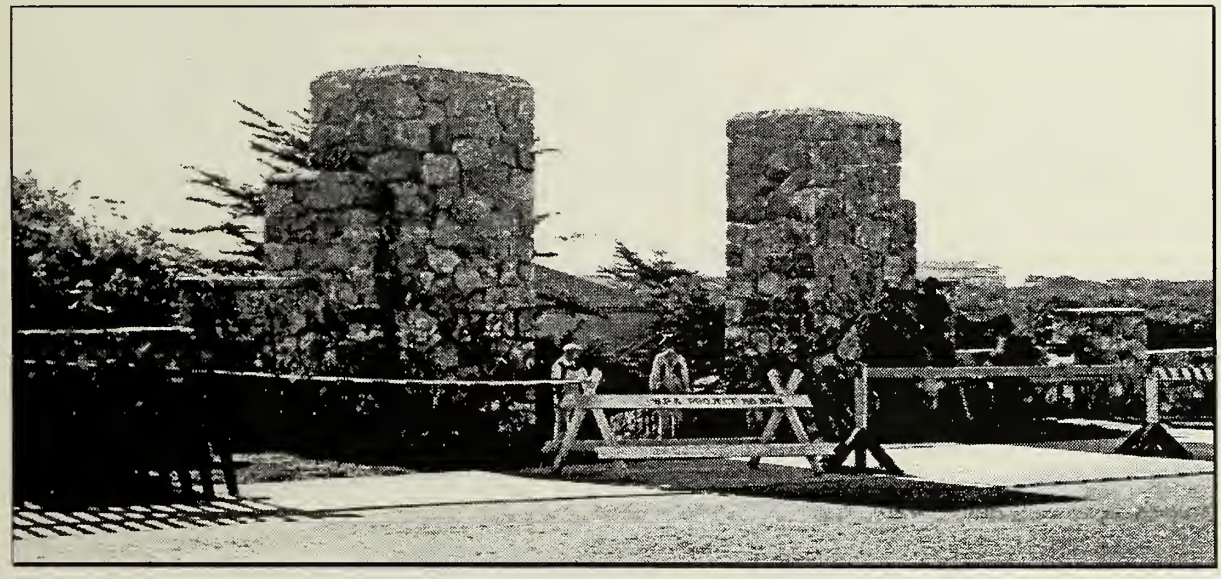
City and County of San Francisco
Planning Department

SAN FRANCISCO ZOOLOGICAL GARDENS MASTER PLAN

Draft Environmental Impact Report

Case No. 95.469E



Draft EIR Publication Date: September 6, 1997
Draft EIR Public Hearing Date: October 9, 1997
Draft EIR Public Comment Period: October 9, 1997

Written Comments should be sent to:

Environmental Review Officer
San Francisco Planning Department
1660 Mission Street, Fifth Floor
San Francisco, CA 94103

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San Francisco Zoological Gardens master plan : 1997.

PLANNING DEPARTMENT

City and County of San Francisco 1660 Mission Street San Francisco, CA 94103-2414

(415) 558-6378 PLANNING COMMISSION FAX: 558-6409 ADMINISTRATION FAX: 558-6426 CURRENT PLANNING/ZONING FAX: 558-6409 LONG RANGE PLANNING FAX: 558-6426

DATE: September 5, 1997

TO: Distribution List for the San Francisco Zoological Gardens Master Plan Draft EIR

FROM: Hillary E. Gitelman, Environmental Review Officer

SUBJECT: Request for the Final Environmental Impact Report for the San Francisco Zoological Gardens Master Plan Draft EIR

This is the Draft of the Environmental Impact Report (EIR) for the San Francisco Zoological Gardens Master Plan. A public hearing will be held on the adequacy and accuracy of this document. After the public hearing, our office will prepare and publish a document titled "Summary of Comments and Responses" which will contain a summary of all relevant comments on this Draft EIR and our responses to those comments; it may also specify changes to this Draft EIR. Public agencies and members of the public who testify at the hearing on the Draft EIR will automatically receive a copy of the Comments and Responses document, along with notice of the date reserved for certification; others may receive such copies and notice on request or by visiting our office. This Draft EIR together with the Summary of Comments and Responses document will be considered by the Planning Commission in an advertised public meeting and certified as a Final EIR if deemed adequate.

After certification, we will modify the Draft EIR as specified by the Comments and Responses document and print both documents in a single publication called the Final Environmental Impact Report. The Final EIR will add no new information to the combination of the two documents except to reproduce the certification resolution. It will simply provide the information in one rather than two documents. Therefore, if you receive a copy of the Comments and Responses document in addition to this copy of the Draft EIR, you will technically have a copy of the Final EIR.

We are aware that many people who receive the Draft EIR and Summary of Comments and Responses have no interest in receiving virtually the same information after the EIR has been certified. To avoid expending money and paper needlessly, we would like to send copies of the Final EIR to private individuals only if they request them.

If you would like a copy of the Final EIR, therefore, please fill out and mail the postcard provided inside the back cover to the Office of Environmental Review within two weeks after certification of the EIR. Any private party not requesting a Final EIR by that time will not be mailed a copy. Public agencies on the distribution list will automatically receive a copy of the Final EIR.

Thank you for your interest in this project.

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San Francisco Planning Department
Office of Environmental Review
1660 Mission Street, 5th Floor
San Francisco, CA 94103

Attn: Irene Nishimura, EIR Coordinator
95.469E San Francisco Zoological Gardens
Draft Master Plan EIR

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REQUEST FOR FINAL ENVIRONMENTAL IMPACT REPORT

TO: San Francisco Planning Depatment,
Office of Environmental Review

Please send me a copy of the Final EIR.

Signed: _____

Print Your Name and Address Below:

SAN FRANCISCO ZOO MASTER PLAN
DRAFT EIR

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SUMMARY

The project evaluated in this Environmental Impact Report (EIR) is the proposed San Francisco Zoological Gardens' Master Plan (referred to in this EIR as the *SF Zoo Master Plan*), published in June 1994. The *SF Zoo Master Plan*, is a multiple-phase physical/management design and development plan for all existing and proposed Zoo facilities, to be implemented over the next 20 years as funds are available. It sets forth specific programs for the Zoo's role in conservation, education, recreation, and research, in support of its primary mission, the preservation of wildlife. The *SF Zoo Master Plan* also addresses programmatic elements, such as future educational programs, facilities management, and special events.

This informational document is a Program EIR for use by responsible and trustee agencies and the public to identify and evaluate the potential physical environmental consequences of the proposed *SF Zoo Master Plan*, to present measures to reduce or avoid potential environmental impacts, and to examine feasible alternatives to the proposed plan. The analyses contained herein will allow decision-makers to make informed decisions on the policies, objectives, development standards, and range of proposed individual activities in the *SF Zoo Master Plan* in a comprehensive manner. After environmental review of the plan has been completed and the EIR is certified by the Planning Commission as meeting the requirements of *CEQA*, the information in the EIR will be reviewed and considered by the Recreation and Park Commission to approve, disapprove or modify the draft *SF Zoo Master Plan*. Once the plan is approved, specific actions and recommendations can be considered for implementation by the Zoological Society. Pursuant to State CEQA Guidelines, Section 15168, specific actions would be examined to determine whether they are covered by this Program EIR, or whether additional environmental analysis is required.

A. PROJECT DESCRIPTION

The San Francisco Zoological Gardens is located in the southwest part of the City. The existing Zoo facility, which encompasses approximately 75 acres, is bounded by The Great Highway and the Pacific Ocean to the west, Sloat Boulevard and the Sunset District to the north, Lake Merced, the Recreation Center for the Handicapped and the Oceanside Water Pollution Control Plant (OWPCP) to the south, and residential areas to the east. The *SF Zoo Master Plan* project site includes the existing Zoo, plus an additional 30 acres of San Francisco public park land at the Zoo's western and southern boundaries.

The existing Zoo contains approximately 15 acres of open and enclosed animal exhibits, three acres of non-exhibit structures (offices, gift shops, etc.), 14 acres of pedestrian walkways/service roads,

42 acres of non-exhibit landscaping and buffer zones, and one acre of off-street, surface parking. The Zoo is home to over 83 species of exotic and domestic mammals, 30 species of reptiles and amphibians, 83 species of birds and 66 species of invertebrates. Twenty-eight species are classified as endangered or threatened and 17 are part of an international breeding program that seeks to maintain captive populations of endangered species and preserve their genetic diversity through captive breeding programs in cooperation with the American Zoo Association.

The area west of the Zoo, known as the Fleishhacker site, is the former location of the Fleishhacker Pool and the site of the Fleishhacker Bath House. This property, like the Zoo itself, is owned by the City and County of San Francisco and is managed through a public-private partnership between the San Francisco Recreation and Park Department and the non-profit San Francisco Zoological Society.

Nearly three-fourths of the Zoo facilities are in disrepair, worn by time, a harsh coastal environment and deferred maintenance. Visitor facilities, such as the Mother's Building (current gift shop), the pump station and restrooms, and the snack shop, dating back to the original 1920's Zoo are in disrepair and are slated for renovation or demolition under the *SF Zoo Master Plan*. Animal exhibits dating back to the 1936 Hobart Zoo design no longer meet U.S. Department of Agriculture (USDA) health and safety criteria. Animal housing is undersized and provides no natural habitat for the animals. Key examples are the Pachyderm House, the Lion House, and the bear grottos.

The proposed *SF Zoo Master Plan* is a physical/management plan that includes both existing and proposed animal, visitor and staff facilities. The physical changes proposed in the *SF Zoo Master Plan* include overall rearrangement of animal exhibits into exhibits designated as natural habitats and illustrative of biogeographic regions of the world, as well as expansion and rearrangement of support facilities. The changes would include demolition or reconstruction of existing buildings and structures, removal of existing vegetation and landscape features, and recontouring animal paddocks and water features. The proposed biogeographic regions would be relandscaped with vegetation representative of the region and new animal management facilities (exhibit space, protective shelters, feeding areas) would be constructed. New enhanced visitor amenities and facilities (children's center, interpretative and interactive exhibits, signage, lighted and surfaced pathways, seating and eating areas, children's play area, restrooms, on-site visitor parking and bus areas, retail facilities) would be developed as part of the initial phase of the plan. Key features of the proposed plan are the reorientation of the visitor entry from Sloat Boulevard to the Great Highway and a reorientation of the internal pedestrian circulation from a north-south axis to an east-west axis.

The proposed *SF Zoo Master Plan* is described and analyzed in two phases of development: near-term (1997-2006) phase and post-2006 phase. The greatest level of detail is provided for the near-term (1997-2006) phase.

The physical changes to the existing Zoo that are proposed in the *SF Zoo Master Plan* for the initial phase of development would be concentrated primarily in the western end, off the Great Highway. This would include expansion of the Zoo footprint by about 20 acres to the West to use a portion of existing park land formerly occupied by the Fleishhacker outdoor pool. The area is presently used as a storage and staff parking area, and construction staging area. Existing unused open space would be developed for use by Zoo animals of the African Savanna. The area is cleared of vegetation and unpaved. Initial changes would resolve current animal management issues and would integrate and expand development of family and children's attractions and educational opportunities. Some buildings (Pachyderm House, pump house, and a small café), dating back to the 1930's, are proposed to be demolished.

Planned improvements include: New Main Visitor Entry Plaza / Parking / Transit Drop-Off, Visitor Spine/ Pedestrian Circulation System, Children's Center / Zoo, Education Center, Animal Resource Center (ARC), African Savanna, Elephant and Rhino Savanna, Support Services, Retail Cluster 'B', Madagascar, Orangutans / Chimpanzees / Gorillas.

The post-2006 phase of development, primarily at the eastern and southeastern side of the Zoo is contingent on available funding. This later phase of the *SF Zoo Master Plan* would involve demolition of the Lion House, the Aviary, the bear grottos, and existing paddocks and shelters. The new biogeographic regions that would be created would include the South American Gateway, Montane Asia and Tropical Asia. An extension of the initial phase Savanna would also be planned to include elephants and rhinos to complete the African theme.

B. MAIN ENVIRONMENTAL EFFECTS AND MITIGATION MEASURES

The Zoo Master Plan would result in physical and non-physical (i.e., operational) changes to the existing Zoo and its environs. Chapter II of this EIR contains a thorough analysis of potential physical effects (direct, indirect, and cumulative). The main identified effects are summarized below, along with related improvement and mitigation measures, where applicable. The proposed Zoo Master Plan's primary intention is to improve the Zoo's physical environment for the housing and protection of zoo animals and for the education and enjoyment of visitors. Improvements, or beneficial impacts of the Plan, would themselves affect the existing environmental setting, however, and it is these related or resulting effects that are described below.

VISUAL QUALITY

Implementation of the proposed project would involve the removal and replacement of trees and other vegetative cover that characterize the Zoo from external viewing points. This vegetation also provides visual screening of construction activities and Zoo maintenance and operations of a variety of heavy

equipment and trucks. Removal of vegetation and visual buffers would temporarily reduce the existing visual quality of the project area during periods of construction, but would not substantially degrade or obstruct scenic views or vistas from public areas outside the Zoo. Following development of *SF Zoo Master Plan* projects, the visual quality of the Zoo and its environs would be enhanced over existing conditions, a beneficial effect.

EMPLOYMENT / VISITOR GROWTH AND TRANSPORTATION ISSUES

The proposed *SF Zoo Master Plan* project could increase the visitor attendance of the San Francisco Zoo as the project is implemented over the next five to seven years. Full-time and part-time employment at the Zoo would increase by about 105 employees and opportunities for volunteer work would increase from about 500 to 675 positions. Housing demand would not substantially increase as a result of the increase in Zoo employment.

On peak attendance days of 30,000 visitors, traffic impacts would occur at the intersections of The Great Highway with Sloat Boulevard and Skyline Boulevard where levels of service would degrade from Level of Service (LOS) C or D to LOS F. This condition would be expected to occur less than 10 times a year on maximum peak-use days, and would be a less-than-significant impact with the improvement measures proposed as part of the project.

The proposed 1,740 parking spaces would not be adequate to meet parking demand on maximum peak-use days. The resulting overflow of vehicles into the adjacent neighborhood to search for parking and the potential shift to transit as parking lots reach their capacity would result in potential impacts to the transit system.

With the implementation of a new traffic circulation plan for the Zoo and new main parking area, circulation impacts could occur. To facilitate access to the Zoo, the following improvement measures would be implemented.

- The Great Highway/Sloat Boulevard intersection level of service would be restored to LOS D by adjusting the signal timing to permit right turns from northbound on The Great Highway to Sloat Boulevard during the same phase that the westbound Sloat Boulevard traffic movements occur. Operations at the northbound left-turn approach to the Skyline Boulevard/Great Highway intersection would be improved by using traffic control officers to facilitate traffic flow on the highest peak use attendance days, e.g. free days.

- Aggressive implementation of the comprehensive transportation demand management strategy adopted by the Zoo which identifies measures to increase transit, pedestrian, and bicycle use as a means of getting to the Zoo would reduce potential effects related to parking overflow during peak periods. Measures that would be included are: a visitor discount program for Muni patrons,

offering free Muni or BART passes to employees, providing secure bicycle racks ("U" type) in the new main entrance area, and designating a Zoo transportation manager. Additional measures to be evaluated include: visitor bus shuttle services during peak periods (summer months); increased marketing of alternatives to the auto; parking fees; increased transit service levels on maximum peak use days; and widening pedestrian walkways along Sloat Boulevard.

- To direct visitors to the new Zoo main entrance, appropriate signs would be installed along Sloat Boulevard, The Great Highway, and Skyline. An electronic "FULL" sign visible from The Great Highway and a sign on Sloat Boulevard at Skyline Boulevard are proposed.

- An approximately 1,100-foot long entry drive to the Zoo from The Great Highway would be incorporated into the project improvements to provide queuing capacity. The design includes a deceleration ramp with a 400-foot taper feeding into two 650-foot long vehicle storage lanes before entering the parking area. This would accommodate 60 vehicles and minimize the potential for traffic queuing onto The Great Highway.

- Provide an exclusive right turn lane on Sloat Boulevard west of the new Zoo parking entrance to provide adequate queuing for traffic entering the Zoo parking lot from Sloat Boulevard. Prohibit left turn movements from westbound Sloat Boulevard into the parking lot.

- Manage the parking lot with parking crews on peak use days to ensure that cars waiting to enter the lot do not back-up on to The Great Highway. As the main parking lots fill, close-off full areas and reroute traffic to parking on Sloat Boulevard and to Herbst Road, as necessary.

- Design traffic flow out of the main parking area to minimize delays and conflicts. The acceleration ramp from the Zoo exit road to The Great Highway would be 700-feet plus a minimum taper of 300-feet to allow traffic to safely merge on to The Great Highway. Ensure adequate provision is made for southbound traffic exiting the parking facility by the addition of additional northbound right turn capacity at The Great Highway and Sloat Boulevard intersection.

AIR QUALITY AND CLIMATE

Dust generation during construction would be reduced to a less-than-significant level by implementing proven construction control practices. The project sponsor shall require that the general contractor sprinkle demolition areas with water routinely during demolition activity; water during pavement cutting, excess soils loading and hauling, and temporary stockpiling; sprinkle all active construction areas with water at least twice per day to reduce dust generation by about 50 percent; water three times daily or apply soil stabilization to unpaved access roads, parking areas, and staging areas at construction sites; cover stockpiles of soil, sand, and other materials; cover trucks hauling debris, soil, sand or other material; shut down idle construction equipment; encapsulate any excavated materials

that are potentially hazardous because of harmful mineral content or are a potential nuisance because of organic content; and sweep daily with water sweepers all paved access roads, parking areas, staging areas, and construction sites and adjacent public streets if visible soil material is carried off the site.

The local wind conditions in conjunction with low background pollution levels result in excellent air quality conditions at the Zoo. Additional vehicle trips to and from the Zoo which are anticipated as a result of the Zoo Master Plan would not be expected to result in violations of State/Federal standards for criteria pollutants. The number of days when large increases in traffic would be expected would occur 10 or fewer days throughout the year and would not significantly affect air quality.

NOISE

Construction and demolition activities for SF Zoo Master Plan projects would intermittently and temporarily generate noise levels above ambient background levels during construction periods for individual project facilities. While temporary and intermittent, these noise increases could be disturbing to some Zoo animals, employees, and visitors, and, in special situations, where noise sensitive animals are affected, would require mitigation measures proven effective in previous Zoo construction projects (Avian Conservation Center, Wet Weather Lift Station).

The following proposed measures would reduce the severity of the potential noise impact, to a less-than-significant level in these special situations.

- The contractor(s) will be required to carry out construction activities in a manner such that noise criteria specified in the Noise Ordinance (Section 2907 of the Police Code) are not exceeded. The contractor(s) will use appropriate construction methods and equipment and will install acoustic barriers as necessary. Jackhammers will be provided with intake and exhaust mufflers, and, if necessary, with acoustical attenuating shields or shrouds recommended by the manufacturer and approved by the Director of Public Works as the best available means of accomplishing maximum noise level reduction. The contractor(s) will submit the plans for mitigation of noise impacts to the construction manager for approval. The contractor(s) will use the best practicable noise mufflers on all construction equipment. Construction will progress in such ways as to habituate Zoo animals to construction noise, and to minimize construction during breeding seasons. Whenever any unusually noisy construction activity is anticipated, Zoo staff will be notified in advance. The responses of sensitive animals will be monitored and any behavioral changes that may be related to construction noise will be noted and construction will be halted until measures can be taken to reduce the noise impacts on the affected animals.

- The contractor will be restricted from making sudden or impulsive noise in the areas adjacent to the living quarters of animals.

- Construction specifications will require the contractor to start noisy equipment and machinery 50 feet or more from animal exhibits before moving equipment to the vicinity of animal exhibits.

BIOLOGICAL RESOURCES

The Zoo occasionally supports two naturally occurring sensitive wildlife species: nesting red-shouldered hawks and nesting saltmarsh common yellowthroat. None of the other species considered in this report as having potential to occur in the region are known to occur at the Zoo.

Unless mitigated, implementation of the Zoo Forest Management Plan has potential to harm or harass nesting saltmarsh common yellowthroat by removing dense vegetation used by the species at the Friendship Lagoon, in front of the bear exhibit, and at the lion and tiger grottos. To reduce the potential for impacts on nesting saltmarsh common yellowthroat during facilities improvements, the following improvement measures would be implemented:

- Improvements in the vicinity of the Friendship Lagoon, bear exhibit, and lion and tiger grottos would be restricted to the non-breeding season (late October to early March). Proposed facility improvements would be reviewed, and modified as necessary to ensure that the existing vegetation cover and water used by the species is retained wherever possible. If facility improvements cannot be accomplished during the non-breeding season, a qualified specialist (biologist) or zookeeper would identify and demarcate any active nests present in advance of construction activities. Construction areas would be surveyed during the breeding season (late March to early October) to identify active nests that could be affected by planned facility improvements. The specialist will determine suitable methods to reduce or minimize impacts to nesting saltmarsh common yellowthroat, in consultation with the California Department of Fish and Game (DFG) and the U.S. Fish and Wildlife Service (USFWS).

