic Site during December, January, and February, 1992 (e=exotic, n=native, n*=native to California, but not to the site)

Species	Vegetation Type*										
	NFD	CDS	NCBS	CBM	CFM	R-Su	R-H	R-Sh	NNG	MCP	SB
Abronia latifolia [n] (sand verbena)	x					x					
Abronia umbellata [n] (beach sand verbena)	x										
Acacia longifolia [e] (Sydney golden wattle)								x			x
Acacia melanoxylon [e] (Blackwood acacia)									x	x	
Achillea millifolium [e] (yarrow)		x	x				x		x		
Agapanthus africanus [e] (lily of the Nile)	x					x		x	x		
Agave sp. [e] (agave)								x			
Albizia distachya [e] (plume albizia)		x	x					x			
Ammophila arenaria [e] (european beachgrass)								x			
Artemisia californica [n] (California sagebrush)	x	x	x					x			
Artemisia pycnocephala [n] (beach sagebrush)	x							x			
Avena fatua [e] (wild oat)		x	x				x	x		x	
Baccharis pilularis [n] (dwarf coyote brush)	x	x	x				x	x			
Brassica campestris [e] (field mustard)		x	x					x			

*NFD - Northern Foredune, CDS - Central Dune Scrub, NCBS - Northern Coastal Bluff Scrub, CBM - Coastal Brackish Marsh, CFM - Coastal Freshwater Marsh, R-Su - Ruderal Succulent, R-H - Ruderal Herbaceous, R-Sh - Ruderal Shrub, NNG - Non-native Grassland, MCP - Monterey Cypress Plantation, SB - Stabilized Bluff

Table 2. (cont.)

Species	NFD	CDS	NCBS	CBM	CFM	R-Su	R-H	R-Sh	NNG	MCP	SB
	Vegetation Type										
Bromus rigidus [e] (ripgut brome)		x	x					x	x		
Brugmansia sp. [e] (angel's trumpet)								x	x		
Cakile maritima [e] (sea rocket)	x					x		x			
Calindrinia ciliata var. menziesii [n] (red maids)								x		x	
Cardamine oligosperma [n] (bitter-cress)										x	
Carex pansa [n] (dune sedge)	x										
Coprosma repens [e] (mirror plant)								x		x	x
Cotula coronipifolia [e] (brass buttons)				x							
Cupressus macrocarpa [n*] (Monterey cypress)	x							x	x	x	x
Cynodon dactylon [e] (Bermuda grass)							x	x			x
Cyperus sp. [e/n] (umbrella sedge)					x						
Distichlis spicata [n] (salt grass)				x							
Dudley farinosa [n] (live-forever)						x		x			x
Equisetum arvense [n] (common horsetail)					x			x			
Erigeron glaucus (n) (seaside daisy)	x					x		x			
Eriophyllum staechadifolium [n] (lizard tail)	x								x		

Table 2. (cont.)

Species	NFD	CDS	NCBS	CBM	CFM	R-Su	R-H	R-Sh	NNG	MCP	SB
	Vegetation Type										
Erodium botrys [e] (filaree)							x		x		
Erodium cicutarium [e] (storksbill)									x		
Eschscholzia californica [n] (California poppy)	x	x	x					x	x		
Foeniculum vulgare [e] (common fennel)									x	x	
Fragaria chiloensis [n] (beach strawberry)	x					x		x	x		
Fritillaria liliacea [n] (lily-like fritillary)							x				
Galium aparine [e] (climbing bedstraw)								x		x	
Galium sp. {e/n} (bedstraw)										x	
Haplopappus ericoides [n] (mock heather)	x										
Hebe franciscana [e] (hebe)											x
Hedera canariensis [e] (Algerian ivy)								x		x	
Heracleum lanatum [n] (cow parsnip)							x		x		
Hordeum hystrix [e] (cheat grass)							x				
Hordeum leporinum [e] (wild barley)		x	x					x	x		
Hypochoeris radicata [e] (hairy cat's ear)							x				

Table 2. (cont.)