Implementation of the Zoo Forest Management Plan also has the potential to harm or harass nesting raptors, including red-shouldered hawks by removing trees that support raptor nests. Large trees present at the Zoo could be used for nesting by several raptor species. The removal or destruction of active raptor nests is considered a violation of the California Department of Fish and Game Code (Section 3503.5). The following measures are described and would be implemented to reduce potential for impacts on nesting raptors to a less-than-significant level.

- Reforestation efforts would be restricted to the non-breeding season (July to January). If reforestation cannot be accomplished during the non-breeding season, a qualified specialist or zookeeper would identify active raptor nests within the Zoo. Where active nests are located in trees scheduled for removal, the specialist will determine suitable methods to reduce or minimize impacts on nesting raptors through consultation with DFG and USFWS. Suitable methods to reduce or minimize impacts may include one or all of the following:

- Wherever possible, tree removal activities throughout the Zoo will occur during the raptor non-breeding season (July-January).

- If removal of trees is unavoidable during the raptor nesting season (February through late June), a focused survey will be conducted by a qualified specialist or zookeeper prior to tree removal. All trees to be removed will be surveyed to identify any active raptor nests present.

- Where active nests are found, a minimum 500-foot buffer zone will be established around the active nest sites. The buffer zone may be adjusted at the recommendation of the qualified specialist or zookeeper, based on site-specific conditions. No tree removal activities will be undertaken within the buffer zone until young raptors have fledged or adults have abandoned the nest site (as determined by a qualified specialist or zookeeper).

GEOLOGY AND HAZARDS

The project would increase the number of people exposed to the site's earthquake hazards, particularly hazards posed by damages to structures and interior facilities during ground shaking. Mitigation measures proposed as part of the project, and outlined below, would reduce this impact to a less-than-significant level. In addition, project structures and foundations would be designed in accordance with building codes and standards based on San Francisco seismic requirements. These standards take into account the potential levels of seismic shaking and amplification due to soil type and thickness.

- Detailed, site-specific geotechnical investigations shall be conducted for all proposed project sites by a qualified geotechnical consultant prior to final design of proposed facilities. The geotechnical investigations and studies will include the following, as appropriate: field exploration; subsurface exploration; and laboratory testing and engineering analysis to evaluate soil and rock stability, slope stability, on-site drainage for subsurface structures, soil characteristics for corrosivity, permeability, liquefaction and densification, soil lurching and lateral spreading, differential settlement, and foundation support and design. The studies will include development of construction, excavation, and design measures required to ensure public safety, structural integrity, and protection of existing structures during construction and operation. Precautions, such as underpinning or shoring, as determined by site-specific geotechnical investigations, may be necessary to prevent settlement of existing nearby structures during and after construction. The project sponsor will implement all recommendations of the geotechnical investigations and studies during final design and construction of proposed facilities.

- The Zoo's evacuation and emergency response plan will be periodically reviewed and updated by Zoo management, in consultation with the Mayor's Office of Emergency Services, to insure

coordination between the City's emergency planning activities and implementation of the Zoo Master Plan.

Potentially hazardous materials may be present in Zoo buildings proposed for renovation or demolition. These materials would be properly identified and abated or removed prior to demolition or renovation in accordance with the following measure:

- Each structure to be renovated or demolished shall be inspected by a qualified environmental specialist retained by the Zoo for the presence of asbestos, PCBs, lead, and other hazardous materials. If found, these materials will be managed as required by law and according to Title 8, Section 1529 of the California Administrative Code. Actions would include asbestos surveys and abatement, removal of old transformers, and inspections for chemical spills, contamination, and lead within and around structures. Asbestos removal contractors must be certified as such by the State Contractors Licensing Board.

CULTURAL RESOURCES

The proposed Zoo Master Plan would retain the following elements which contribute to the potentially eligible San Francisco Zoo Historic District: The Mothers Building, the Carousel, the Zoo Keeper's Residence, the Terrace Restaurant, and the stone walls along Sloat Boulevard. The initial phase of the proposed Zoo Master Plan development would demolish the Pachyderm Building, circular fountain, snack building, public restrooms, pump station and landscape elements. The second phase of the Zoo Master Plan would remove the Aviary, the Lion House, the paddocks, the bear dens, and the Friendship Lagoon. All of these structures contribute to the potential historic district.

To partially mitigate the extent of loss of the resources, an Historic American Building Survey (HABS) would be conducted using National Park Service format and guidance to expand the information contained in the Historic Landscape and Architectural Survey Report. Additional descriptive information on the buildings would be included and large format photographs and landscape features that contribute to the Zoological Historic District would preserve this information at the Library of Congress for future generations. Development and distribution of a CD ROM, video, or classroom book to fully document the historical and architectural evolution of the San Francisco Zoological Gardens would further expand this mitigation measure. An exhibit of the history of the Zoo could also be developed as an on-site educational resource in the proposed Children's Zoo Education Center Building. These documentation measures would not reduce the loss of historic resources to less-than-significant, therefore this significant impact would be unavoidable for the proposed project.

C. ALTERNATIVES TO THE PROPOSED PROJECT

In accordance with CEQA and the State CEQA Guidelines, this EIR includes a discussion of alternatives to the proposed project that would reduce or eliminate potentially significant and unmitigable effects. Thus, the No Project Alternative and Preservation Alternative are presented and described below and in Chapter IV. In addition, it should be noted that the Zoo Master Plan itself contains various policies and actions which may or may not be implemented in their entirety or in the sequence assumed herein. As such, the Zoo Master Plan itself could be said to include variations to the program presented in the EIR, and decision makers could choose to implement some aspects of the Plan and reject others.

NO PROJECT ALTERNATIVE

The No Project Alternative would mean that the existing Zoo entry on Sloat Boulevard; the internal and external visitor circulation system to the Zoo; and existing landscaping, animal exhibits, animal care facilities, educational facilities, and visitor amenities would remain as they are today. The Zoo would not expand to the west to occupy the 30 acres of park land designated as a joint-use area. Traffic and parking along Sloat Boulevard would continue to be congested during summer months and on weekends when visitor attendance is high, particularly on special event days such as the Zoo Run and on 'free days'.

Routine maintenance and operations at the Zoological Gardens would continue, and improvements to animal exhibits could be made, on an as-needed basis to meet health and safety needs of animals. The 55-year old animal facilities that are in disrepair and no longer meet the health and safety needs of animals and their keepers would remain in use, be abandoned, or would be closed pending future replacement projects.

PRESERVATION ALTERNATIVE

The Preservation Alternative would preserve the most prominent structures and physical elements from the 1920's that are identified as contributing to a potentially eligible San Francisco Zoo Historic District (see Chapter IV) as well as those structures that would be preserved as part of the Zoo Master Plan. The Preservation Alternative would modify the proposed Zoo Master Plan by preserving to the extent feasible a majority of the structures and landscape elements of the original Hobart design:

- The Aviary, a classic Moderne Style architectural design, would remain along the northeastern edge of the Zoo, where the Australian Biogeographic region is planned. This building could potentially be converted to use as a Zoo History Museum or Educational Center with substantial ventilation, seismic, and ADA retrofitting. Reuse of the building could also require removal of surrounding trees to increase natural lighting.

- The Lion House, another Moderne Style of architectural design, located in the central part of the Zoo, adjacent to the proposed visitor spine and future Insectarium, would be preserved and potentially rehabilitated for another type of animal exhibit. Seismic retrofit, and plumbing, electrical and heating retrofit would be necessary to open this building for public use. The undersized exterior paddocks, dens and outdated moats would need to be redesigned and expanded for continued animal use.

- The Pachyderm House, another visually dominant feature in the central part of the Zoo (along with the Lion House), flanks the original Hobart designed central plaza. The Pachyderm House is located where the South American and Australian Gateways are planned. Potential re-use of this building has not been defined.

- The existing stucco and tile roof Snack Building, located adjacent to the existing picnic area, Mother's Building and Zoo entry area off Sloat Boulevard, would be preserved and relocated (depending on feasibility) to the new Visitor Plaza at the west end of the Zoo for the storage of maintenance materials or perhaps strollers. ADA accessibility improvements would be required.

- The circular fountain and stairway, near the Lion House and the original Hobart landscape plan with a north-south axial focus on the circular fountain and the oval features at each end, is located where the new visitor spine and Asian Montane Biogeographic region are planned. They would be preserved as part of the 1936 landscape plan for the Zoo.

The Zoological Society believes that both of the above alternatives would fail to achieve important project objectives, as described in Chapter I, and would affect their ability to continue the species survival program.

D. UNRESOLVED ISSUES AND AREAS OF CONTROVERSY

During the development of the SF Zoo Master Plan and the campaign for the recently passed Zoo bond measure, issues were raised that may remain controversial. The ability of the Zoological Society to raise their private contribution of matching funds to supplement the bond funds and the proposal to charge for parking were issues raised by opponents of the Zoo bond measure. Also raised, was the issue of costs incurred by the City as a result of "forcing" the Oceanside Water Pollution Control Plant and the Recycled Water Treatment Plant to be built underground to accommodate Zoo expansion / improvements. The impacts associated with these two projects received independent environmental review.

A potential area of controversy could exist over the issue of the preservation of historic buildings versus the development of new and re-designed animal habitats.

E. PUBLIC PARTICIPATION

The planning process for the Zoo has invited public input through the Zoological Society (27,000 members) and Recreation and Park Commission meetings on the Zoo Master Plan since the development of a statement of goals and objectives in 1974. In 1975, San Francisco voters approved a Charter Amendment (Prop A) providing for joint use of land to the west of the existing Zoo for construction of a sewage /water treatment facility and Zoo expansion. The first conceptual master plan for the Zoo was adopted by the Recreation and Park Commission in October of 1976. The plan was again updated, and approved by the Commission in concept in April 1986 and more recently in June 1994 and recommended for environmental review prior to formal approval. The Zoological Society has held several workshops with local community groups and neighbors to discuss the plan and invite input. In June of 1997, a bond measure funding the implementation of specific elements of the Zoo Master Plan was approved by the voters of San Francisco. The Zoo is governed by the Recreation and Park Commission and the Zoological Society's 50-member Board of Directors.

F. EIR ORGANIZATION

This Program EIR is organized into five chapters, plus a Summary and Appendices.

The Project Description, Chapter I, is a summary of the draft *SF Zoo Master Plan* as put forth for environmental review by the Recreation and Park Commission. The Project Description discusses the project sponsors objectives, provides a description of the proposed Zoo Master Plan actions (project) location, describes the operational and physical characteristics of the proposed project, and identifies the schedule and phasing of the project and its required approvals.

Chapter II, Environmental Setting, Impacts and Mitigation Measures, describes the existing Zoo environmental setting, discusses the potential environmental impacts of the proposed project, and describes mitigation measures for the potentially significant impacts. This EIR addresses potential changes to land use, planning and zoning, visual quality, population, transportation, air quality and climate, noise, utilities, energy use and public services, biological resources, geology and topography, water, hazards, and cultural resources (historic properties). Within each impact section contained in Chapter II of this EIR, potential environmental impacts are described and improvement measures identified. Following the impacts section, feasible mitigation measures that could avoid, alleviate or lessen the severity of identified potential significant impacts are described. Cumulative impacts are described as they relate to the implementation of one or more individual activities in the *SF Zoo Master Plan,* or as they relate to other projects in the area of the SF Zoological Gardens. Impacts from construction activities are described, in addition to impacts associated with the long-term implementation of Zoo Master Plan policies and actions.

Chapter III, Other Topics Required by CEQA, includes the project's potential for unavoidable significant impacts and significant irreversible effects. A section on the Unresolved Issues and Areas of Controversy is also included.

Chapter IV describes and analyzes alternatives to the proposed project, provides discussion of potential environmental impacts associated with each alternative, and discusses the relationship of each alternative to the proposed project. The discussion of alternatives includes (A) a No-Project Alternative and (B) a Historic Property Preservation Alternative. The evaluation focuses on alternatives that may be capable of eliminating significant adverse environmental effects of the project or reducing them to less-than-significant levels, even if the alternatives would impede the attainment of one or more basic project objective or would be more costly. The distinctive environmental characteristics of the alternatives are identified and compared to project impacts.

The distribution list for agencies and persons receiving the Draft EIR is included at the end of the document. The Appendices include supporting documentation for the environmental analysis presented in this Program EIR, a list of agency personnel responsible for preparing this Draft Program EIR, and identifies organizations and persons consulted during its preparation. Background file documents cited throughout the EIR are on file and available for public review at the San Francisco Planning Department, 1660 Mission Street, San Francisco, California.

I. PROJECT DESCRIPTION

A. PROJECT LOCATION

The San Francisco Zoological Gardens is located in the southwest part of the City, at 1 Zoo Road (see Figure 1). The existing Zoo facility, which encompasses approximately 75 acres, is bounded by The Great Highway and the Pacific Ocean to the west, Sloat Boulevard and the Sunset District to the north, Lake Merced, the Recreation Center for the Handicapped and the Oceanside Water Pollution Control Plant (OWPCP) to the south, and residential areas to the east. The *SF Zoo Master Plan* project site includes the existing Zoo, plus an additional 30 acres of San Francisco public park land at the Zoo's western and southern boundaries. The area west of the Zoo, known as the Fleishhacker site, is the former location of the Fleishhacker Pool and the site of the Fleishhacker Bath House. This property, like the Zoo itself, is owned by the City and County of San Francisco and until 1992 was managed by the Recreation and Park Commission. Today the Zoo and the Fleishhacker site are managed through a public-private partnership between the San Francisco Recreation and Park Department and the non-profit San Francisco Zoological Society. The future use of this area is being coordinated with the San Francisco Public Works Department, which plans to construct a recycled water treatment plant and water storage facilities in this area, as part of the *San Francisco Recycled Water Master Plan (SFRWMP)*. Potential impacts of the SFRWMP have been analyzed in a separate EIR.

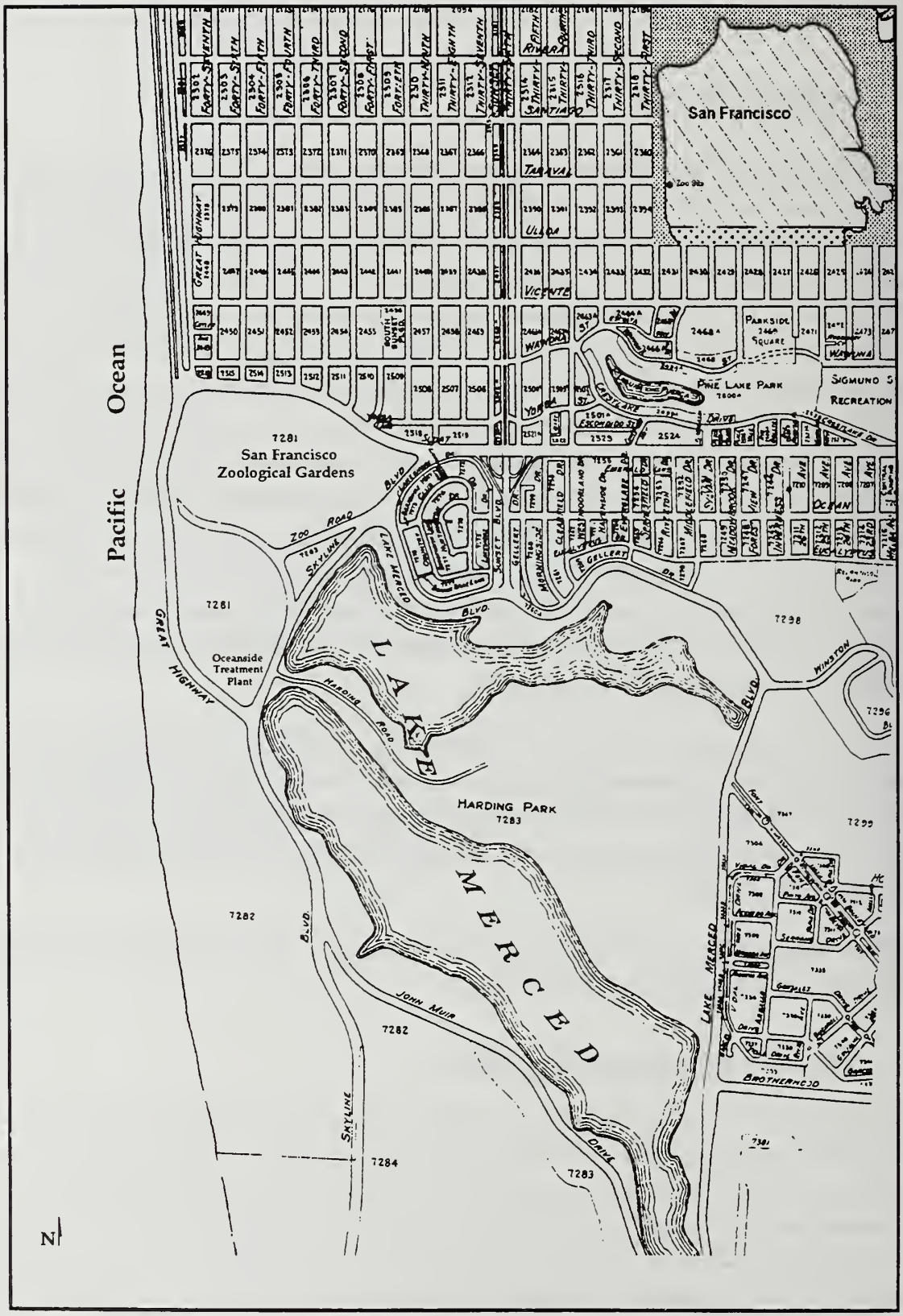
The area south of the Zoo is known as the Oceanside Water Pollution Control Plant/San Francisco Zoological Gardens Joint Use Area (JUA). The JUA is a site where portions of the OWPCP have been built underground, and where the Zoo expansion would occur above these facilities at ground level. A portion of this area, at the southern end, is the site of the Zoo's newly constructed (completed in 1996) Avian Conservation Center.

The Zoo's relationships to the *SFRWMP* and OWPCP facilities are discussed in greater detail below, and in Section III.A, Land Use and Planning, of this EIR.

B. PROJECT SPONSORS OBJECTIVES

The San Francisco Zoological Society Five-Year Plan for the San Francisco Zoological Gardens (1993-1998) states, "The mission of the Zoo is to enrich human appreciation and understanding of natural diversity, to encourage commitment to the preservation of wildlife habitats, and to promote global conservation through education, and the exhibitry, propagation and management of wildlife. The Zoo will be an oasis, an institution caring for wildlife, a safe haven for families enjoying animals in naturalistic open habitats. The Zoo will be a place of exploration, discovery, and fun - a place to be proud of and part of.

Figure 1 Project Location Map



The Zoo will provide opportunity for adventures and peaceful relaxation. It will reach out into the community and to other countries."

For almost 70 years, the SF Zoological Gardens has served to educate people about wild animals, while also providing the City with a park for family outings and recreational opportunities. However, the emphasis on education and types of animal exhibits has varied over the years. The historical story of the SF Zoological Gardens conforms in many ways to the evolution of zoos in America and to the principle that zoos are often redesigned to keep abreast of new ideas on the care and management of animals. To date, there have actually been three generations of the Zoo in San Francisco, with the proposed project as the fourth generation of animal care and management. The first Zoo, now almost entirely gone, was comprised of a menagerie of caged animals and a small number of buildings. The second Zoo, much of which still exists, was largely a series of moated enclosures and animal paddocks within a formally designed landscape. The third Zoo, which also still stands, is a combination of the moated design and a newer concept of zoogeographic, with animals from the same part of the world grouped together. The objective of the proposed *SF Zoo Master Plan* is to implement the fourth generation Zoo.

The *SF Zoo Master Plan* also sets forth the ZooWEB (Worldwide Education for Biodiversity) philosophy. This philosophy holds that everything in nature is interconnected in an intricate "web of life." Similarly, ZooWEB is intended to integrate all Zoo exhibits, programs and personnel into a web of integrated parts. Each part plays an important role in promoting and reinforcing a conservation ethic in visitors to the Zoo. Central to the ZooWEB philosophy is the establishment of "linkages" between the Zoo's conservation message and the everyday lives of its visitors. These linkages include: 1) the belief that all Zoo departments educate the public and must therefore link to and reinforce each other's messages; 2) the fact that as a part of a greater global conservation strategy, the Zoo is a partner with other conservation and science education organizations, and is therefore linked to field conservation projects and formal educational systems; and 3) the need to incorporate community input in the Zoo's educational methodologies so that all segments of the community can be actively involved in the Zoo's conservation mission.

Nearly three-fourths of the 55-year-old Zoo facilities are in disrepair; worn by time and the harsh coastal environment. Most of the older animal exhibits built during the early 1900's are inhumane for animals, and submit animals and keepers to unnecessary exposure to physical risk. Years of budgetary cutbacks and deferred maintenance have exacerbated the problem of the aging facilities, and ultimately affected the quality of animal care. Deteriorated animal housing has caused animal keepers to face daily physical risks. As visitors decreased, the Zoo operating deficit increased. In 1990, the Earthquake Bonds approved by the voters, included $26 million for the Zoo to replace damaged and corroded underground utilities. However, no fund was available to solve the Zoo's greater problems, including:

- Chimpanzee and orangutan homes that are too small to facilitate social groups; night quarters that don't have any space for working with the animals; exhibit floors made of concrete, rather than grass or dirt as is found in their natural habitat; and poorly operating doors and related hardware.