Species	Vegetation Type										
	NFD	CDS	NCBS	CBM	CFM	R-Su	R-H	R-Sh	NNG	MCP	SB
Iris douglasiana [n] (Douglas iris)							x				
Iris sp. [e] (iris)					x						
Juncus sp. [n] (rush)	x				x			x	x		
Lampranthus filicaulis [e] (Redondo creeper)						x					x
Lavatera arborea [e] (tree mallow)		x	x					x	x	x	x
Lobularia martina [e] (sweet alyssum)	x	x	x			x	x	x	x	x	x
Lupinus arboreus [n] (coastal bush lupine)	x	x	x				x	x	x		
Lupinus sp. [n] (lupine)								x			
Malva parviflora [e] (cheeseweed)		x					x	x	x	x	
Marah fabaceus [n] (wild cucumber)	x	x					x	x	x		
Medicago hispida [e] (bur clover)							x	x	x		
Melaleuca nesophila [e] (pink melaleuca)										x	x
Mesembryanthemum chilense [e] (sea-fig)	x					x	x	x	x		
Mesembryanthemum edule [e] (Hottentot-fig)						x	x	x	x		x
Mimulus guttatus [n] (monkey flower)				x	x						
Muehlenbeckia complexa [e] (mattress vine)								x			

Table 2. (cont.)

Species	Vegetation Type										
	NFD	CDS	NCBS	CBM	CFM	R-Su	R-H	R-Sh	NNG	MCP	SB
Oxalis pes-caprae [e] (Bermuda-buttercup)	x	x				x	x	x	x	x	x
Pennisetum claudestinum [e] (kikuyugrass)	x							x			
Phalaris canariensis [e] (canary grass)									x		
Picris echioides [e] (prickly ox tongue)							x	x	x		
Pinus radiata [n*] (Monterey pine)								x		x	x
Pittosporum undulatum [e] (victorian box)								x			x
Plantago lanceloata [e] (buckhorn plantain)		x	x				x		x		
Plantago major [e] (common plantain)					x		x				
Poa annua [e] (annual bluegrass)									x		
Polypogon monspeliensis [e] (rabbitfoot grass)					x						
Ranunculus californica [n] (California buttercup)						x					
Raphanis sativus [e] (wild radish)	x	x	x		x	x	x	x	x		
Ribes sanguineum [n] (pink flowering currant)										x	
Rorippa nasturtium-aquatica [n] (watercress)				x	x						
Rubus procerus [e] (Himalaya berry)	x							x			
Rubus vitifolius [n] (California blackberry)					x		x	x		x	

Table 2. (cont.)

Species	Vegetation Type										
	NFD	CDS	NCBS	CBM	CFM	R-Su	R-H	R-Sh	NNG	MCP	SB
Rumex cripus [e] (curly dock)					x		x	x	x		
Salix lasiolepis [n] (arroya willow)					x		x	x			
Scrophularia californica [n] (California figwort)									x		
Sedum sp. [n/e] (stonecrop)						x		x			x
Senecio mikanioides [e] (German-ivy)								x		x	
Senecio vulgaris [e] (common groundsel)		x				x	x		x		
Silybum marianum [e] (milk thistle)									x	x	
Solanium nodiflorum [e] (nightshade)								x		x	
Sonchus asper [e] (sow thistle)		x	x			x	x	x	x		
Stellaria media [e] (common chickweed)							x	x	x	x	
Tamarix pentandra [e] (tamarisk)											x
Tanacetum camphoratum [n] (dune tansy)	x							x			
Taraxacum officinale [e] (dandelion)									x		x
Trifolium sp. [e/n] (clover)							x		x		
Tropaeolum majus [e] (nasturtium)					x			x			
Typha sp. [n] (cattail)					x						

Table 2. (cont.)

Species	Vegetation Type										
	NFD	CDS	NCBS	CBM	CFM	R-Su	R-H	R-Sh	NNG	MCP	SB
Utrica sp. [n/e] (nettle)					x						
Vicia gigantea [n] (giant vetch)							x				
Vinca major [e] (giant periwinkle)								x			
Zantedeschia aethiopica [e] (cala lily)					x						

Table 3. Plant species which do not appear in Table 2, but were reported by Jake Sigg, Sue Smith, and Peter Rubtzoff of the California Native Plant Society following a reconnaissance of the Sutro Bath Wetland and Hill Slope Area on May 23, 1991.