- Inadequate housing for the giraffe herd; a lack of space in night quarters; deteriorating stall dividers; antiquated feeding brackets; insufficiently equipped doors to shift the animals into and out of the exhibit; and the lack of a loading area for both the giraffes and rhinoceros.

- Lion quarters that do not have enough space or separate quarters that are required for breeding.

- The African elephant night quarters are too small and there is no means to separate the animals when necessary; the moat, which comprises the outer barrier, is no longer considered safe; and exhibit doors and latches do not work well.

- The Bear grottos and dens are outdated and inadequate; the grottos need soft natural surfaces and larger, secure areas for feeding and animal care.

- Substandard and inadequate visitor facilities including restrooms, food services, and playgrounds.

The existing physical facilities for animals in the SF Zoological Gardens are antiquated, and in some cases, no longer meet criteria used by the US Department of Agriculture for accreditation of a zoo. Criteria for maintaining a healthy and safe environment for animals, and for the necessary care and feeding of animals by their keepers has changed since the Zoo was founded in 1929. For example, keeping animals in concrete hard-surface enclosures has been shown to lead to physical problems (early arthritis), and soft natural surfaces, such as grass and soil, have been found to be better for animal health and well-being. Many of the existing buildings and animal enclosures no longer meet the constantly evolving understanding of what constitutes a healthy and safe environment for animal care, staff and visitors. The visitor amenities and educational opportunities at the SF Zoological Gardens are outdated and do not meet the full potential of this important educational and recreation resource in the City. Approximately three-fourths of the 55-year old Zoo facilities need renovation and reconstruction.

The *SF Zoo Master Plan* proposes to remove outdated animal facilities and deteriorated visitor facilities to comply with US Department of Agriculture (USDA) criteria for meeting health and safety standards for animal management in zoos and to comply with City building codes for meeting seismic hazards upgrades and Americans with Disabilities Act (ADA) standards. The proposed plan is consistent with the world-wide philosophy for zoo management, education, and wildlife care, as well as the need for improved preservation of endangered species through enhanced breeding programs. A Bond measure to fund $48 million of the proposed improvements to the Zoo was passed by San Francisco voters on the June 1997

ballot. The Bond will fund the reconstruction of a major portion of the Zoo, and will be used to leverage an estimated $25 million in private funds to be raised by the Zoological Society.

C. PROJECT CHARACTERISTICS

OVERVIEW

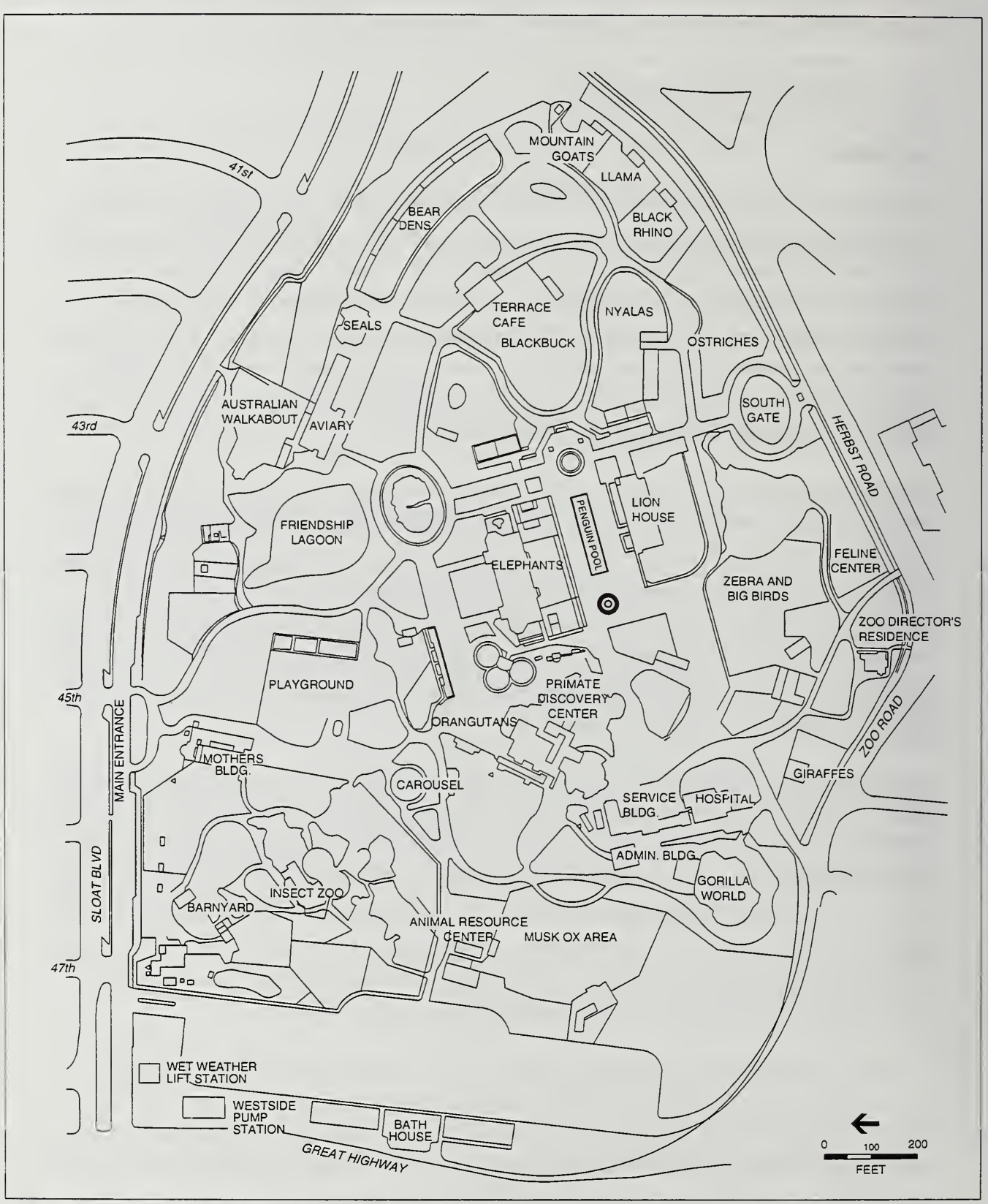
The existing Zoo contains approximately 15 acres of open and enclosed animal exhibits, three acres of non-exhibit structures (offices, gift shops, etc.), 14 acres of pedestrian walkways/service roads, 42 acres of non-exhibit landscaping and buffer zones, and one acre of off-street, surface parking (see Figure 2). The Zoo is home to over 83 species of exotic and domestic mammals, 30 species of reptiles and amphibians, 83 species of birds and 66 species of invertebrates. Twenty-eight species are classified as endangered or threatened and 17 are part of an international breeding program that seeks to maintain captive populations of endangered species and preserve their genetic diversity through captive breeding programs in cooperation with the American Zoo Association.

The Zoo has grown from the original 23 acres leased from the Spring Valley Water Company in the mid-1920's to the present 75-acre site. The first Zoo, dating between 1925 and 1940 was referred to as the 'Fleishhacker Zoo' and was located adjacent to a salt-water pool and poolhouse. It included the Mother's Building, a playfield and a menagerie of animals kept in small barns and cages. The only surviving buildings from this first Zoo are: the Mother's Building (an historic building listed on the National Register of Historic Places), the pump station and restroom, a snack shop, the carousel, the original hospital, and the Zoo Director's House. Each of these facilities is in disrepair and is identified in the proposed *SF Zoo Master Plan* to either be renovated or demolished.

The second Zoo was expanded from 23 acres to 92 acres (an additional 69 acres) and was designed by Lewis P. Hobart, a prominent architect who played an instrumental role in rebuilding San Francisco after the 1906 earthquake. The Hobart design for the Zoo included a landscape plan with informal curving pathways combined with a more formal, axial arrangement of buildings and landscape features. The Lion House and Pachyderm House were the dominant buildings. Landscaping featured a wall of eucalyptus trees around the Zoo's perimeter, with smaller deciduous trees and shrubs inside the Zoo along pathways. The formal and informal design features of the Zoo had a north-south orientation converging at the central fountain that connected two oval shaped features by a main walkway.

The primary surviving features of Hobart's 1936 Zoo design include: the pathways, lakes, circular fountain, rectangular pool, bridges, the Aviary building, the seal pool, the bear dens, hoofed animal paddocks, small mammal dens, the Lion House, the Pachyderm House and the Terrace Restaurant. Many of these facilities are concrete structures built by the Works Progress Administration (WPA) and no longer meet U.S. Department of Agriculture (USDA) health and safety criteria.

Figure 2 Existing Zoo Layout



Source: Kennedy/Jenks Consultants - AGS Inc. An Association

Existing features added since 1967 include the Feline Conservation Center, koala crossing, the Primate Discovery Center, gorilla wood, the African Scene, the Walkabout Exhibit, the Avian Conservation Center, and the hospital expansion area. Offices, classrooms, meeting space and support facilities are in temporary trailers at the western side of the main Zoo.

The main entrance to the existing Zoo is along Sloat Boulevard, on the north side of the Zoo. The main entry is constrained by narrow walkways on a steep slope that is not conducive to strollers or to wheelchair use. A second entrance is located off Herbst Road along the south side of the Zoo. This entrance is open daily from Memorial Day through Labor Day and open on weekends and special event (free day) times when visitor numbers are high.

The Zoo is open 365 days a year, primarily serving an urban audience of nearly one million visitors a year including families, educational groups, community centers and scientific researchers. The Zoo attracts about 4,000 visitors on a typical day and about 15,000 to 20,000 on a peak visitor day. Peak visitor days occur about ten times per year on "free days" when no entry fee is charged and when weather conditions are mild and sunny. There are 900 parking spaces available to visitors along Sloat Boulevard and in a parking area at the corner of Sloat Boulevard and Herbst Road. In 1996, the Zoo employed about 250 persons, with about 120 full-time and 130 part-time staff during the peak summer season. An estimated 30 volunteers provide services at the Zoo on an average day. Staff and volunteer parking is available at the back gate off Zoo Road and in the unpaved area where the former Fleishhacker pool was located.

SAN FRANCISCO ZOO MASTER PLAN BIOGEOGRAPHIC REGIONS

Under the proposed *SF Zoo Master Plan*, the Zoo would be comprised of five major exhibit complexes, each subdivided into specific biogeographic regions. Each exhibit complex would include animal exhibit areas in a natural habitat setting, animal holding buildings, exterior paddocks, pedestrian walkways and service roads. Some of the exhibit complexes would also include viewing and interpretive shelters, special visitor areas and public restrooms. Introducing each region would be a gateway exhibit selected to illustrate its climate, plant material, culture, and animals and their seasonal distribution, in contrast to those of coastal California. These gateways would be entered through a landscape zone which would thematically create a transition from the central native coastal California landscape to the specific biogeographic region. The five major exhibit complexes and their biogeographic regions are summarized on Table 1.

PROPOSED PHYSICAL CHANGES TO THE EXISTING ZOO

The proposed *SF Zoo Master Plan* is a physical/management plan that includes both existing and proposed animal, visitor and staff facilities. The physical changes proposed in the *SF Zoo Master Plan*

Table 1
Proposed Biogeographic Regions

Biogeographic Region	Exhibit Features
African	Savanna Tropical Dry Forest Tropical Rain Forest
Asian Montane and Southeast Asian	Himalayan Mountains Sichuan Province Dry Woodlands Tropical Forest and Grassland Lowland Tropical Rainforest
Australian	Seasonal Tropical Forest Eucalyptus Forest
South American	Cloud Forest Tropical Dry Forest Patagonian Desert Tropical Rainforest
North American	Children's Zoo

include overall rearrangement of animal exhibits into exhibits designated as natural habitats and illustrative of biogeographic regions of the world, as well as expansion and rearrangement of support facilities. The changes would include demolition or reconstruction of existing buildings and structures, removal of existing vegetation and landscape features, and recontouring animal paddocks and water features. The proposed biogeographic regions would be re-landscaped with vegetation representative of the region and new animal management facilities (exhibit space, protective shelters, feeding areas) would be constructed. New enhanced visitor amenities and facilities (children's center, interpretative and interactive exhibits, signage, lighted and surfaced pathways, seating and eating areas, children's play area, restrooms, on-site visitor parking and bus areas, retail facilities) would be developed as part of the initial phase of the Plan.

A key change proposed by the plan would be a reorientation of the existing visitor entrance and parking from Sloat Boulevard on the north side of the Zoo to a newly developed entrance off the Great Highway and the western end of Sloat Boulevard to an on-site parking and bus drop-off area and visitor gate. The planned parking area would develop an existing unpaved parking area (currently used by Zoo staff and volunteers) for visitors, school buses and charter buses. The parking area would be developed initially for about 500 spaces (same as existing) and would be expanded to 865 spaces as visitor attendance increases.

The entry off Sloat Boulevard would remain as a secondary entry for school groups. Existing on-street parking along Sloat Boulevard would remain for use by patrons of commercial business across from the Zoo. Table 2 compares existing Zoo facilities with those proposed under the *SF Zoo Master Plan.*

TABLE 2
COMPARISON: EXISTING SAN FRANCISCO ZOO AND 1994 MASTER PLAN

	EXISTING		MASTER PLAN	
LAND USE	**Approximate Area**	**Percentage of Total Area**	**Approximate Area**	**Percentage of Total Area**
Animal Exhibits	15 acres	24.0%	18 acres	18.6%
Structures	3 acres	5.0%	5 acres	5.2%
Exterior Paddocks			1 acre	0.7%
Conservation Facilities			10 acres	10.6%
Pedestrian Walkways	12 acres	21.0%	8 acres	8.0%
Service Roads	2 acres	2.0%	2 acres	2.1%
Visitor Plaza/Parking/Transit Drop-off			19 acres	20.2%
Non-Exhibit Landscaping/Buffers	30 acres	48.0%	34 acres	34.6%
TOTAL	75 acres	100.0%	105 acres	100.0%
Visitor Parking Spaces	871[1]		1,736[2]	
On-Site Staff Parking Space	300		120	
Typical Number of Visitors/Day	4,000		7,000-10,000	
Maximum Peak Visitors/Day	15,000 to 20,000[3]		15,000-30,000	

[1] Existing off-site visitor parking spaces include approximately 242 diagonal spaces in the middle of Sloat Boulevard, 200 diagonal spaces on Sloat Boulevard facing the Zoo perimeter near the existing entrance, 204 spaces in a lot at Sloat Boulevard and Skyline Boulevard, and 225 spaces along Herbst Road.

[2] On-site visitor parking would be developed in phases as visitor attendance increases. The parking would consist of 871 existing spaces plus 482 spaces proposed in the first phase and up to 383 spaces in the second phase for a total of 1,736 parking spaces.

[3] Maximum peak days (20,000) are "free-days" during summer; about 10 days per year.

Source: *San Francisco Zoological Gardens Master Plan Summary Report*, The Portico Group, June 1994.

In addition to the physical changes proposed, The *SF Zoo Master Plan* also addresses programmatic elements, such as future educational programs, facilities management, and special events. The focus of the EIR is on the physical changes proposed, and the potential impacts to the natural environment that these changes would affect. Program or management elements that would affect overall Zoo attendance are also addressed to the extent they result in physical impacts. Some of the changes have already undergone environmental review by the City and have received necessary approvals (demolition of cat cages, monkey island, ADA improvements, development of South American Gateway, the Zoo Infrastructure Project). Some are under construction or have been completed (Avian Conservation Center). All projects are addressed in this EIR because this is a Program EIR covering the integration of all actions, mitigation and improvement measures and cumulative impacts on Park land occupied by the San Francisco Zoological Gardens.

CONSTRUCTION ACTIVITIES

Construction activities for all phases would generally include: demolition of existing buildings and structures and pathways; clearing and grubbing of existing vegetation (except for mature trees identified for preservation); grading and re-contouring; constructing utility connections to sewers, electrical, and water; paving new pathways and access roads; installation of irrigation systems and water system pumps; landscaping; fencing; construction of new buildings and structures; installing night lighting; plumbing/electrical installation; and development of new signage. Equipment used for the above construction would include: graders, hydraulic jacks, clambucket; backhoe; scrapers; dump trucks and other earthmoving and heavy construction equipment. Concrete removal would be with a core drill. Typical construction crews on-site at one time would be 10-30 persons.

SUPPORT SERVICES

The efficient operations of the Zoo require that staff and administration are in regular communication with each other. For this reason, the administration offices are located adjacent to the facilities that support the day-to-day operations of the Zoo. These include food storage and preparation, recycling, horticulture and greenhouse areas, health care, exhibit shops, graphics department, research center, and maintenance, along with adequate guest and employee parking. Support services are currently, and would continue to be, located central to the Zoo administration and accessible off of Herbst Road. This enables direct access to each of the exhibit areas, animal holding areas, and Zoo grounds, while providing a separate zoo staff entry from the public entry. Service roads within the Zoo are separate from visitor paths wherever possible, and typically are located behind exhibits on a service road or pathway.

ATTENDANCE

Under the *SF Zoo Master Plan*, the project sponsor hopes to increase the average number of daily and peak day visitors to the Zoo after proposed improvements have been made (by the year 2006) to between 7,000 and 10,000 on an average day and from 15,000 to 30,000 on peak days. Attendance projections done in conjunction with the *SF Zoo Master Plan* indicate that improvements to exhibits, new retail and visitor amenities, and special visitor attractions would result in visitor increases.[1]

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[1] San Francisco Zoological Gardens Master Plan Summary Report, The Portico Group, June 1994 and San Francisco Zoo staff, Jim Lazarus, Chief Operating Officer. Current attendance on peak days is already approaching the projected attendance; attendance of 27,000 was recorded on a free day the first week of July, 1997.

DEVELOPMENT SCHEDULE

The proposed *SF Zoo Master Plan* is described and analyzed by phase of development, with the greatest detail provided for the near-term (1997-2006) phase. Table 3 briefly summarizes the schedule of *SF Zoo Master Plan* implementation:

Table 3
Master Plan Phases

Initial Phase: 1997-2006		Second Phase: After 2006	
Demolish	**Develop**	**Demolish**	**Develop**
1. Existing unpaved parking	1 Entry Plaza; transit drop off/parking; ticket booth; landscape windbreak	1. Friendship Lagoon	1. South American Gateway
2. Animal Resource Center, pump house, reservoir, playground, snack shop, Pachyderm, restrooms	2. Visitor spine; kiosks; gift shops; restrooms; seating areas	2. Aviary, open paddocks, bear dens	2. Australian Biogeographic Region
3. Barn	3. Children's Center / Zoo (North American Region)	3. Lion Building	3. Asian Montane Biogeographic Region
4. Move Temporary trailers	4. Education Center/Administration	4. Mountain goats, llamas, bear grottos	4. Southeast Asian Biogeographic Region
5. Move Temporary trailer	5. Animal Resource Center		
6. No Demolition	6. Carousel Renovation		
7 Pond, wood shelters	7. African Savanna (giraffe, Zebra, Antelope, Lion)		
8. Pachyderm Building	8. Elephant/Rhino Savanna		
9. Giraffe barn, hay storage barn, commissary building	9. Service Warehousing		
10. No Demolition	10. Retail cluster "B"		
11. Clear vegetation (eucalyptus)	11. Madagascar Exhibit		
12. Clear vegetation	12. Orangutan, Chimp, Gorilla Exhibit		

NEAR-TERM / INITIAL IMPROVEMENTS (1997-2006)

The physical changes to the existing Zoo that are proposed in the *SF Zoo Master Plan* for the initial phase of development would be concentrated primarily in the western end, off the Great Highway. This would include expansion of the Zoo footprint by about 20 acres to the West to use a portion of existing park land formerly occupied by the Fleishhacker outdoor pool. It is now cleared of vegetation and unpaved. The area is presently used as a storage and staff parking area, and construction staging area. Existing unused open space would be developed for use by Zoo animals of the African Biogeographic Region (Savanna). Initial changes are intended to resolve current animal management issues and to integrate and expand development of family and children's attractions and educational opportunities. The proposed construction activities, including demolition or expansion of existing facilities, and the planned

improvements are described for each element in the Initial Phase. Some buildings proposed to be demolished date back to the second phase Zoo designed by Hobart and constructed during the 1930's.

New Main Visitor Entry Plaza / Parking / Transit Drop-Off

The existing visitor entry off Sloat Boulevard does not provide a strong visual image for the Zoo and is located on a steep slope where access is difficult for strollers and mobility impaired persons. The existing entry also lacks adequate and secure parking, and bus drop-off, particularly for peak visitor days and evening events.

The proposed new visitor entry would be accessible from both The Great Highway, between Sloat Boulevard and Skyline Drive, immediately south of the Fleishhacker Poolhouse, and also from Sloat Boulevard near its intersection with the Great Highway. The existing, unpaved open area used for storage of Zoo materials and staff and volunteer parking would be paved and landscaped (with trees and shrubs in containers) and nightlights for security would be added. The paved plaza would include a multi-use area with bus and shuttle drop-off areas, a plug-in area for the Zoo's electrical vehicles, secured bike racks, and a new visitor parking lot and drop-off space for automobiles, tour buses and visitor shuttle vans (and potentially for MUNI buses). The Zoo tram would have several stops in the visitor entry plaza to pick-up persons who choose the narrated Zoo travel experience over walking. Pedestrians and Muni patrons would be able to enter the new entry plaza off of Sloat Boulevard at 47th Avenue.

The new entry plaza would be located where the existing paved access road provides staff access to the Zoo. Buildings and structures that would need to be demolished include: the Animal Resource Center (ARC), animal holding areas, the pump house, and Zoo reservoir. The ARC would be relocated to the north of the proposed Children's Center, bordering on Sloat Boulevard. The animal holding area would be relocated to the support services area. The new underground Zoo reservoir will be located on the north end of the Fleishhacker site. The existing temporary trailers used as staff offices and education classroom and labs would be temporarily used as construction trailers and then removed. Existing vegetation would be removed and replaced with new native California coastal vegetation. The existing paved visitor walkway, extending westward from the Carousel, would be re-paved to widen the pathway from 8 feet to 20 feet to provide a expanded view into the Zoo.

The new entry plaza would include (see Figure 3, Main Visitor Entry Plaza)

- an entry feature landmark in a circular area in front of a new ticket booth (4,000 sq.ft.), clearly designating the entry point to the Zoo.

Figure 3 Main Visitor Entry Plaza and Children's Center/Zoo

Source: The Portico Group, December 1996

→ Public View

- a gift shop and food service buildings located inside the ticket booth (strollers and wheelchairs would be available for rent in the gift shop)
- an ADA accessible public restroom (800 sq.ft.) inside the ticket booth
- information kiosks with maps of the Zoo
- Zoo tram station and covered storage (6,000 sq.ft.)
- on-site paved parking for 500-865 vehicles, developed as visitor numbers increase, accessible to vehicles from the north through a signed gate off of Sloat Boulevard near the intersection with the Great Highway and accessible to vehicles from the east and south off the Great Highway near the Fleishhacker Poolhouse.
- a bus drop-off area for charter and shuttle buses, and potentially for MUNI buses.

Visitor Spine / Pedestrian Circulation System

The proposed visitor spine/circulation system (Figure 4) would be the 'main street' that unites the discovery trail loops to each of the five exhibit biogeographic regions and provides necessary visitor services (restrooms, drinking fountains, food services, seating/resting areas, shade trees, informational kiosks, directional signage, tramway stations, security lighting). This tree-lined spine would be a linear landscape of California coastal vegetation, with adjoining greenspace and picnic/play areas for family and large group gatherings. The proposed visitor spine would reorient the visitor circulation axis from the existing north-south orientation with the entry off of Sloat Boulevard to a west-east orientation with the entry off of The Great Highway (the existing Sloat Boulevard entrance would be retained for special group use). The plan would widen pathways and open visual exposure to biogeographic areas within the Zoo.

An oval shaped event space (80,000 sq.ft.) is proposed near the Mothers Building adjoining a picnic shelter. Adjacent to the picnic area, a Zoo-fest tent area (80 feet x 160 feet) is planned for special events, and a small food service area and restroom building. (See Figure 3, page 13)

Existing buildings and structures that would need to be demolished to develop the visitor spine/circulation system would include the existing children's playground, the octagonal snack building (part of the original Zoo, built in 1925), a stucco restroom built in 1925, the Siamangs cages, the circular fountain, and the Pachyderm (elephant) House.

Children's Center / Zoo

The existing Children's Zoo includes a petting area and a barn. The existing barn would be demolished and replaced with smaller animal shelters and a barnyard with animal contact opportunities for children.

Figure 4 Vistor Spine/Circulation System

Source: The Portico Group, December 1996

Small animal exhibits for domestic horses and ponies, goats, sheep, skunks, raccoons, pigeons, cattle, donkeys, rabbits, gerbils, armadillos, flamingos, black-tailed prairie dog, guinea pig, reptiles, pigs and other animals common to North America are planned for the barnyard. An amphitheater (3,250 sq.ft.), blacksmith shop (200 sq.ft.), chicken coop (1,000 sq.ft.), milking barn (2,000 sq.ft.), garden space and nursery are also planned for the exhibit area. (see Figure 3, page 13). The 75,000 sq.ft. area would be landscaped and fenced around the perimeter.

Education Center / Animal Resource Center

A new 14,500 sq.ft., single-story, woodframe Education Center and Animal Resource Center (ARC), with a tile roof, is proposed to be constructed adjacent to the landmark Mothers Building (used as a visitor center and gift shop) along the northwest side of the Zoo (Figure 3, page 13). The building would back up to the Zoo perimeter landscaping and fenceline along Sloat Boulevard. The architectural design of the building would be compatible with the Mediterranean-style, 1925 Mothers Building (a National Register Historic property). A formal courtyard to the south of the education building would connect it with the Mothers Building. The Education Center would have three classrooms (3,600 sq.ft. total), a 300-seat auditorium, a library (800 sq.ft.), administrative offices (2,000 sq.ft. total), two conference rooms (300 sq.ft. total), a graphics department (1,200 sq.ft.), and storage, kitchen and restroom space. The new education center would complement the San Francisco Unified School District science education program by training teachers, and would provide computer links to remote sites for information and research.

A new animal resource center would replace the existing ARC that would be demolished to accommodate the Entry Plaza and Visitor Spine (see Figure 3, page 13). The ARC is where outreach animals are kept. It typically houses about 85 small mammals and reptiles. The ARC would include an office, volunteer room, storage area, nine exterior holding yards, and exercise yard.

Carousel Renovation

The carousel dates back to the original Zoo (1926) and remains as a prominent feature at the Zoo. The *SF Zoo Master Plan* proposes a visitor plaza around the carousel to provide a focal point in the visitor spine leading into the Zoo (Figure 3, page 13). A children's play area and food service area are proposed adjacent to the carousel. Under the Plan, the carousel would also be repaired and renovated.

African Biogeographic Region

The existing meadow area used by the musk ox would be converted to an African Savanna for the giraffe, zebra, antelope gazelle, ostrich and crowned crane and eventually the African Lion and Black Rhino and elephants (Figure 5). Moving these popular and highly visible animals to an area of the Zoo closer to the main entry plaza, where they can be observed from the visitor spine, is an important part of the *SF Zoo Master Plan*. Granite kopje outcrops and savanna-type vegetation would be added to the open meadow. The existing man-made pond would be filled and the wood shelters would be replaced with a 60 ft. by

Figure 5 African Biogeographic Region

Source: The Portico Group, December 1996

→ Public View
H Holding Building

0 100 200
FEET

100 ft. holding building (night shelter). The exhibit area would be about 95,000 sq.ft. of open space. Existing trees and shrubs would be replaced with new wind break landscaping.

Elephant and Rhino Savanna

Moving the elephants to the Savanna would include construction of new elephant management facilities to allow for 'protective contact management' (separating zoo keepers from animals by controlled barriers). The new pachyderm building, designed with heavy-duty constraints for animal care, would replace the existing facility. Moving the elephants from the existing hard surface exhibit areas to a soft surface environment would improve their well being and would better meet USDA care criteria. A holding building of 7,200 sq.ft. and exhibit area of 65,000 sq.ft. are proposed (Figure 5, page 17).

Support Services

Existing food storage and preparation facilities, recycling facilities, grounds keeper area and greenhouse, located adjacent to the hospital and administration buildings, would be replaced or expanded. (Figure 6) A new hay and grain storage building of about 4,600 sq.ft. is proposed for the Service Area. A maintenance and exhibits shop of about 7,400 sq.ft. is proposed and a 4,800 sq.ft. food service storage building is planned off of Herbst Road. These facilities would be constructed in the area currently used by giraffes and zebras and staff parking. The existing giraffe barn, hay storage barn and the original hospital/commissary building would be demolished. Giraffes and zebras would be relocated to the African Savanna area. (See above - African Biogeographic Region). A new commissary will be constructed adjacent to the food storage area. A 100-space employee parking lot will be incorporated into the support services area.

Retail Cluster 'B'

A new visitor center, located central to the Zoo, would be constructed in the area where the existing Pachyderm (elephant) building is located. (See Figure 4, page 15) The existing building and animal yards would be demolished. Elephants would be moved to the African Savanna or to another zoo.

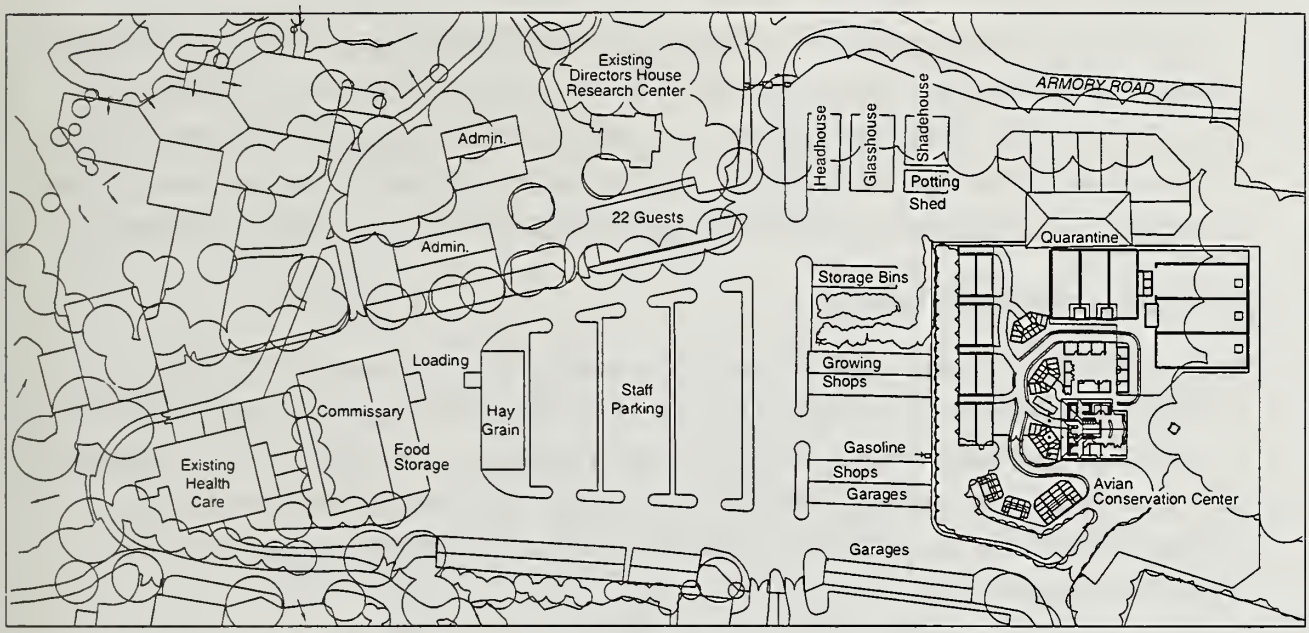
The Gateway Plaza of about 40,000 sq.ft. would include:

- a sit-down restaurant / retail shop with outdoor eating (3,200 sq. ft.); and
- a 600 sq.ft. restroom.

Madagascar

The Madagascar exhibit would be a redevelopment of the existing Primate Discovery Center as a multi-tiered attraction that focuses on Madagascar ecosystems and world primates. (See Figure 5, page 17) A two-level panoramic café with interior seating and exterior decks overlooking the adjacent future Savanna

Figure 6 Support Services



Source: The Portico Group, December 1996

and visitors spine would be developed to maximize visitor exposure to the exhibit. The changes proposed are within the footprint of the existing Primate Center.

Orangutans / Chimpanzees / Gorillas

The development of exhibit areas for orangutans, chimpanzees, and gorillas to the west and southwest of the existing gorilla exhibit is proposed. This area of the existing Zoo is unused and would tie into the African Biogeographic Region without extensive changes (see Figure 5, page 17). The area is primarily cypress and eucalyptus trees and undergrowth that is in need of reforestation. The area would be cleared of vegetation and re-landscaped to provide wind breaks and to open the exhibit area to visitor viewing.

ZOO DEVELOPMENT AFTER 2006

The post-2006 phase of development, primarily at the eastern and southeastern side of the Zoo is contingent on available funding. This later phase of the *SF Zoo Master Plan* would involve demolition of the Lion House, the Aviary, the bear grottos, and existing paddocks and shelters. The new biogeographic regions that would be created would include South American, Asian Montane and Southeast Asian. An extension of the initial phase African Biogeographic Region would include elephants and rhinos to complete the African theme.

South American Biogeographic Region

The remainder of the South American Biogeographic Region would be completed after 2006. The 22,000 sq.ft. area would be re-contoured and converted to a forest-like environment for tropical dry forest animals (tamarinds, monkeys, capybara, tapir, insects, and reptiles). (See Figure 7). Two indoor climate controlled buildings (18,000 sq.ft.) would be constructed to create a rain forest environment. The penguin pool would be reconstructed at the inside edge of the South American Gateway area near the visitor spine. Water features would be constructed throughout the biogeographic region.

Australian Biogeographic Region

This newly created region would be located along the northeastern perimeter of the Zoo (Figure 8), and would include a tropical rain forest and a eucalyptus forest. Animals would include parrots, cockatoos, birds of paradise, sea turtles, tree kangaroos, wallaby, roos, emu, cassowary, and koala. The Australian rain forest building would be about 20,000 sq.ft. and the eucalyptus forest exhibit area would be about 12,000 sq.ft. of space. The region also includes a spinifex grassland exhibit for the wallaby's (developed in 1996).

Asian Montane Biogeographic Region

This biogeographic region is planned for the area on the southeast side of the Zoo, just west of the south gate entrance off Herbst Road (Figure 9). The area is open paddocks and would be converted to replicate

Figure 7 South American Biogreographic Region

Source: The Portico Group, December 1996

Figure 8 Australian Biogeographic Region

Source: The Portico Group, December 1996

→ Public View
H Holding Building

0 50 100
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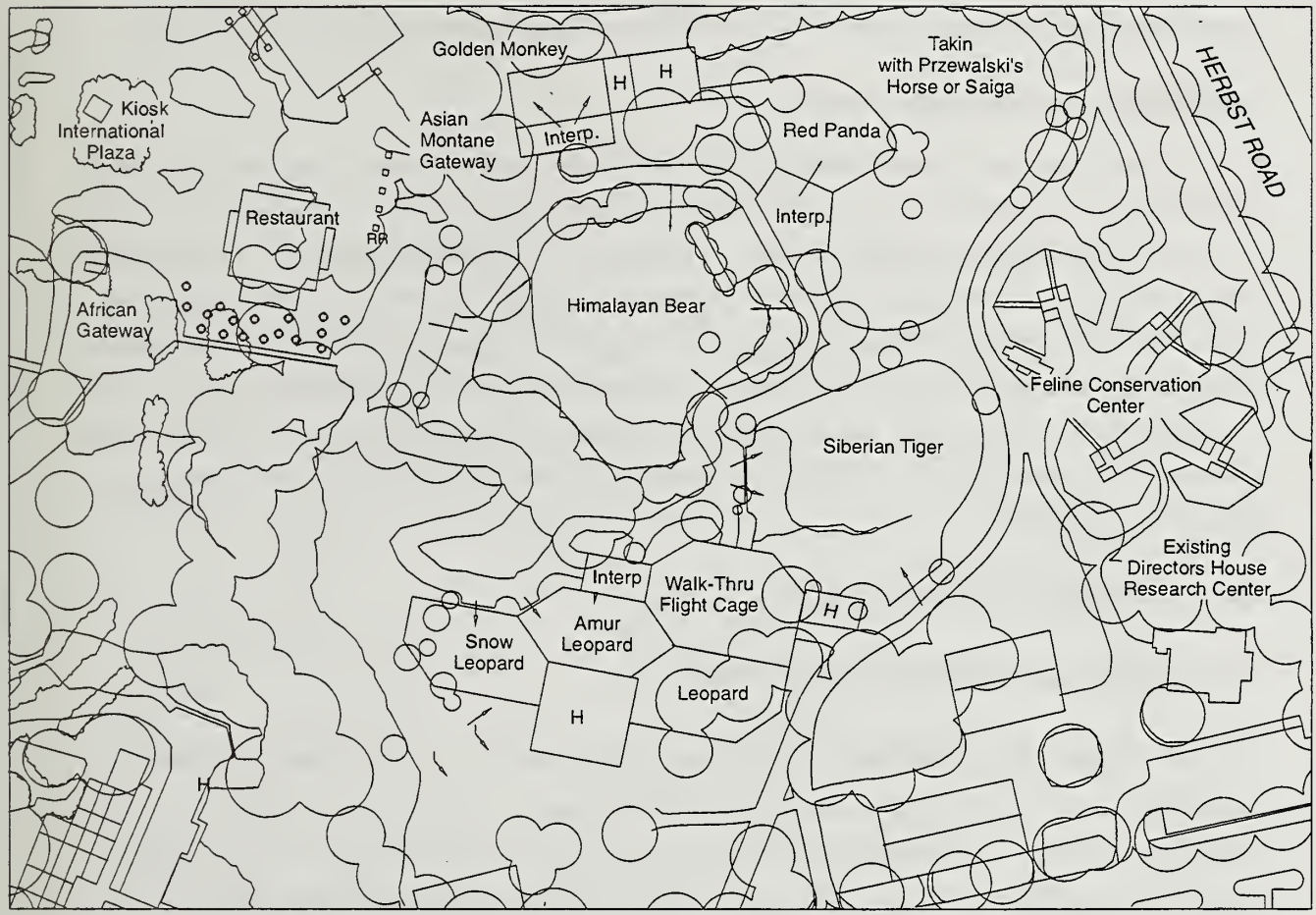
Figure 9 Asian Montane Biogeographic Region



Source: The Portico Group, December 1996

alpine mountain meadows, stone walls and terraces surrounded by fir trees, rhododendron and birch. The existing Lion House would be demolished. Exhibits would include snow leopard, Siberian tiger, Himalayan black bear, saiga antelope, red panda and golden monkey. Exhibit space would range from 12,400 sq.ft. for the snow leopard to 21,800 sq.ft. for the Siberian tiger, and 29,775 sq.ft. for the takin and przewalski horse and saiga. A 4,200 sq.ft. insectarium and a 9,300 sq.ft. reptilarium would also be constructed.

Southeast Asia Biogeographic Region

This biogeographic region would convert the existing bear dens and grottos at the eastern end of the Zoo to lush tropical canopies, boulders and cliff faces with cascades and streams of water flowing in between to create a tropical forest, grassland and lowland tropical rain forest setting (Figure 10). Exhibits would include Asian lion (10,360 sq.ft.), Blackbuck (33,540 sq.ft.), Languar (12,800 sq.ft.), Indian rhinoceros (30,290 sq.ft.), Muntjac (21,50 sq.ft.), Barasingha (14,020 sq.ft.), an aviary (6,200 sq.ft.), Asian primate (9,200 sq.ft.), Siamang (14,220 sq.ft.), gibbon and Orangutan. Creating this biogeographic region would involve demolition of the grottos and bear dens and extensive earth movement and construction of water features. The bears would be relocated within the Asian Montane and South American Biogeographic Regions, or phased out.

RELATIONSHIP TO OTHER PROJECTS

San Francisco Zoo Infrastructure Master Plan

The San Francisco Zoo Infrastructure Master Plan has been adopted by the Recreation and Park Commission and its environmental review has been completed.[2] Implementation of the Zoo Infrastructure Master Plan projects began in the Fall of 1996, and is designed to meet the increased demand anticipated in the future, regardless of whether the *SF Zoo Master Plan* is adopted and implemented. Replacement of utility and water lines (including potable water, recycled water, groundwater, sewer, electricity, phone and natural gas) into a single utility corridor, will proceed in 100-foot intervals throughout the Zoo between late 1997 and 1999.

The Zoo Infrastructure Master Plan includes construction of a new wet weather lift station and groundwater wells in the northwest corner of the Zoo, in the vicinity of the existing Westside Pump Station. The wet weather lift station is scheduled to be completed in 1997. The Zoo Infrastructure Master Plan also includes plans for a new groundwater storage reservoir to be located on the north end of the Fleishhacker site, which is scheduled to be constructed between late 1997 and 1998.