Native Species

Scientific Name	Common Name
Agrostis sp.	Agrostis grass
Atriplex hastata	Saltbush sp.
Bromus maritimus	Brome
Camissonia cheiranthifolia	Beach primrose
Distichlis spicata	Salt-grass
Elymus mollis	American dune grass
E. triticoides	Elymus grass
Epilobium watsonii v. franciscana	S.F. willow-herb
Equisetum telmateia	Horsetail
Franseria chamissonis	Beach bur
Gnaphalium chilense	Cudweed
Jaumea carnosa	Jaumea
Juncus bufonius	Toad rush
J. leseurii	Rush
Ludwigia peploides	Ludwigia
Plantago maritima	Plantain
Polypogon interruptus	Polypogon
Potentilla egedii v. grandis	Pacific silverweed
Potamogeton sp.	Potamogeton
Ribes sanguineum var. glutinosum	Coast red current
Rubus ursinus	California blackberry
Rumex salicifolius	Willow-leafed dock
Ruppia maritima	Ruppia
Scirpus paludosus	Tule
S. pungens	Tule
Salix lasiolepis v. bigelovii	Arroyo willow
Spergularia macrotheca	Large-flowered sand spurry
S. marina	Sand spurry
Urtica holosericea	Stinging nettle

Introduced Native or Escaped Exotic Species

Albizia lophantha	Plume albizia
Anagallis arvensis	Scarlet pimpernell
Avena barbata	Wild oats
Carduus pycnocephalus	Italian thistle
Cyperus alternifolius	Umbrella sedge
Erodium cicutarium	Red-stemmed filaree
Festuca arundinacea	Tall fescue
Foeniculum vulgare	Fennel
Geranium dissectum	Cut-leaved geranium
Hedera helix	English ivy
Hedypnois cretica	Hedypnois
Lobularia maritima	Lobularia
Lolium sp.	Grass sp.
Malva sylvestris	High mallow
Matthiola sp.	Stock
Melilotus indicus	Clover
Mesembryanthemum sp.	Ice plant
Monerma cylindrica	Grass sp.
Parapholis incurva	Sickle grass
Plantago coronopus	Common plantain
Solanum aviculare	New Zealand solanum
S. furcatum	Nightshade
Sonchus oleraceus	Sow thistle
Tetragonia tetragonioides	New Zealand spinach

Appendix I:

Sources of Information for Historic Vegetation Maps of Sutro Historic District

Pre-settlement Vegetation

Canizares, Don Jose 1776. Map of the San Francisco Bay. Bancroft Library, University of California. Berkeley, CA.

Two types of vegetation are indicated on the Canizares map: tree cover and non-tree cover. The Sutro Historic District is indicated as being without tree cover.

Beechey, F. W. 1827 &28. Map of the Harbour of San Francisco. Hydrographical Office, Admiralty, Royal Navy. London. Bancroft Library, University of California. Berkeley, CA

As with the Canizares maps, the Beechey map shows areas with and without tree cover. No tree cover is indicated for the study area.

Higgins, S.W. 1855. Map of the San Francisco Peninsula. In Mayfield (1980).

Map indicating marshy areas, sea cliffs, and sand dunes. The Sutro Historic District is indicated as a mosaic of sea cliffs, sand dunes, and unspecified vegetation.

Blake, W.P. 1857. Geological Report by William P. Blake, geologist and mineralogist of the expedition: p. 145-162 in Report of exploration in California for railroad routes to connect with the routes near the 35th and 32nd Parallels. Corps of Topographical Engineers, 370 p.

A most useful account of the sand dunes and their vegetation on the San Francisco peninsula. The dunes are described as supporting "a low growth of vegetation, principally shrubs and evergreen and dwarf oak".

Schlocker, J., Bonilla, M. G. and D. H. Radbruch. 1958. Geology of the San Francisco North quadrangle (California): U.S. Geol. Survey, Misc. Geol. Inv. Map I-272.

Map used to determine the extent of sand dunes and areas of surface covered by sand in the Sutro Historic District.

Clarke, W. G. 1959. The vegetation cover of the San Francisco Bay Region in the Early Spanish Period. MA Thesis (Geography). University of California, Berkeley, CA. 220 p.

Area shown on Clarke's map as grassland with a symbol indication chaparral in indeterminate locations. This conclusion is based on description of chaparral (assumed to be northern coastal scrub) in diaries of early travelers which could not be specifically tied to given locations in San Francisco. Clarke's map on the southern margin of the study area.

Cooper, W. S. 1967. Coastal Dunes of California. The Geological Society of America. Memoir 104. 131 p.

Cooper reviews many description of the sand dunes and their vegetation on the San Francisco peninsula. These descriptions suggest a mosaic of open sand, coastal strand community, northern coastal scrub, riparian thickets dominated by willow, and grassland occurred. Occurred in the study area. Cooper was a professor of plant ecology at the University of Minnesota. The field work for this publication was begun in 1919. Major reconnaissances were made in 1927 and 1933 of the San Francisco sand dunes. Publication was delayed until after his retirement from the University of Minnesota.

Mayfield, D.W. 1980. Ecology of a discovered land. Pacific Discovery 33(5):15-20.

Area shown as grassland and dune sand along line suggested by Blake (1857). Like Clarke, Mayfield quotes early traveler's description of low scrubby vegetation on the steeper slopes near the ocean at the northern end of the San Francisco Peninsula.

1867 Vegetation

The above references, in particular Blake (1857) and Cooper (1967) plus:

W.V Gray and C. B. Gifford. 1873. Bird's Eye View of the City and County of San Francisco, 1873. Color Lithograph published by A. L. Bancroft Co. Bancroft Library. University of California. Berkeley, CA.

North slope of Sutro heights and the areas to the north immediately adjacent to the sea cliffs are shown to be supporting shrub cover. No naturally occurring trees or forest plantations are indicated.

Anon. 1867. Photograph taken at the Presidio looking west from the present location of the Presidio Museum (former base hospital). Archives of the Presidio of San Francisco. San Francisco, CA (no reference number).

Hill at the horizon supports a scrub and grassland cover. This hill has the same geology (old sand dune) as much of the Sutro Historic District.

Anon. 1882. Photograph taken at the Presidio looking north from hill south of the parade ground. Archives of the Presidio of San Francisco. San Francisco, CA. (no reference number).

Immediate slope below photographer is covered with a scrub type. This slope has the same geology (old sand dune) as much of the Sutro Historic District.

1888 Vegetation

The above references, plus the following photographs from the San Francisco Room of the San Francisco Public Library:

Sutro Heights, San Francisco. 1886. Taber Photography Company. San Francisco, CA.

No. 53 - Rocky Point below Sutro Terrace

Slope to north supports northern coastal strand

No. 32 - Venus statue

Slope in background (looking northeast) is grassland

No. 50 - Hebe statue

Slope which now supports Monterey cypress plantation is scrub with open areas of grassland on the upper slope and ridge top.

1910 Vegetation

The above references, plus the following photographs from the San Francisco Room of the San Francisco Public library:

No. 70 - Billington, W.D. (c. 1896-1900). Sutro Bath, Construction Complete. (negative # 819).

Northern coastal scrub on point north of bath and uphill to the east in the areas now supporting Monterey cypress plantation.

Photographer unknown, date believed to be early 20th century

No. 63-8 - Back of Sutro Bath

Slope east of the bath densely covered with planted shrubs, some Monterey cypress

no number - S.F. Ocean Beach Folder, Sutro Bath Exterior

Small grove of Monterey cypress to north of round pool (water storage for baths); slope above Baths densely covered with planted shrubs.

no number - S.F. District Land's End Folder, Land's End Street |Car Stop, Oct. 1908.

Slopes with scattered shrubs on less steep uplands, steep slopes covered with northern coastal scrub, Pampas grass invading.

1992 Vegetation

Field mapping conducted in February, 1992

Of interest to understanding the cultural vegetation of the site are the following photographs from the San Francisco Room of the San Francisco Public Library:

No. 4556 - Aerial Photo of Sutro Baths (12/12/51)

Monterey cypress plantation covers area between street car line and Point Lobos Avenue. This area was cleared of trees at some point following this 1951 photograph.

no number - Photo by Larry Moon (Nov. 1, 1966) "Sutro Bath After Fire"

Portion of Monterey cypress plantation was burned in the fire (6/26/66). It is that portion of the stand which now support the the snags resulting form the fire

Appendix II

Rare and Endangered Plant Species

No rare or endangered plant species were observed on the site during the reconnaissance conducted from December to February, 1991-92. The California Natural Diversity Data Base overlay map for the San Francisco North quadrangle indicates that San Francisco gumplant (*Grindelia maritima*), a plant listed as a category 2 species under the U.S. Rare and Endangered Species Act, was reported on coastal bluffs north of the study area in 1987. A careful search was made of the coastal bluffs in the study area to specifically locate any San Francisco gumplants; however, no plants of this species were found. No other rare or endangered species are reported to be within or near the study area.

Acknowledgements

We wish to express our appreciation to Sheryl C. Salazar for her preparation of the figures and maps used in this report and to the staff of the San Francisco Room of the San Francisco Public Library for their assistance in locating early photographs of the Sutro Historic District.