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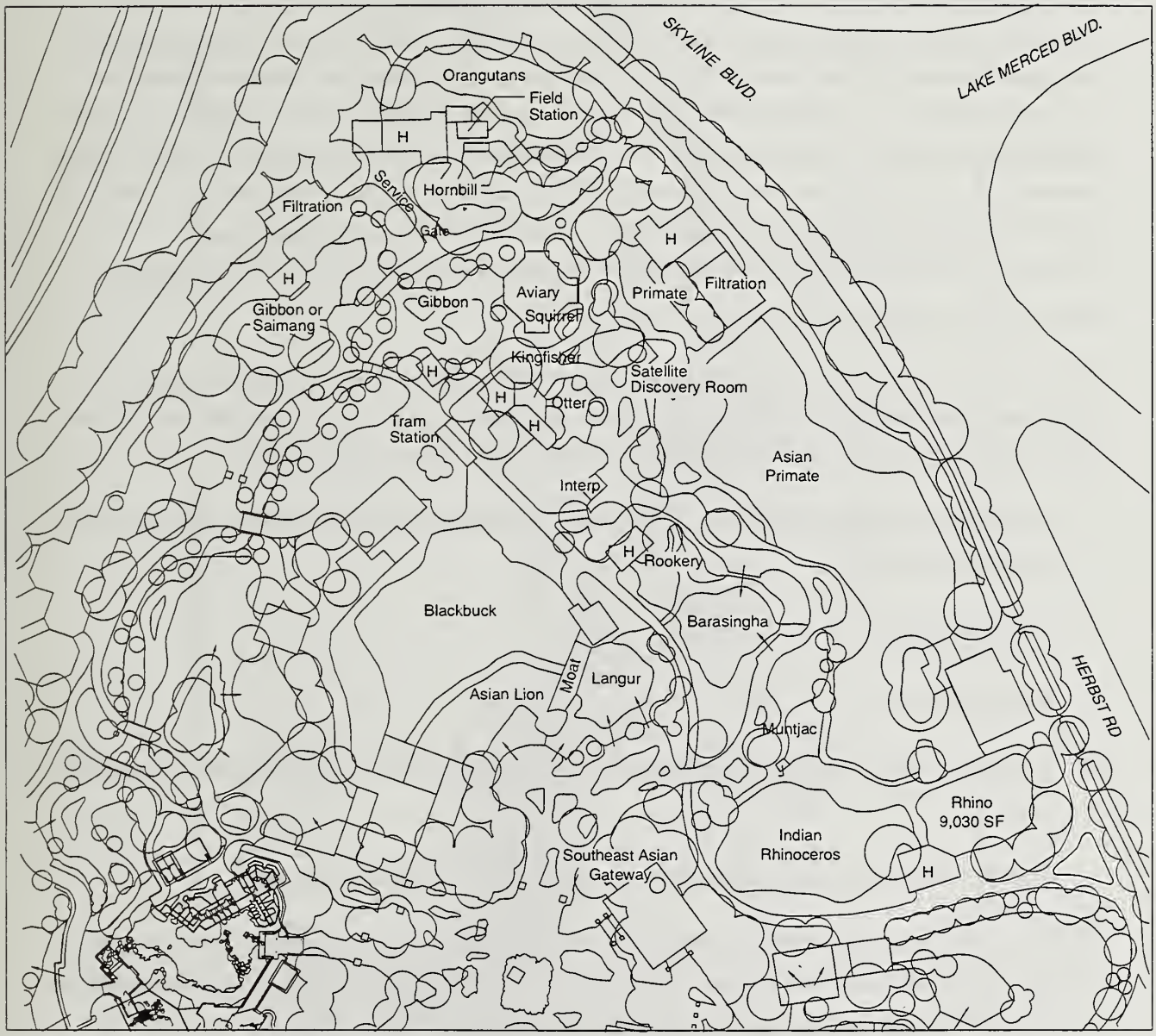
[2] City and County of San Francisco, Planning Department, Negative Declaration, File No. 94.336E San Francisco Infrastructure Replacement, November 16, 1994.

Figure 10 Southeast Asian Biogeographic Region



Source: The Portico Group, December 1996

Recycled Water Master Plan and Groundwater Master Plan Projects

The San Francisco Department of Public Works and the San Francisco Water Department have prepared a *Recycled Water Master Plan* and *Groundwater Master Plan*.[3] These two companion planning documents are intended to provide guidance for the long-term efficient use of the City's local water resources, including recycled (reclaimed) water and groundwater. These plans have been prepared to comply with Article 22 of the *San Francisco Public Works Code*, known as the Reclaimed Water Use Ordinance. In addition to identifying long-term goals for the use of alternative water supplies, the plans include specific near-term projects that would be implemented to achieve these goals. An Environmental Impact Report (EIR) on these plans was prepared by the San Francisco Planning Department, Office of Environmental Review, 94.366E, and was certified on August 7, 1997 (State Clearinghouse No. 940123049). The EIR examined, among other things, the potential impacts of these projects on existing and proposed Zoo facilities.

One of the near-term projects called for in the *Recycled Water Master Plan* is a Recycled Water Treatment Plant (RWTP), proposed to be located at the Fleishhacker site. The proposed layout of the RWTP is shown in Figure 11. The plant would include the following major components:

- an equalization storage facility to store secondary effluent from the Oceanside WPCP before it is sent through the RWTP;
- a filtration system;
- a disinfection system;
- a clearwell storage reservoir to hold tertiary treated, recycled water until it is pumped to the reservoirs; and
- a pump station to pump recycled water to the reservoirs and distribution network.

Staff from the Department of Public Works and the Water Department are coordinating with Zoo staff to develop the RWTP design and construction plans to be compatible with the Zoo's existing and proposed uses of the Fleishhacker site, and to ensure that animals at the Zoo are not adversely affected.[4] As

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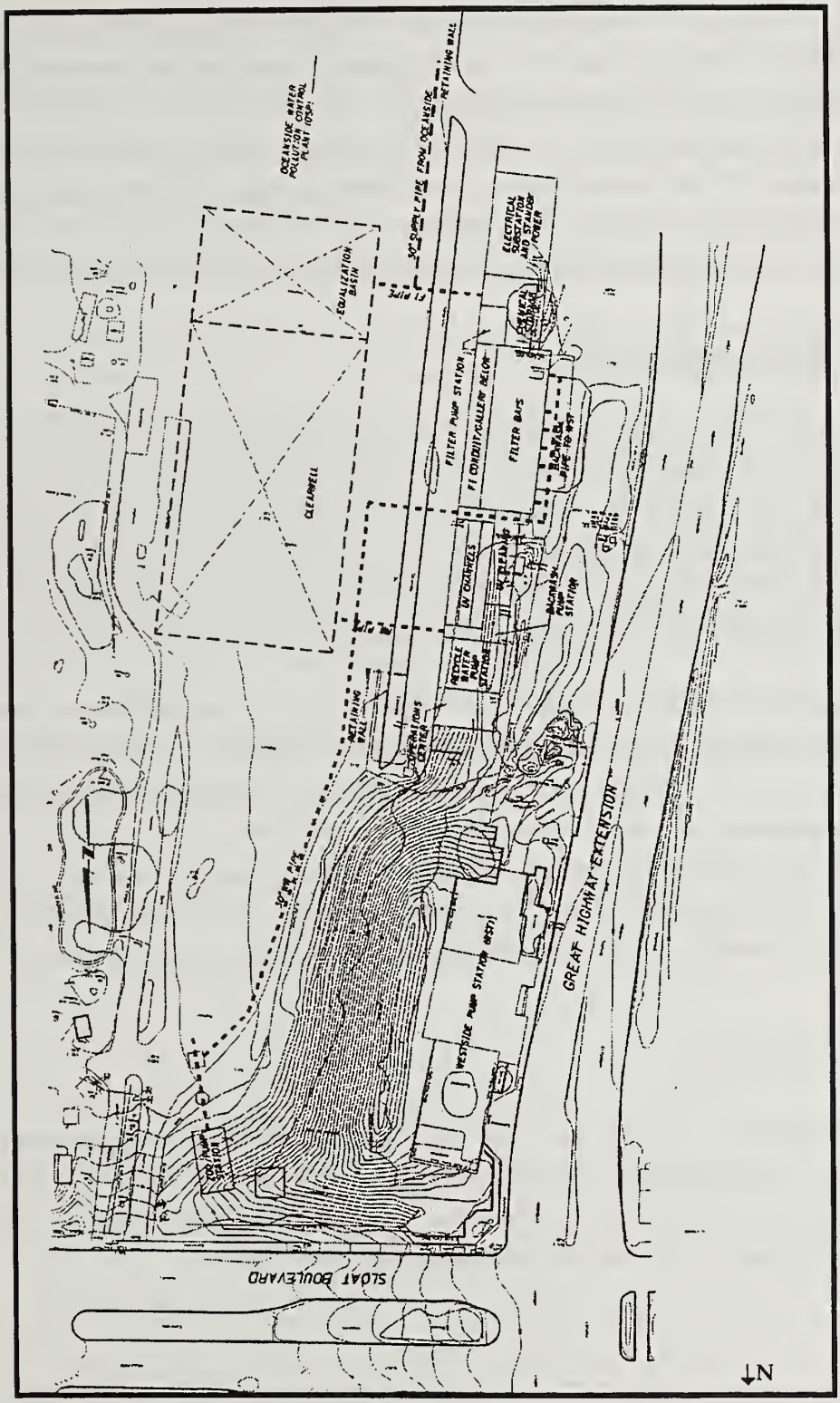
[3] City and County of San Francisco, Department of Public Works, *Recycled Water Master Plan*, September 1995; City and County of San Francisco, Francisco Water Department, *Groundwater Master Plan*, September 1995. These planning documents are on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

[4] A similar level of coordination was required during the planning, design and construction of the Oceanside Water Pollution Control Plant (OWPCP), and the establishment of the OWPCP/SF Zoological Gardens Joint Use Area (JUA).

Figure 11 Recycled Water Treatment Plant



Source: San Francisco Recycled Water Master Plan and Groundwater Master Plan Draft Environmental Impact Report, 92.371E, November 1, 1996

indicated in Figure 11, the RWTP facilities would be constructed both above and below ground, and the above-ground portions of the RWTP would generally be constructed within the footprint of the Fleishhacker Bath House.[5] With a maximum height of 40 feet above ground and an area of about 25,000 sq.ft., the above-ground structure would house the operations center, the filtration and disinfection systems, chemical storage, and the electrical substation and standby power. The below-ground structures would include the secondary effluent pump station, equalization basin and clearwell storage, with a maximum depth of 15 feet below the ground surface. The proposed visitor entry plaza and parking area would be located above the underground portions of the RWTP. An access road about 25 feet wide and 500 feet long for plant maintenance activities would be constructed along the western face of the building.

D. PROJECT APPROVALS

Following a public hearing before the Planning Commission on this Draft EIR, responses to written and oral comments will be prepared and published in a Draft Summary of Comments and Responses. The EIR will be revised as appropriate and presented to the Planning Commission for certification as to accuracy, objectivity and completeness. No project approvals or permits may be issued before the Final EIR is certified. If the EIR is certified as complete, the Recreation and Park Commission may approve the proposed Zoo Master Plan for final design and implementation by the Zoological Society.

The existing Zoo site is within the Coastal Zone and is subject to jurisdiction of the California Coastal Commission. The State Coastal Commission has delegated permitting and approval authority in the urbanized area of San Francisco to the Planning Commission. The San Francisco Planning Commission would therefore review the proposed Zoo Master Plan for consistency with the Local Coastal Program and would be required to take action regarding issuance of a Coastal Development Permit, in accordance with Section 30412 of the California Coastal Act of 1976. Objectives and policies for the Western Shoreline Area Plan of the San Francisco General Plan were adopted in April, 1985 and amended in December of 1987.

PLANS AND POLICIES

Environmental plans and policies, such as the Bay Area Air Quality Plan, directly address environmental issues and/or contain targets or standards which must be met in order to preserve or improve characteristics of the City's physical environment. The *SF Zoo Master Plan* would not obviously or substantially conflict with any such adopted environmental plan or policy.

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[5] The Fleishhacker Bath House was built in 1925 as part of the Fleishhacker Pool complex. The history and cultural significance of this building are discussed in Section III.B. Cultural Resources, of this EIR (page 50).

The City and County of San Francisco General Plan, which provides general objectives and policies to guide land use decisions, contains some policies which relate to physical environmental issues. The *SF Zoo Master Plan* would not obviously or substantially conflict with any such policy. Table 4 shows objectives and policies of the Recreation and Open Space and Transportation Elements of the General Plan that may be relevant to the proposed project. In general, potential conflicts of a proposed project with the General Plan are considered by decision makers (normally the Planning Commission) independently of the environmental review process, as part of the decision to approve or disapprove a proposed project. Any potential conflict not identified in this environmental document could be considered in that context, and would not alter the physical environmental effects of the proposed project.

On November 14, 1986, the voters of San Francisco passed Proposition M, the Accountable Planning Initiative, which established eight Priority Policies (Planning Code Section 101.1). These policies are: preservation and enhancement of neighborhood-serving retail uses; protection of neighborhood character; preservation and enhancement of affordable housing; discouragement of commuter automobiles; protection of industrial and service land uses from commercial office development and enhancement of resident employment and business ownership; earthquake preparedness; landmark and historic building preservation; and protection of open space. Prior to issuing a permit for any project which requires an Initial Study under CEQA or adopting any zoning ordinance or development agreement, the City is required to find that the proposed project or legislation is consistent with the Priority Policies. The Planning Commission, during the review and approval process for the project, would make a determination of the project's conformance with the Priority Policies, and will so advise other approving bodies, including the Recreation and Park Commission.

TABLE 4
SUMMARY OF RELEVANT SAN FRANCISCO GENERAL PLAN
RECREATION AND OPEN SPACE AND TRANSPORTATION OBJECTIVES AND POLICIES

OBJECTIVE	POLICY
Objective 1 Preserve larger areas of open space sufficient to meet the long-range needs of the Bay Region	**Policy 1** Protect the natural character of regional open spaces and place high priority on acquiring open spaces noted for unique natural qualities. **Policy 2** Make open space lands already in public ownership accessible to the public for compatible recreational uses.
Objective 2 Develop and maintain a diversified and balanced citywide system of high quality public open space.	**Policy 2** Preserve existing public open space - Recreation and Cultural Buildings Outdoor spaces in parks and playgrounds should not be diminished except in a few unique cases such as the Zoo, which requires special indoor facilities. **Policy 3** Preserve sunlight in public open spaces. **Policy 4** Gradually eliminate non-recreational uses in parks and playgrounds and reduce automobile traffic in and around public open spaces. **Policy 6** Make open spaces accessible to people with special needs. **Policy 9** Maintain and expand the urban forest.
Objective 3 Provide continuous public open space along the shoreline unless public access clearly conflicts with maritime uses or other uses requiring a waterfront location.	**Policy 1** Assure that new development adjacent to the shoreline capitalizes on its unique waterfront location, considers shoreline land use provisions, improves visual and physical access to the water, and conforms with urban design policies. **Policy 2** Maintain and improve the quality of existing shoreline open space. **Policy 3** Create a trail around the perimeter of the City which links open space along the shoreline and provides for maximum waterfront access. **Policy 5** Provide new public open spaces along the shoreline.
Objective 4 Provide opportunities for recreation and the enjoyment of open space in every San Francisco neighborhood.	**Policy 2** Maximize joint use of other properties and facilities.
Objective 13 Promote the development of marketing strategies that encourage and facilitate the use of transit and other alternatives to the single-occupant automobile for shopping, recreational, cultural and other non-work trips.	**Policy 13.1** Encourage the use of alternatives to the automobile for all age groups in the advertisement of business, recreational and cultural attractions by identifying their proximity to transit facilities and significant landmarks.
Objective 18 Establish a street hierarchy system in which the function and design of each street are consistent with the character and use of adjacent land.	**Policy 18.5** Mitigate and reduce the impacts of automobile traffic in and around parks and along shoreline recreation areas.
Objective 21 Develop transit as the primary mode of travel to and from downtown and all major activity centers within the region	**Policy 21.6** Establish frequent and convenient transit service, including water-based transit, to major recreational facilities and provide special service for sports, cultural and other heavily attended events.
Objective 28 Provide secure and convenient parking facilities for bicycles.	**Policy 28.3** Provide parking facilities which are safe, secure, and convenient.

Source: San Francisco General Plan, San Francisco Planning Department, As Amended through December, 1996.

II. ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES

The following impact analysis describes all potential environmental effects of the proposed Zoo Master Plan, whether or not the effects were found significant. Impacts found to be potentially significant are specifically called out and mitigation measures are described. Improvement measures are also described for environmental effects found to be less-than-significant.

A. LAND USE, PLANNING AND ZONING

SETTING

Project Site

The San Francisco Zoological Gardens (Zoo) is located in the southwest part of San Francisco, at 1 Zoo Road (see Figure 1, page 2). The existing Zoo facility, which encompasses approximately 75 acres, is bounded by the Great Highway and the Pacific Ocean to the west, Sloat Boulevard and the Sunset District to the north, Herbst Road, Lake Merced, the Recreation Center for the Handicapped, the California Army National Guard 223rd Military Intelligence Battalion and the Oceanside Water Pollution Control Plant to the south, and the Lakeshore residential area to the east.

The main (public) entrance to the Zoo is located on the north, at Sloat Boulevard across from 45th Avenue. The employee and service entrance is located on the south at Zoo Road. The South Entrance Gate (a secondary public entrance) is located along Herbst Road, and an exit/emergency access point is located along Sloat Boulevard across from 42nd Avenue. There are currently 970 visitor parking spaces located around the Zoo, including 242 diagonal spaces in the middle of Sloat Boulevard, 200 diagonal spaces on Sloat Boulevard facing the Zoo perimeter near the main entrance, 100 spaces across the Great Highway from the Sloat Boulevard terminus, 203 spaces in a lot at Sloat Boulevard and Skyline Boulevard, and 225 spaces along Herbst Road. Employee parking is available within the employee/service entrance and at the Fleishhacker site (See also, Section III.E, Transportation).

The land use characteristics of the existing Zoo facility (i.e., the design of its structures and their spatial organization) arise from its historical development and evolving principals governing the care and management of animals. The original Zoo began around 1925 at the Fleishhacker Playfield as a "kind of trained menagerie for the enjoyment of children."[6] Over the first decade of its existence, the small

[6] *Historic Landscape and Architecture Survey of the San Francisco Zoological Gardens*, July 1996, Archaeological/Historical Consultants. This report provides a detailed discussion of the history of the San Francisco Zoo, including the historic integrity of its

menagerie which displayed animals in rows of cages evolved in stages towards becoming a full-fledged zoo, with a diversity of animals professionally managed and exhibited. Major buildings constructed during this period include the Delia Fleishhacker Memorial Building (the Mothers Building) and the Carousel.

By the mid-1930s, two converging factors led to a major expansion and redesign of the Zoo: 1) the concept of a "barless zoo" where animals were not confined in cages, but grouped by species and provided better living conditions, and where viewing opportunities for visitors were improved; and 2) the vast federal program administered by the Works Progress Administration (WPA), which aimed to put large numbers of men to work (following the Great Depression) on public works projects such as Zoo construction.

By March of 1937, nearly 1,000 men were at work on the new Zoo, the main components of which included a central plaza with a fountain, a turtle pool, a lion house and yards, a pachyderm house and yards, a primate house, a cafe and convenience station, monkey island, a lake and aviary for aquatic birds, the Coypu Rat pool, bear dens, an otter pool, animal paddocks and small mammal dens, together with landscaping and a rock wall surrounding the Zoo. The major buildings constructed during this phase (the Aviary and the Lion and Pachyderm Houses) were designed in a style that combined elements of the Moderne and Classical architectural styles, similar to the exhibition buildings constructed in 1939 for the Golden Gate International Exhibition on Treasure Island, another WPA project. The historic significance and integrity of Zoo buildings and landscaping is discussed in Section II.K of this Program EIR. After the opening of the renovated Zoo on October 6, 1940, there followed a period of nearly two decades during which few changes occurred.

From the late 1960s to the present, there again was substantial renovation and new construction at the Zoo, leading to its current configuration and the development of a master plan for its future. Table 2, page 9, summarizes the physical characteristics of current Zoo facilities; Figure 2, page 6, depicts these facilities in plan view.

Surrounding Area and Adjacent Land Uses

Land uses surrounding the existing Zoo are shown on Figure 12 and briefly described below.

The area between the western boundary of the existing Zoo and the Great Highway is known as the Fleishhacker site. The Fleishhacker site is the location of the former Fleishhacker Pool and the abandoned Fleishhacker Bath House. This property, like the Zoo itself, is owned by the City and County of San Francisco and is managed through a partnership between the San Francisco Recreation and Park

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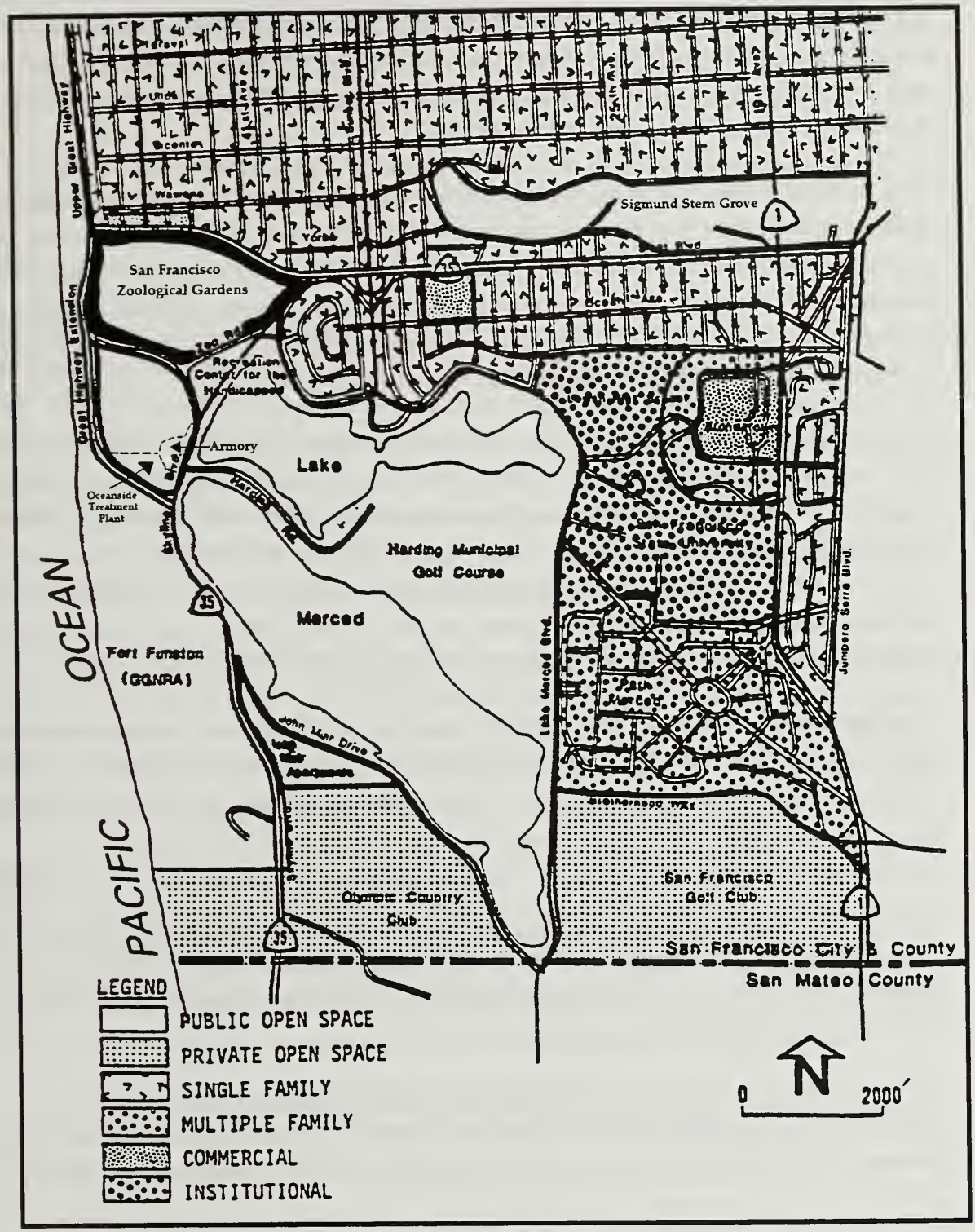
landscape features and buildings. A copy of this report is on file and available for public review at the San Francisco Planning Department, 1660 Mission Street, Project File No. 95.469E.

Figure 12 Land Use



Department and the non-profit San Francisco Zoological Society. At present, the Fleishhacker site is unpaved and used for surface parking by Zoo employees and volunteers and as a staging area for ongoing Zoo projects (such as the wet weather lift station). The future use of this area as the Zoo's main entrance and visitor plaza is being coordinated with the San Francisco Public Works Department, which plans to construct a recycled water treatment plant and water storage facility in this area, as part of the *San Francisco Recycled Water Master Plan (SFRWMP).*

At the southeast corner of the intersection of Sloat Boulevard and the Great Highway (adjacent to the Fleishhacker Site), is the Westside Pump Station, which stores untreated sewage and transports it to the Oceanside Water Pollution Control Plant. The Westside Pump Station is managed by the San Francisco Department of Public Works. Further to the west, across the Great Highway, is an area of surface parking and public restrooms serving the southernmost portion of Ocean Beach, which is part of the Golden Gate National Recreation Area (GGNRA) managed by the National Park Service.

The Oceanside Water Pollution Control Plant (OWPCP) is located along the Great Highway south of the Zoo. The OWPCP is the newest of three water pollution control plants operated by the San Francisco Department of Public Works, and provides primary and secondary treatment for an average dry weather capacity of 21 million gallons per day. On November 4, 1975, the Charter of San Francisco was amended by the voters to allow the area immediately south of the existing Zoo to be used for both Zoo expansion and below-grade portions of the OWPCP making the Joint Use Area (JUA), an area of about 43 acres. The newly constructed (1996) Avian Conservation Center occupies about 2.5 acres of the JUA.

In the area between the OWPCP and Skyline Boulevard (adjacent to the Avian Conservation Center), is the U.S. Dept. of Army, California Army National Guard, 223rd Military Intelligence Battalion. This facility has 15 on-site employees, and provides the Army with worldwide linguistic support.[7] On the south side of Herbst Road (opposite the Zoo's employee/service entrance) is the Recreation Center for the Handicapped (RCH). The RCH is a private, non-profit agency which "promotes the personal growth and independent living for children and adults with disabilities."[8] The RCH serves approximately 1,800 clients weekly, through programs offering recreation, education, vocational rehabilitation and respite care. To the southeast of the RCH are Lake Merced and Harding Park, which have facilities for golfing, boating, picnics, fishing, and other forms of recreation.

The area north of the Zoo (across Sloat Boulevard) is the Sunset District of San Francisco, a predominantly low-rise single family residential area. A small commercial strip has developed along Sloat Boulevard between 44th Avenue and 47th Avenue (opposite the Zoo's current entrance), which includes

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[7] Mr. Steve Marquette, California Army National Guard, 223rd Military Intelligence Battalion, personal communication, September 10, 1996.

(from east to west): George's Zoo (a liquor store/deli located below two levels of apartments), a two-story Days Inn hotel, 49 Cafe and Pasquale's Pizza, the United Irish Cultural Center, Sloat Garden Center, the Carousel hamburger stand, Robert's Motel, and John's Ocean Beach Cafe. Fifteen duplex residential units and one 3-unit building are being constructed on the corner of Sloat Boulevard and the Great Highway, across from the Zoo. This 33-unit development is scheduled for completion in 1997.

The Lakeshore Acres residential area is located to the east of the Zoo (outside the Sunset District), along Lake Merced, Skyline, and Sloat Boulevards.

Zoning

Figure 13 illustrates zoning and height and bulk districts for the Zoo project site and its surroundings. The Zoo, including the Fleishhacker site, is within a P (Public Use) District. Principal permitted uses in P districts, identified in Section 234.1 of the *Planning Code*, include public structures and uses of the City and County of San Francisco and other governmental agencies, including accessory non-public uses that conform to the *General Plan*. The surrounding area includes NC-2 (Small-Scale Neighborhood Commercial) Districts to the north along Sloat Boulevard; RH- (Residential, House, One-Family) Districts to the north; RH-1 (D) (Residential, House, One-Family, Detached Dwelling) Districts to the east; and P (Public Use) Districts to the south (Lake Merced, Harding Park, and Fort Funston).[9]

The San Francisco Zoo is in the OS Height and Bulk District (see Figure 13). Section 290 of the *Planning Code* states that the height and bulk of buildings and structures in the OS District shall be determined in accordance with the objectives, principals and policies of the *General Plan*, and no building or structure or addition thereto shall be permitted unless in conformance with the *General Plan*. The surrounding area includes OS, 40-X and 100-A Height and Bulk Districts

IMPACTS

Under the proposed *SF Zoo Master Plan*, the existing western and southwestern boundaries of the Zoo would be extended, increasing the size of the Zoo from about 75 acres to about 105 acres. New areas proposed for incorporation into the Zoo have long been zoned for and planned as Zoo expansion areas, and such expansion would be compatible with other existing and planned land uses in the area.

Expansion of the Zoo as proposed would therefore not disrupt or divide the physical arrangement of an

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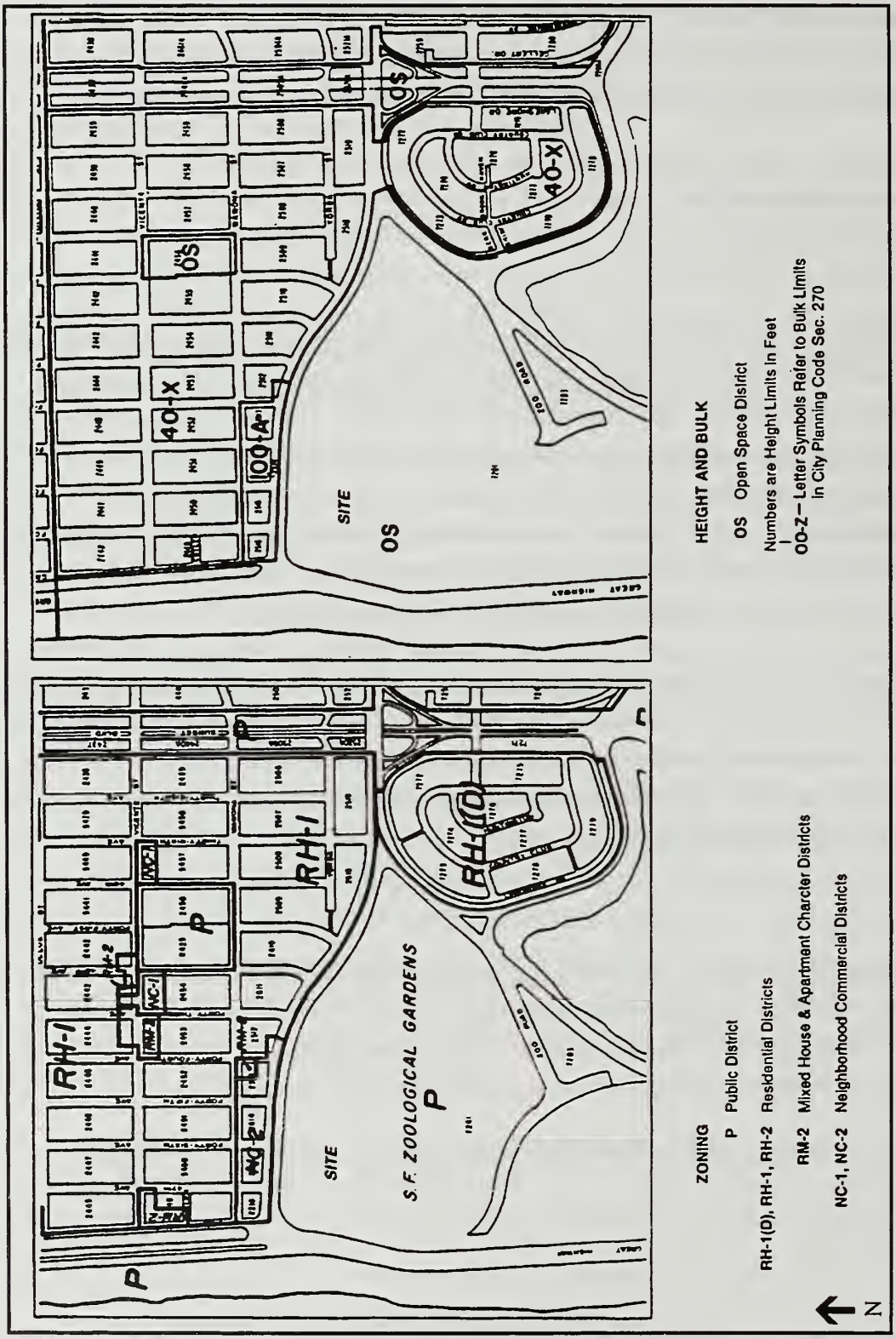
[8] Recreation Center for the Handicapped Promotional Literature, faxed September 11, 1996.

[9] City and County of San Francisco, *City and County of San Francisco Municipal Code, Zoning Map, Sheet 13* September 30, 1990.

Figure 13 Zoning



Source: City and County of San Francisco Municipal Code, Planning Department, Zoning Maps, 1990.

established community. The proposed project would introduce no new types of land uses to the site that do not already exist there.

During construction of *SF Zoo Master Plan* projects, there would be temporary changes in the land use characteristics of the site. The effects of construction-related land use changes would include changes in the visual character of the Zoo, changes in vehicular and pedestrian circulation patterns, and the temporary closure of some exhibits and facilities. As described in the Project Description, implementation of the *SF Zoo Master Plan* would first occur over a period of approximately 20 years (1997-2017), with the highest level of activity occurring in the initial phase (through the year 2006). If the project were approved and construction proceeded in a timely fashion thereafter, temporary construction-related land use changes would occur at the westernmost portion of the Zoo (around the Fleishhacker site), followed by the interior visitors' spine. Construction-related land use changes would result from such activities as tree removal and replacement, building demolition and renovation and new construction.

The Project Description describes each phase of project implementation, including buildings and other facilities to be demolished or renovated, and new ones to be constructed. During periods of construction, the Zoo would remain open to the public, but certain areas would be closed from three to twelve months. Also, vehicular and pedestrian circulation patterns within and around the Zoo would be altered to accommodate construction activity. While these disruptions would be of limited duration, they could adversely affect visitors' experience of the Zoo.

Cumulative Land Use Impacts and Relationship to Other Planned Projects

Recycled Water Treatment Plant

The area to the immediate west of the existing Zoo, known as the Fleishhacker site, is the former location of the Fleishhacker Pool and the site of the abandoned Fleishhacker Bath House (see Figure 2, page 6). As part of the San Francisco Zoo Infrastructure Master Plan project, a wet weather lift station is currently being constructed at the northern end of the Fleishhacker site (near Sloat Boulevard). The wet weather lift station, a component of the new drainage/sewer system, will "lift" flows from the drainage/sewer system to the Westside Transport facility. It is scheduled to be completed in Fall 1997. The future use of the entire Fleishhacker site is being coordinated with the San Francisco Public Works Department, which plans to construct a Recycled Water Treatment Plant (RWTP) and water storage facilities in this area, as part of the *San Francisco Recycled Water Master Plan (SFRWMP)*. The above-ground portion of the RWTP project will occupy the footprint of the abandoned Fleishhacker Bath House. Water storage facilities will be located underground in the area formerly occupied by the Fleishhacker Pool. During the anticipated 24-month RWTP construction period, about five acres of the Fleishhacker site would be occupied with construction activity, and staging RWTP construction would displace other uses of the site for the duration of construction. The EIR for the *SFRWMP*, which included an evaluation of the impacts of the RWTP project on the Zoo, found that consolidation of uses at the Fleishhacker site onto the southern end of the

paved area during construction would not substantially compromise the concurrent use of the site for employee and volunteer parking and Zoo staging and storage activities.

Uses of the Fleishhacker site currently include employee and volunteer parking, Zoo materials storage, and staging for on-going Zoo projects. As shown in Figure 3, page 13, the Zoo's new main entrance and visitor Entry Plaza is proposed to be located at the Fleishhacker site. This would include a landscaped and paved area for tour buses, school buses, visitor parking (located above the future SFRWMP water storage facility), bicycle storage facilities and a circular entry gateway. From the vehicle area and circular gateway, visitors would be led to the Zoo's new entry plaza, including a 4,000 sq.ft. ticket booth, a 5,700 sq.ft. gift shop and food service building, a 6,000 sq.ft. Zoo tram station, information kiosks, and handicap-accessible public restrooms.

The vicinity of the Fleishhacker site could experience cumulative construction land use effects (temporary displacement of on-site and adjacent uses for construction and staging) due to closely scheduled or simultaneous construction of the RWTP project along with Zoo infrastructure improvements and Zoo Master Plan projects in and around the Fleishhacker site. Construction of RWTP facilities has been closely coordinated with Zoo infrastructure and Master Plan projects, and no substantial conflict is anticipated. All of the proposed Zoo infrastructure work adjacent to the RWTP site, including replacement of the utility line corridor adjacent to the RWTP site, construction of the nearby wet-weather lift station and groundwater wells, and construction of the groundwater reservoir is scheduled to occur prior to the start of the RWTP construction.

Oceanside Water Pollution Control Plant

The area south of the Zoo is known as the Oceanside Water Pollution Control Plant/San Francisco Zoological Gardens Joint Use Area (JUA) (see Figure 1, page 2). The JUA is where portions of the OWPCP have been built underground, and expansion of the Zoo is expected to occur above these facilities on the surface. The JUA is also adjacent to the California Army National Guard 223rd Military Intelligence Battalion. This joint use is consistent with Proposition A passed in 1975 by the San Francisco voters for expansion of the Zoo on Park land.

The underground portions of the OWPCP which are located in the JUA were specifically designed and engineered to support future Zoo structures. As part of the mitigation plan for the Infrastructure Master Plan, the Avian Conservation Center (ACC) was relocated from an area adjacent to the Fleishhacker site, to the eastern portion of the JUA. Construction of the new ACC was completed in September 1996. The new facility is 46,000 sq.ft. in size, and includes fledgling and breeding enclosures, incubation and hatching facilities, and a support building which houses video monitoring, and food storage and preparation equipment. The new ACC is open to the public only for limited special tours.

The remaining portion of the surface area of the JUA is graded but still undeveloped. Under the proposed project, a portion of this area would include a Mammal Conservation Center and animal paddocks to be built at the western end of the JUA, adjacent to the ACC.

Because construction-period land use changes would affect different portions of the project site at different times and would generally be temporary and intermittent, the potential effects would not be considered significant.

MITIGATION MEASURES

The potential land use impacts would not be significant and would not require mitigation measures.

B. VISUAL QUALITY

Visual Quality addresses the potential changes to the visual characteristics of an existing landscape and the significance of the change in defining scenic resources available to public view. The natural physical elements that contribute to visual character typically include landform, buildings, surfaces, structures, vegetation, water and their inherent light, shadow, texture and form.

To assess the visual quality of an area and the changes that might result from a project, an objective description of the visual characteristics of the project is provided, along with a depiction of the scenic qualities of an area. A key factor in determining visual impact is the location and distance from which a project would be viewed, nearby or far away, from lower or higher elevations, from straight on or from an oblique angle. The context of the view in terms of historic character, uniqueness and pristine natural setting is also a key factor in the assessment of visual change.

SETTING

Visual and Aesthetic Characteristics of the Project Area

The San Francisco Zoo is located in the southwest quadrant of the City, where the visual characteristics of surrounding landscapes differ from the highly scenic natural and open views of the ocean and beach to the west, to the densely built residential neighborhoods to the north and the east, to the naturalistic amenities of Lake Merced and its environs to the south.

To the north of the Zoo, the Sunset District is a densely built residential area with clear view corridors established along the grid of north-south and east-west oriented streets. To the west, south, and southeast of the Zoo, the visual character has a naturalistic appearance in the middle ground and distant landscape. The Golden Gate National Recreation Area includes beaches and sand dunes located across the Great Highway, and the Fort Funston area with its rugged landscape, hiking trails, hangliders, and cliffs overlooking the Pacific Ocean. Foreground views from within the Zoo are dominated by the strong linear feature of the 4-lane Great Highway. To the south, the dominant visual features include the building of the Recreation Center for the Handicapped, the bermed hillside, the Armory and the variety of mature trees and shrubs which surround Harding Park and Lake Merced. To the east of the Zoo, the visual characteristics are a blending of those to the north and south: grid streets and single-family residential development extending to the northern boundary of Lake Merced. Sloat Boulevard forms the dominant view corridor from its origin at Portola Drive.

The visual characteristics of the project area, focused on views of the ocean and beach, provide a scenic background to the Zoo setting. The only disparate element is the commercial strip on the north side of Sloat Boulevard between 44th and 47th Avenues.

Visibility of the Project Site from Surrounding Areas

The San Francisco Zoo is predominantly planted with three species of trees: Monterey Cypress (*Cupressus macrocarpa*), Eucalyptus (*Eucalyptus globulus*), and Monterey Pine (*Pinus radiata*). Since the majority of these trees were planted in the late 1920s, they now reach heights of 50 feet and higher.[10] From nearly all vantage points outside the Zoo, only its perimeter trees and shrubbery are visible. Likewise, from vantage points within the Zoo, views beyond the Zoo's boundaries are limited to internal Zoo landscaping and the spatial orientation of the exhibits. Figure 14 includes existing views of the Zoo as seen from various surrounding vantage points on clear days. During periods of moderate to dense fog, the visibility of the Zoo and its environs is substantially reduced.

The Zoo is prominently visible from near-range vantage points along Sloat Boulevard, between the Great Highway and 37th Avenue. From street-level locations along Sloat Boulevard, the Zoo's northern boundary is seen as a tall bank of mature trees. In the vicinity of 45th Avenue, the only physical structures visible from outside the Zoo are its main entrance gate and the Mothers Building. To the west, the Pacific Ocean is clearly visible, adding to the natural visual elements of this setting.

From mid-range viewing points along Ulloa Street, the Zoo's vegetative canopy is visible to the south along 41st, 42nd, 43rd, 44th, 45th, 46th, and 47th Avenues. From these perspectives, there is strong contrast between the densely built urban setting in the near-range view, and vegetative cover in mid- and long-range views. Views of the Zoo down these streets varies due primarily to sloping topography of the area. Looking down 46th Avenue and 47th Avenue, for example, the wall of trees at the Zoo's northern boundary form the horizon line of the view, above which only sky is visible. Looking down 41st Avenue and 42nd Avenue (which are at higher elevations), this wall of trees is framed by more distant views of Lake Merced and Fort Funston vegetation and landform, which are themselves framed by the Milagra and Sweeney Ridges (in San Mateo County). Sloat Boulevard is a major east-west view corridor in the area due to its width, sloping topography, and its views, which include the Pacific Ocean and Mt. Davidson. Looking west down Sloat Boulevard from 19th Avenue, views of the Zoo are blocked by mature street trees in the Sloat Boulevard median and along both sides of Sunset Boulevard. This view is also punctuated by the bell tower of the First United Presbyterian Church, located on the north side of Sloat Boulevard at 35th Avenue, which is the only vertical element breaking the horizon line. Mid-range views of the Zoo looking westward down Sloat Boulevard open up once Sunset Boulevard is crossed. From 37th

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[10] The discussion in this section is limited to the visual characteristics of the Zoo's existing vegetative cover, and plans contained in the Forest Management Plan for its replacement. Section H of this EIR, Biological Resources, addresses the health of the existing forest, its habitat potential, and the role the Zoo's forest plays in wind abatement, solar access, and the central role that vegetation plays in the biogeographic regions concept set forth in the Master Plan.

Figure 14 Views of the Zoo

Looking west on Sloat Boulevard

Looking south to Zoo Entrance on Sloat Boulevard

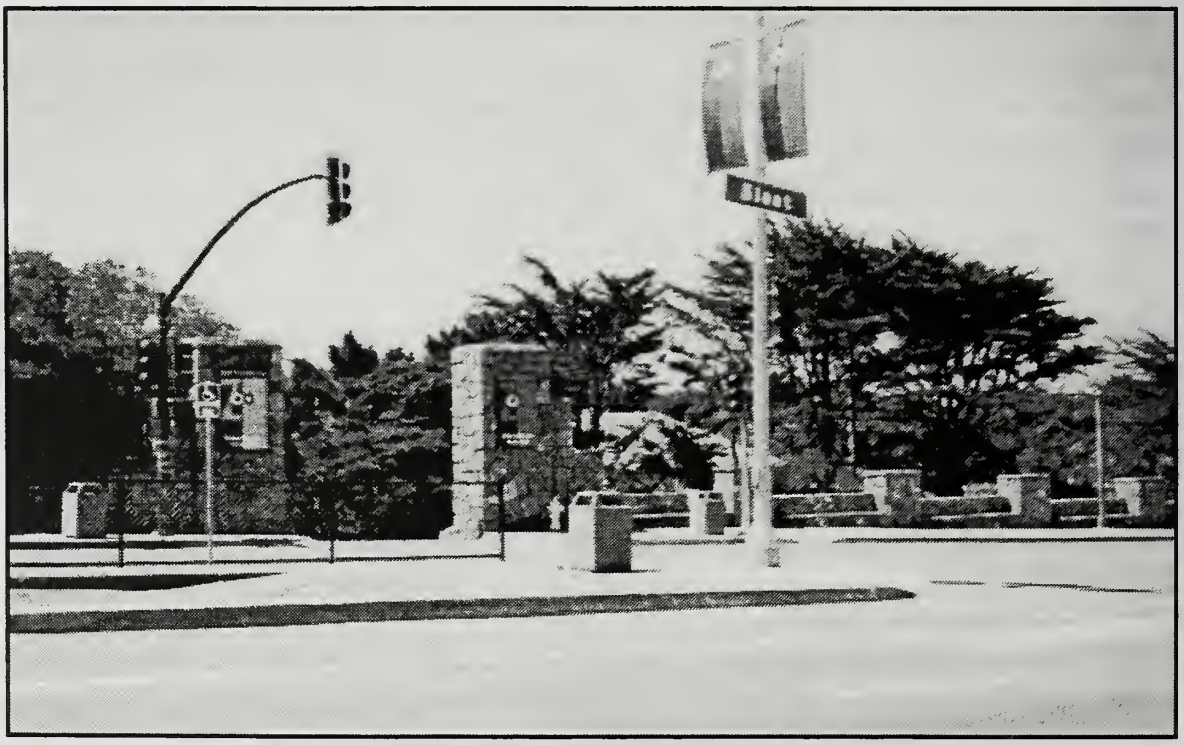

Figure 14 (contd) Views of the Zoo

Looking south to the Zoo from 41st Avenue

Looking south to the Zoo from 46th Avenue and Wawona Street

Avenue and Sloat Boulevard, for example, the mature perimeter trees forming the Zoo's eastern boundary are clearly visible and represent a dominant visual feature from this vantage. The other significant visual feature in this view is the Pacific Ocean, which is clearly visible from 37th Avenue.

Views of the Fleishhacker site are somewhat limited. On the west, views of the site from the Great Highway at Sloat Boulevard are obscured by a vegetated berm and the Westside Pump Station. The Bath House is visible from the Great Highway and the public beach parking lot across the street. Further south along the Great Highway, dense landscaping of mature trees and shrubs block views of the site. South of the Fleishhacker site, along the Great Highway, are limited public views of the Zoo due to the bermed topography and vegetative cover associated with the Oceanside Water Pollution Control Plant (OWPCP).

From southern vantage points along Skyline Boulevard, the Zoo's perimeter landscaping is visible as part of a larger natural setting created by landforms and landscaping associated with Lake Merced, the Recreation Center for the Handicapped, and the OWPCP. The water of Lake Merced is also visible along this segment of Skyline Boulevard. Looking northward from the entrance of Harding Park (at Skyline Boulevard), long-range views (above the Zoo's canopy) include portions of the Inner Sunset District, as well as portions of Mt. Sutro, Twin Peaks and Mt. Davidson.

Light, Glare and Shading

The existing trees and shrubs surrounding the Zoo perimeter provide a buffer to adjacent properties from internal Zoo lights. Zoo buildings are less than 40 feet high and resulting shading is in amounts common and accepted in urban recreational / educational facilities such as zoos.

IMPACTS

Implementation of the proposed *SF Zoo Master Plan* would have a long-term beneficial effect on the visual quality of the Zoo and its environs, through a combination of factors. Under the proposed project, the Zoo would be reorganized into five major exhibit complexes, each subdivided into specific biogeographic regions. Each exhibit complex would include animal exhibit areas, animal holding buildings, exterior paddocks, pedestrian walkways and service roads, each with distinct and consistent visual characteristics. Some of the exhibit complexes would include viewing and interpretive shelters, special visitor areas and public restrooms. Introducing each region would be a gateway exhibit illustrating its climate, plant material, culture, and animals and their seasonal distribution, in contrast to those of coastal California. These gateways would be entered through landscape zones which would thematically create a transition from the central native coastal California landscape to the specific biogeographic region.

Under the proposed project, all remnants of old exhibits and facilities would be removed, administrative offices would be moved out of portable trailers and permanently housed, and a comprehensive signage and lighting plan would be implemented.

Construction Impacts

Implementation of the proposed project would involve the removal and replacement of trees and other vegetative cover that characterize the Zoo from external view points and would also provide visual screening of construction areas. The existing visual quality of the project area would be impacted during construction. None of the proposed changes would substantially degrade or obstruct scenic views or vistas from public areas outside the Zoo.

The Zoo itself is a public area from which scenic views are enjoyed; some of these views would be temporarily degraded due to removal and replacement of vegetation. The effects of project construction on the visual quality of the project area would be observed at various times by three distinct groups: 1) visitors and personnel within the Zoo itself; 2) residents in the Sunset District who have views of the Zoo; and 3) pedestrians and vehicular occupants in areas with views of the Zoo. Visual changes within the Zoo would be most noticed by visitors and staff and secondarily by residents in the residential complex at Sloat Boulevard and the Great Highway adjacent to the Zoo.

If the proposed project were approved and construction proceeded in a timely fashion thereafter, construction activities would occur periodically at the Zoo for approximately 20 years (1997 to 2017). The first phase of project implementation (through the year 2006) would be focused on the westernmost portion of the Zoo. This phase of project development would be the most intensive phase as well as the most visible to viewer groups inside and outside Zoo boundaries. Latter phases of Master Plan development would occur at the Zoo's interior, in areas screened from view points outside the Zoo, and less visible from, inside the Zoo.

The phasing of the *SF Zoo Master Plan* construction projects is described in the Project Description of this EIR. The phasing plan is designed to minimize, to the greatest feasible extent, potential disruptions caused by construction activities. The plan would be implemented in stages so that once construction commenced in a particular area, all construction-related activities necessary to complete that area would be carried out at one time and appropriate re-vegetation and landscaping activities would be performed as construction activities were concluded. This would reduce the length of time disturbed areas would be left bare and allow for growth of new vegetation. Construction activities would include the demolition and/or renovation of buildings, construction of new exhibits and support facilities, re-contouring paths and open space areas, landscaping, and reforestation. During development of the African Savanna Biogeographic Region, for example, Musk Ox would be relocated; softscape and hardscape features of the existing meadow would be modified for habitation by Giraffe, Zebra, Antelope, and Lions; and the area's portion of the reforestation plan would be implemented, including tree removal and replacement. The total period of construction activity in this area would be about four months. Depending on their complexity, other parts of the Zoo could be under construction for a year or more.

During the first phase of plan implementation, a substantial number of mature trees would be removed and replaced at the westernmost portion of the Zoo. While most of this work would involve hand-held equipment such as chain saws, heavy construction equipment would be used during this period to transport and plant new large trees, and to shred and haul vegetation and debris. The visual effect of tree removal and reforestation would be greatest during the early construction period, but would diminish over time as new vegetation matured.

MITIGATION MEASURES

The potential visual quality impacts would not be significant and would not require mitigation measures.

C. POPULATION / GROWTH

SETTING

Employment

The San Francisco Zoo employs about 250 to 300 full- and part-time staff depending on the season (peak season is summer), including animal care specialists, administration, grounds-keepers, retail and food service and support personnel. Typically, the staff is 120 full-time personnel and 130 part-time personnel. There are also approximately 500 volunteers at the Zoo. During a typical weekday about 30 volunteers and 5 docents lead tours, raise funds and provide other support services for the Zoo. There is no housing or residential population located on the project site. The former Zoo Director's Residence is used as an administration building.

Visitor Attendance

Based on daily attendance records maintained by the Zoo, the average daily visitor population ranges from less than 4,000 to a peak of more than 20,000 on about tens days annually (typically free days). During the 1981-1988 period, the average annual attendance at the Zoo was approximately 970,830. Attendance declined in the past five years to less than 700,000 annually and increased again to 823,000 in 1996 after several new exhibits were opened (Otter River, Warthog Exhibit, Flamingo Lake, Australian Outback, Feline Conservation Center). The attendance figures fluctuate based on seasonal variations in weather and daylight hours, weekday vs. weekend and holiday attendance, the occurrence of special exhibits and other promotions at the Zoo (such as free day) and other Bay Area attractions, and attendance by large groups such as schools.

IMPACTS

Based on daily attendance records maintained by the Zoo, the average daily visitor population currently ranges from less than 4,000 to a peak of up to 20,000 on free days. These attendance figures fluctuate based on seasonal variations in weather and length of the daylight period, weekday vs. weekend and holiday attendance, the occurrence of special exhibits and other promotions at the Zoo and other Bay Area attractions, and attendance by large groups such as schools.

Under the *SF Zoo Master Plan*, the Zoo attendance levels are projected by the Zoological Society to increase by the year 2006, with average daily visitation of 7,000 to 10,000 and a maximum daily peak visitation of 15,000 to 30,000 over the next five to seven years. The increase in attendance is anticipated because of the improvements to animal exhibits, improved visitor and retail amenities, and special exhibits planned as part of the Master Plan implementation. The expansion and reorganization of Zoo facilities under the *SF Zoo Master Plan* would be sufficient to accommodate projected attendance levels.

Increased visitor capacity would be accomplished by expanding the boundaries of the present Zoo and by reorganizing the pedestrian circulation within the Zoo and animal exhibits.

The proposed San Francisco Zoological Master Plan would cause a moderate increase in business activity at the project site over the course of its implementation, increasing employment at the Zoo by about 105 employees (including full- and part-time workers). This would generate job opportunities for people with a range of skill levels and educational qualifications. Measured by employment, the number of paid employees would increase from 250 to about 335 after full implementation. The project would also increase opportunities for volunteer work at the Zoo, from about 500 to 675. The project's employment growth would provide job opportunities for residents of San Francisco and other Bay Area communities. The additional jobs created by the project would likely represent a range of skill levels and educational qualifications. Construction of the proposed project would require an estimated 30 persons/year for twenty years.

The proposed project would not displace any housing and would not reduce the supply of land available for residential development because the proposed development is entirely within the existing park property. Increased employment at the Zoo resulting from project implementation would not generate a noticeable demand for housing in San Francisco and the Bay Area. Under the proposed Zoo Master Plan, it is anticipated that most workers would come from the existing Bay area population and demand for housing would be less-than-significant as a result of new employment opportunities at the project site. Housing demand would be accommodated by existing and future housing in San Francisco, along the Peninsula, or in other Bay Area communities. The proposed project would not noticeably affect the jobs/housing balance in San Francisco.

MITIGATION MEASURES

The potential employment and visitor attendance impacts would not be significant and would not require mitigation measures.

D. TRANSPORTATION

SETTING

Regional Access

A number of regional freeways and highways in San Francisco provide access to the San Francisco Zoo. Regional access to and from the Peninsula is provided via U.S. 101, Interstate 280, and State Routes (SR) 1 and 35. Regional access to and from the East Bay is provided via the Bay Bridge (I-80), U.S. 101, and I-280. North Bay regional access is provided via the Golden Gate Bridge (U.S. 101) and SR 1 (Figure 15).

Sloat Boulevard, east of Skyline, and Skyline Boulevard, south of Sloat Boulevard, are designated as SR 35 in San Francisco. The continuous segments of Junipero Serra Boulevard, 19th Avenue, Crossover Drive, Park Presidio By-Pass Drive and Park Presidio are designated as SR 1 in San Francisco. Sloat Boulevard and Skyline Boulevard bound the Zoo on the north edge and east edge, respectively. SR 1, the main north/south regional route through western San Francisco, is located approximately 1.6 miles to the east of the Zoo main entrance at Sloat Boulevard and 45th Avenue.

I-280 serves as the primary regional access route to the Zoo from the south and east. Zoo visitors from the South Bay or Peninsula may continue north from I-280 on Junipero Serra Boulevard to Sloat Boulevard, and turn west on Sloat, traveling approximately three miles on surface streets, to access the Zoo. Skyline Boulevard (SR 35) and The Great Highway also provide a regional access route from the south. Travelers from the East Bay or southeastern San Francisco may exit I-280 at Ocean Avenue or Alemany Boulevard to approach the Zoo, traveling approximately three and one half miles on surface streets. Visitors from the north approach the Zoo via 19th Avenue (SR 1) or The Great Highway, traveling approximately 5.5 miles on surface streets upon exiting the freeway at the Presidio. From the east, Market Street and Portola Drive serve as a major approach route in the City.

The 1989 Loma Prieta earthquake had notable effects on the regional highway system for San Francisco. Repairs to some of the facilities have been completed, others are in the engineering and planning phases. Repairs to the Bay Bridge were completed within one month of the earthquake. Full repairs to I-280 between Cesar Chavez Street and U.S. 101 south were completed in 1995. Repairs between Fourth Street and Cesar Chavez Street are expected to be fully completed by the end of 1997 and repairs at the Alemany Circle by spring of 1998.[11]

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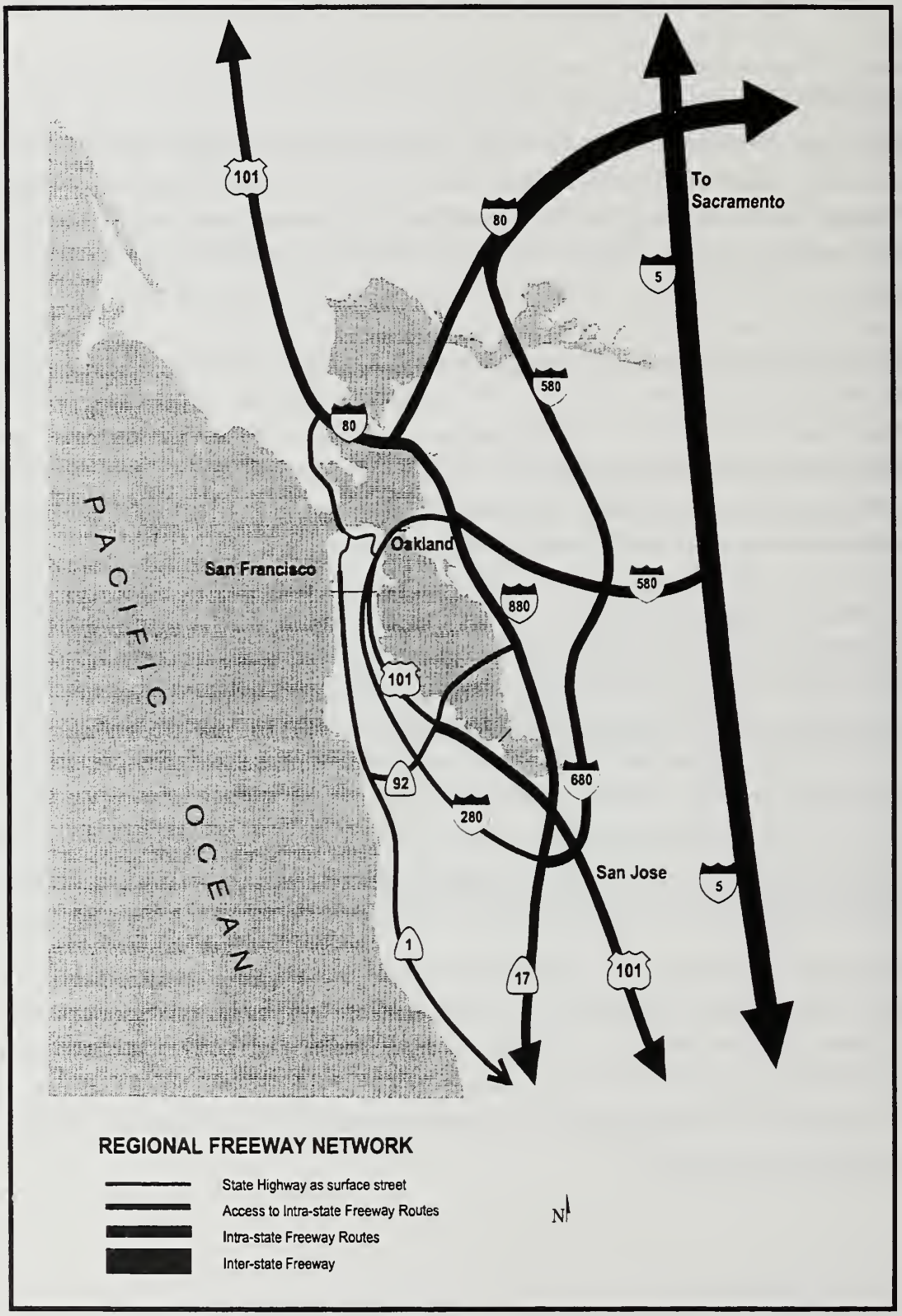
[11] Jeff Weiss, Caltrans Public Information, telephone conversation, February 21, 1997.

Figure 15 Regional Freeway Network



Source: San Francisco Planning Department General Plan

Demolition of The Embarcadero Freeway was completed in October 1991 and demolition of the Terminal Separator Structure, the section of the elevated freeway previously connecting from the Bay Bridge/U.S. 101 to Main and Beale Streets, was completed in September 1993. In November 1996, the Board of Supervisors adopted the replacement project for the Mid-Embarcadero/ Terminal Separator Structure including surface street improvements on The Embarcadero Roadway, modifications to existing on- and off-ramps to the freeway, and surface street improvements to facilitate access to and from the downtown, Chinatown, North Beach, and Fisherman's Wharf areas. Improvements are expected to be in place by 2000.

The section of the Central Freeway (U.S. 101) between Fell and Turk Streets was closed immediately following the Loma Prieta Earthquake. Demolition of this damaged section of the freeway was completed in 1992. In August 1996, the section of the freeway between Mission Street / South Van Ness Avenue and Fell Street was closed and demolition of the top deck was completed in November 1996. This remaining section of the freeway has reopened and the decision on the freeway replacement project is pending the completion of the environmental assessment. The environmental analysis is expected to be completed in summer of 1997. The tentative target date for completion of construction of the project is 1999.[12]

These projects, in association with the seismic upgrading of the Golden Gate Bridge and the Bay Bridge, the construction of new I-280 on-and off-ramps to King Street, and the replacement of Doyle Drive as recommended in a November 1996 study published by the San Francisco Transportation Authority, will affect regional access to and from San Francisco over the next 5 to 10 years.

Roadway Network

The San Francisco Zoo is located in the southwestern corner of San Francisco. It is bounded by Sloat Boulevard to the north, The Great Highway to the west and south, and Herbst Road to the east. Figure 16 shows the roadway network serving the Zoo. The main entrance to the Zoo is currently located at 45th Avenue and Sloat Boulevard. A secondary access, the South Gate, is located off of Herbst Road, entering from Skyline Boulevard. Sloat Boulevard is a six-lane, divided roadway running east/west, with on-street parking, that provides access to The Great Highway, Skyline Boulevard (SR 35), Sunset Boulevard and 19th Avenue. Sloat Boulevard is designated as a secondary arterial, west of Skyline

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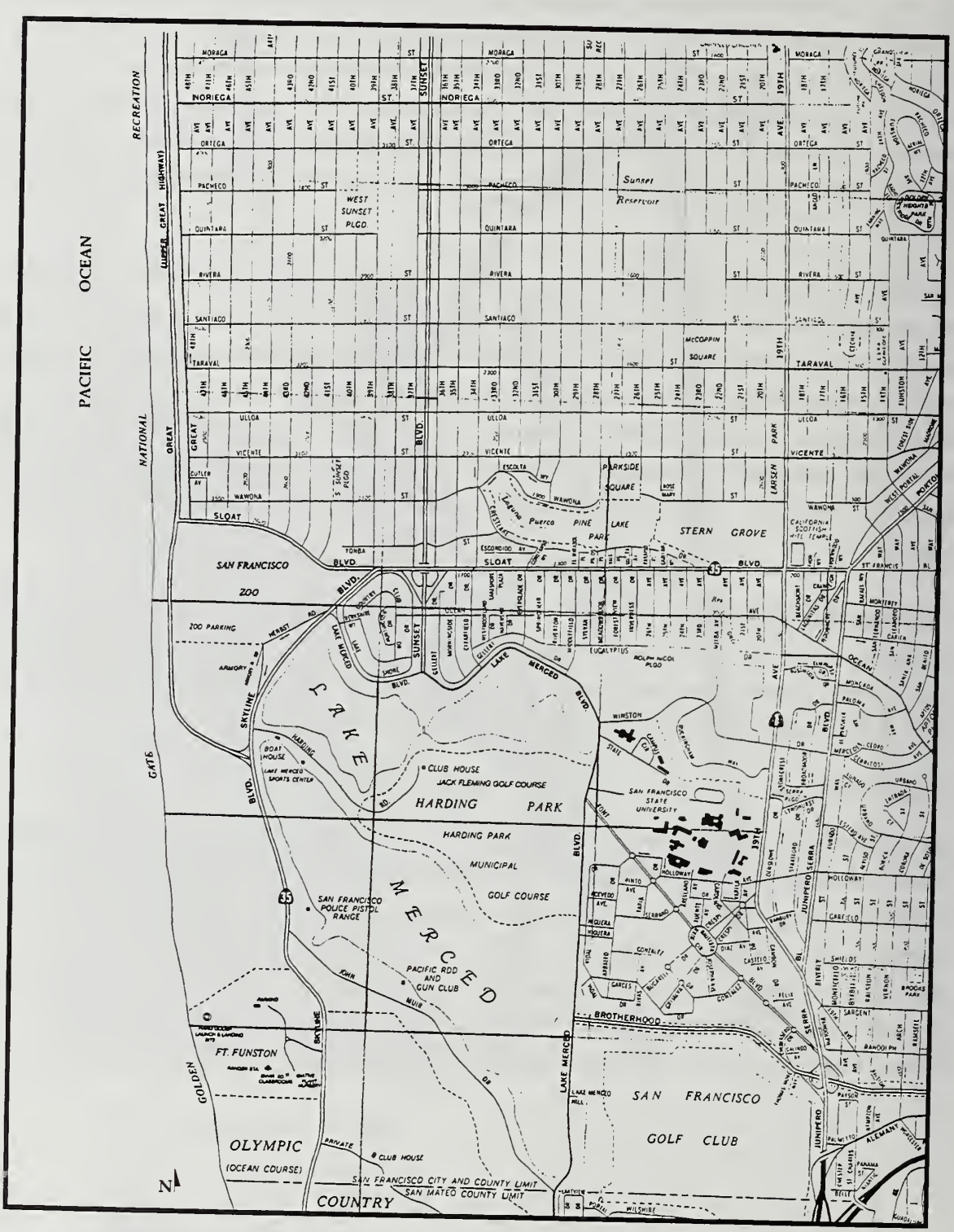
[12] Jerry Robbins, Transportation Planner, Department of Parking and Traffic, telephone conversation, February 20, 1997.

Figure 16 Road Network Serving the Zoo



Source: California State Automobile Association, AAA

Boulevard, and a Major Arterial, east of Skyline Boulevard, in the *San Francisco General Plan.*[13] Side streets intersecting Sloat are generally controlled by stop signs, giving preference to through movements along Sloat. In the vicinity of the Zoo, the intersections of Sloat Boulevard at 45th Avenue and The Great Highway are signalized. The posted speed limit on Sloat Boulevard is 35 miles per hour west of Skyline Boulevard and 40 miles per hour east of Skyline Boulevard.

Skyline Boulevard is a four-lane arterial with a striped median extending south from Sloat Boulevard as a continuation of SR 35. There is no on-street parking along this section of Skyline Boulevard. A striped median with a left-turn lane at the north end of Herbst Road and a merge lane where it enters Skyline Boulevard at the south end of Herbst Road, facilitate access to and from the South Gate of the Zoo. The posted speed limit on Skyline is 45 miles per hour south of Herbst Road and 40 miles per hour between Herbst Road and Sloat Boulevard. Skyline is designated as a Major Arterial in the *San Francisco General Plan.* Herbst Road, a local access road, serves the Zoo's South Gate and employee entrance at Zoo Road, and the Recreation Center for the Handicapped. It is a one-way, westbound, two-lane road.

The Great Highway extends north from Skyline Boulevard along the Pacific Ocean. The Great Highway is a divided four-lane highway with varying median treatments including a concrete barrier and planting strips. Parking is provided at pull-out areas. There is currently no intersection or median break along this section of the highway. The speed limit on The Great Highway is posted at 35 miles per hour north of Sloat Boulevard and 45 miles per hour south of Sloat Boulevard. The Great Highway is designated as a Recreational Street in the *San Francisco General Plan.*[14]

All three of the major streets surrounding the Zoo are included in the Metropolitan Transportation System (MTS) for regional, state, and federal transportation funding purposes. The Great Highway is an MTS Recreational Street, and Sloat and Skyline Boulevards are identified as MTS Streets and Highways. In addition, SR 35 (Sloat, east of Skyline, and Skyline) are designated on the Congestion Management Network.

Traffic volumes on the major roadways serving the Zoo are summarized on Table 5. The most heavily traveled route that visitors would encounter in the vicinity of the Zoo is 19th Avenue. Generally, the major access routes of Sloat Boulevard, The Great Highway, and Skyline Boulevard have adequate capacity to handle the level of daily vehicular traffic generated by the Zoo visitors. The primary conflicts for the Zoo

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[13] The Transportation Element of the San Francisco General Plan (June 1995) identifies secondary arterials as intra-district routes of varying capacity serving as collectors for the major thoroughfare; in some cases, supplemental to the major arterial system. A major arterial is identified as a cross-town thoroughfare, of which the primary function is to link districts within the city and to distribute traffic from and to the freeway; these are routes generally of citywide significance; of varying capacity depending on the travel demand for the specific direction and adjacent land uses.

[14] The Transportation Element of the San Francisco General Plan (June 1995) identifies a recreational street as a special category of street whose major function is to provide for slow pleasure drives and cyclist and pedestrian use; more highly valued for recreational use than for traffic movement.

occur as visitors try to park their vehicles. Conflicts may occur along Sloat Boulevard on peak use days, as cars trying to find parking in the median bays or along the south side of Sloat, circle the blocks adjacent to the Zoo main entrance. The difficulty in finding parking may also force Zoo visitors to look for parking in the adjacent neighborhood on peak use days. Parking-related congestion may affect ease of pedestrian

TABLE 5
EXISTING DAILY TRAFFIC VOLUMES
MAJOR ROADWAYS SERVING THE ZOO

Roadway	Location	Average Daily Traffic (ADT)[1]
Sloat Boulevard	between Skyline and Great Highway	12,000
Sloat Boulevard (SR 35)	between Skyline and Sunset	24,300
Sloat Boulevard (SR 35)	west of 19th Avenue	25,500
Sloat Boulevard	east of 19th Avenue	29,800
Skyline Boulevard (SR 35)	south of Sloat Boulevard	19,000
Skyline Boulevard (SR 35)	south of John Muir Drive	28,300
Great Highway	south of Sloat	24,300
19th Avenue (SR 1)[2]	north of Sloat	75,000
19th Avenue (SR 1)[2]	north of Junipero Serra	64,000
Junipero Serra Boulevard	north of 19th Avenue	30,000

[1] ADT are the average weekday traffic counts.
[2] Major trip attractors / generators between Sloat Boulevard and Junipero Serra Boulevard include San Francisco State University and Ocean Avenue, which account for the difference in Average Daily Traffic at these two locations on 19th Avenue.

Source: San Francisco Department of Parking and Traffic, 24-hour traffic counts 1991-1996 and Caltrans 1995 Traffic Volumes on California State Highway.

access to the Zoo's main entrance, as visitors parking in the center median must cross Sloat Boulevard to the Zoo main gate from the median parking bays.

At the Zoo's South Gate secondary access from Herbst Road, pedestrian/auto conflicts and competition for parking also exist. This parking facility is located adjacent to and also serves the Recreation Center for the Handicapped. Parking demand for the Zoo may make it difficult for visitors to the Recreation Center to find easily accessible parking and to maneuver through a busy parking area.

Intersections

There are three key intersections in the vicinity of the San Francisco Zoo which are affected by visitors traveling to the Zoo: The Great Highway and Sloat Boulevard; Sloat Boulevard, Skyline Boulevard, and 39th Avenue; and Skyline Boulevard and The Great Highway. The Great Highway/Sloat Boulevard intersection is the only intersection that has a traffic signal, the other two intersections are stop sign controlled.

Traffic counts were conducted during "spring break" on Wednesday, April 2, 1997, a free day for Zoo patrons. The attendance recorded at the Zoo for that day was 19,600.[15] Counts were conducted for the peak hour of exit for the Zoo, between 3:00 and 4:00 PM. While traffic volumes on the surrounding streets are generally higher during the traditional PM peak hour between 4:00 and 6:00 PM, the high traffic volumes are generally related to daily commute traffic. By using 3:00 to 4:00 PM as the peak hour of analysis for the Zoo, the impacts resulting from changes to the Zoo circulation system or visitor attendance levels are most readily assessed.

Table 6 summarizes the current level of service (LOS) for Zoo intersections. All three intersections currently operate at LOS C or better, with one exception. The northbound, left turn movement from Skyline Boulevard to The Great Highway operates at LOS D. Generally, the wide streets in the vicinity of the Zoo and the limited number of traffic controls, provide adequate capacity to serve Zoo patrons even on very high level attendance days.

Parking Conditions

There are currently three primary parking areas to serve visitors to the Zoo and two employee parking areas for a total of approximately 1,170 spaces. Table 7 enumerates the Zoo parking available to visitors and employees and Figure 17 shows the location of parking.

Two hundred employee parking spaces are located in the southwestern corner of the Zoo at the Fleishhacker Pool site. The area is proposed to be redesigned for visitor parking at the new main entrance to the Zoo. The remaining 100 employee parking spaces are located off of Zoo Road. Both of the employee parking lots are accessed via Herbst Road.

Most visitors to the Zoo park on Sloat Boulevard, either in the median which accommodates diagonal parking for up to 242 cars or on the south side of the street which has an additional 190 diagonal and 10 parallel parking spaces. Tour bus parking is also provided along Sloat Boulevard. An off-street parking lot at the northeast corner of the Zoo, where Sloat and Skyline Boulevards intersect, accommodates an additional 204 spaces. The area off of Herbst Road provides visitor parking when the South Gate is open. There are approximately 204 combined diagonal and head-on (90°) parking spaces for visitors along Herbst Road which are shared with the Recreation Center for the Handicapped.

Parallel parking on the north side of Sloat Boulevard is reserved for local business patrons. A National Park Service parking lot of approximately 100 spaces at the foot of Sloat Boulevard on the west side of The Great Highway serves as recreational parking for visitors going to the beach and using the pedestrian

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[15] Marla Jurosek, Deputy Director for Operations, San Francisco Zoo. April 2, 1997 attendance records.

TABLE 6
EXISTING INTERSECTION LEVELS OF SERVICE
ZOO PM PEAK EXIT HOUR 3:00 PM TO 4:00 PM

Intersection	LOS	Delay (seconds/vehicle)
Great Highway/Sloat Boulevard (S)	C	22.8
Sloat Boulevard/Skyline Boulevard (US)		
NB Skyline - LT	D	14.5
SB 39th - RT	D	3.8
EB Sloat - T	C	14.5
WB Sloat - LT	B	5.0
Skyline Boulevard/Great Highway (US)		
NB Skyline - LT	D	21.1
SB Skyline - T	D	15.2
EB Great Highway - LT	D	3.5

Notes: S = Signalized intersection, US = Unsignalized intersection, NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound, LT = Left Turn, RT = Right Turn, T = Through.

Source: The Duffey Company. Traffic counts conducted on Wednesday, April 2, 1997 a peak day with attendance of 19,600 visitors to the Zoo.

TABLE 7
SAN FRANCISCO ZOO PARKING SUPPLY

Area	Type of Parking	Supply[1]
Visitor Parking Supply		
Sloat Boulevard - median	On-street diagonal	242 spaces
Sloat Boulevard - south side	On-street diagonal and parallel	200 spaces
Sloat and Skyline Boulevards intersection	Visitor parking lot	204 spaces
Herbst Road	On-street head-on and diagonal	225 spaces
Subtotal - Visitor Parking		871 spaces
Employee Parking Supply		
Herbst Road - Service Entrance	Employee parking lot	100 spaces
Fleishhacker Pool site	Employee parking lot	200 spaces
Subtotal - Employee Parking		300 spaces
TOTAL		1,171 spaces

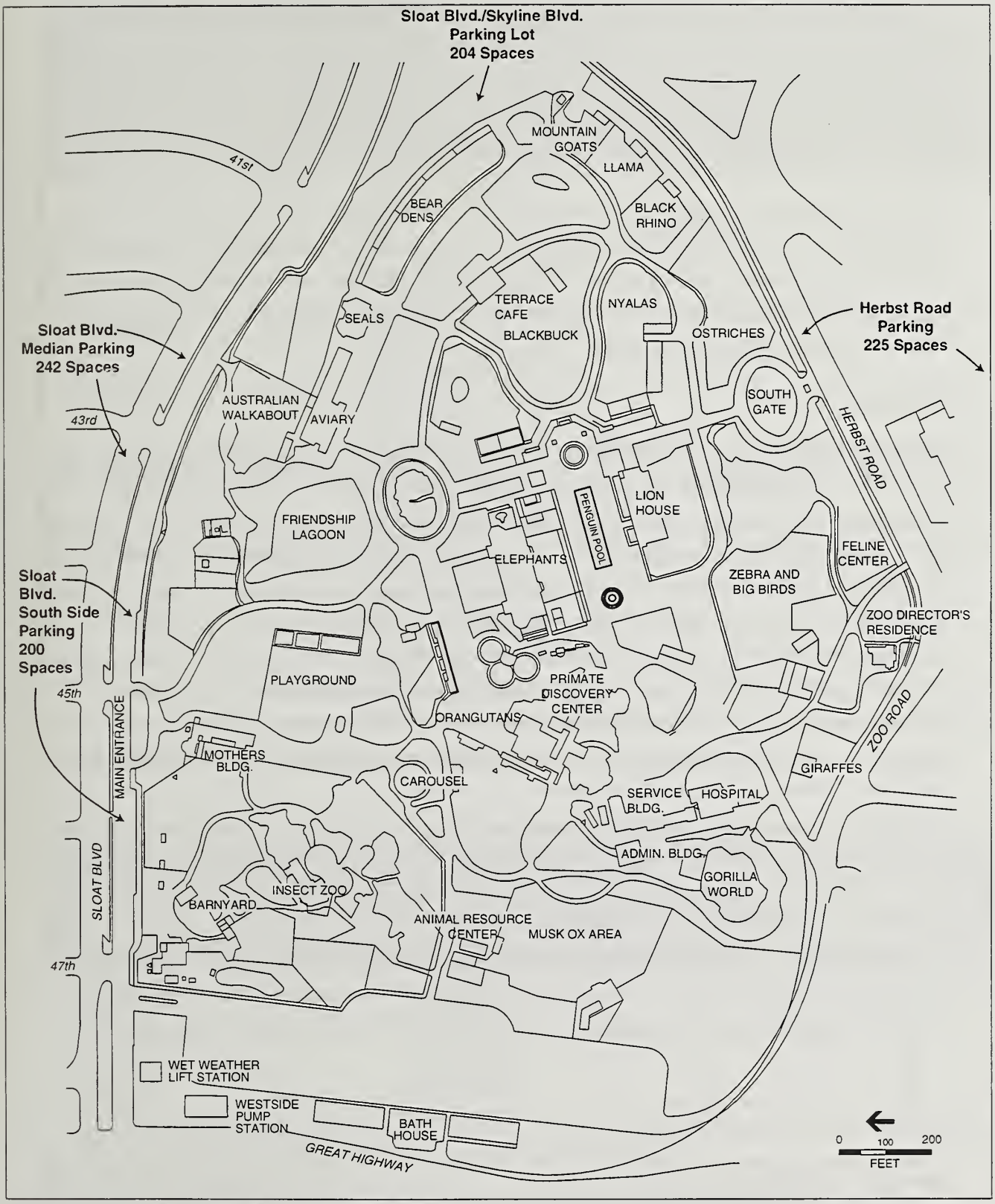
[1] The 200 space employee parking lot located at the Fleishhacker Pool site will be used by employees and construction workers until they are subsumed into the redesigned visitor parking facility.

Source : Parking survey conducted by The Duffey Company in 1996.

walkway and bicycle path along the highway. Neither of these parking areas are assumed to be available for Zoo visitor use.

On average attendance days at the Zoo, there is adequate parking to accommodate Zoo visitors. On peak-use days, visitors tend to circle the blocks on Sloat Boulevard in search of convenient parking and may stop to wait for a parking space to become available. The parking access lane on westbound Sloat

Figure 17 Zoo Parking



Source: Kennedy/Jenks Consultants - AGS Inc. An Association

Boulevard is able to accommodate these stopped vehicles without disrupting traffic flow. The inadequate supply of parking on peak-use days also affects neighborhood businesses on the north side of Sloat Boulevard, as Zoo visitors compete for these spaces. On peak-use days, visitors may search for parking in the neighborhood to the north of Sloat Boulevard. Also on heavy use days, when the South Gate is open, parking located off of Herbst Road is used by visitors to the Zoo, creating conflicts between the users of the Recreation Center for the Handicapped and the Zoo.

Based on recent field observation[16], on peak-use days, all parking areas are fully occupied during mid-day. Parked cars, were observed to be overflowing from the South Gate parking lot and extending north along Skyline Boulevard (a posted No Parking zone). Zoo visitors were also observed to be parking in the neighborhood one to two blocks north of the Zoo, as parking lots reached capacity. This was primarily observed between 46th and 43rd Avenues.

Transit Service

Direct transit service to the Zoo is provided by the San Francisco Municipal Railway (Muni) via the #18-46th Avenue and #23-Monterey bus routes and by the L-Taraval street car. The L-Taraval street car route is designated as a Transit Oriented Primary Transit Street in the *San Francisco General Plan.*[17] The #18-46th Avenue bus route is the western-most north/south bus route in the city connecting Lake Merced, the Zoo (stopping at both the South Gate and main entrance gate), and running along 46th Avenue to Golden Gate Park and The Great Highway to the Palace of the Legion of Honor in the north. The western terminus of the #23-Monterey line is The Great Highway at the foot of Sloat Boulevard. It runs the length of Sloat Boulevard connecting with Hunters Point via Monterey Boulevard, Silver Avenue, Crescent Avenue, and Palou Avenue. Both of these lines provide transfer opportunities at 19th Avenue which serves as a major cross-town bus route. The L-Taraval has its western terminus one block north of Sloat Boulevard on Wawona Street between 46th and 47th Avenues. The primary transit routes in the vicinity of the Zoo are summarized on Table 8 and are depicted in Figure 18. Transit lines serving the Zoo currently operate well below capacity during the Zoo peak exit hours in the peak direction, as noted in Table 9.

Pedestrian and Bicycle Circulation and Facilities

The *San Francisco General Plan* designates Skyline Boulevard and The Great Highway as part of the Bay, Ridge, and Coast Trails. These streets constitute a part of a regional trail system that serves not only San Francisco residents, but also pedestrians from the entire region. Both Skyline Boulevard and The

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[16] Field observations of parking occupancy on April 2, 1997 by The Duffey Company. April 2 was a Wednesday free-day with an attendance of 19,540 visitors.

[17] Transportation Element of the San Francisco General Plan (June 1995), All surface rail streets are designated as Primary Transit Streets. Those that are Transit Oriented are intended to be given transit priority treatments with emphasis on moving transit.

TABLE 8
MUNI TRANSIT LINES PROVIDING SERVICE TO THE ZOO

Transit Line	Type of Service	Route	Weekday Service Frequency (min.)		Weekend Service Frequency (min.)	
			Peak	Mid-Day	Peak	Mid-Day
17-Parkmerced	Community	19th Ave., Eucalyptus Dr., Junipero Serra Blvd., Portola Dr.	20	20	20	20
18-46th Avenue	Cross-town	Winston Ave., Lake Merced Blvd., Skyline Blvd., Sloat Blvd., 46th Ave., Great Highway, Point Lobos Ave.	15	20	20	20
23-Monterey	Cross-town	Sloat Blvd., St. Francis Blvd., Monterey Blvd., Crescent Blvd., Silver Ave., Palou Ave.	15	20	20	20
28-19th Avenue	Cross-town	Junipero Serra Blvd., 19th Ave., Cross Over Drive, Park Presidio Bypass Dr., Park Presidio	11	12	12	12
28L-19th Avenue Limited	Cross-town	Junipero Serra Blvd., 19th Ave., Cross Over Drive, Park Presidio Bypass Dr., Park Presidio	Weekday school hours only			
29-Sunset	Cross-town	3Com Park, Gilman Ave., Paul Ave., Mansell St., Ocean Ave., Garfield St., 19th Ave., Winston Dr., Lake Merced Blvd., Sunset Blvd., Lincoln Way, Crossover Dr., 25th Ave., Lincoln Blvd.	15	15	15	15
L-Taraval	Muni Metro	Taraval St., Muni Metro tunnel	6	10	10-12	10-12

Source: San Francisco Municipal Railway Street and Transit Map, 1996.

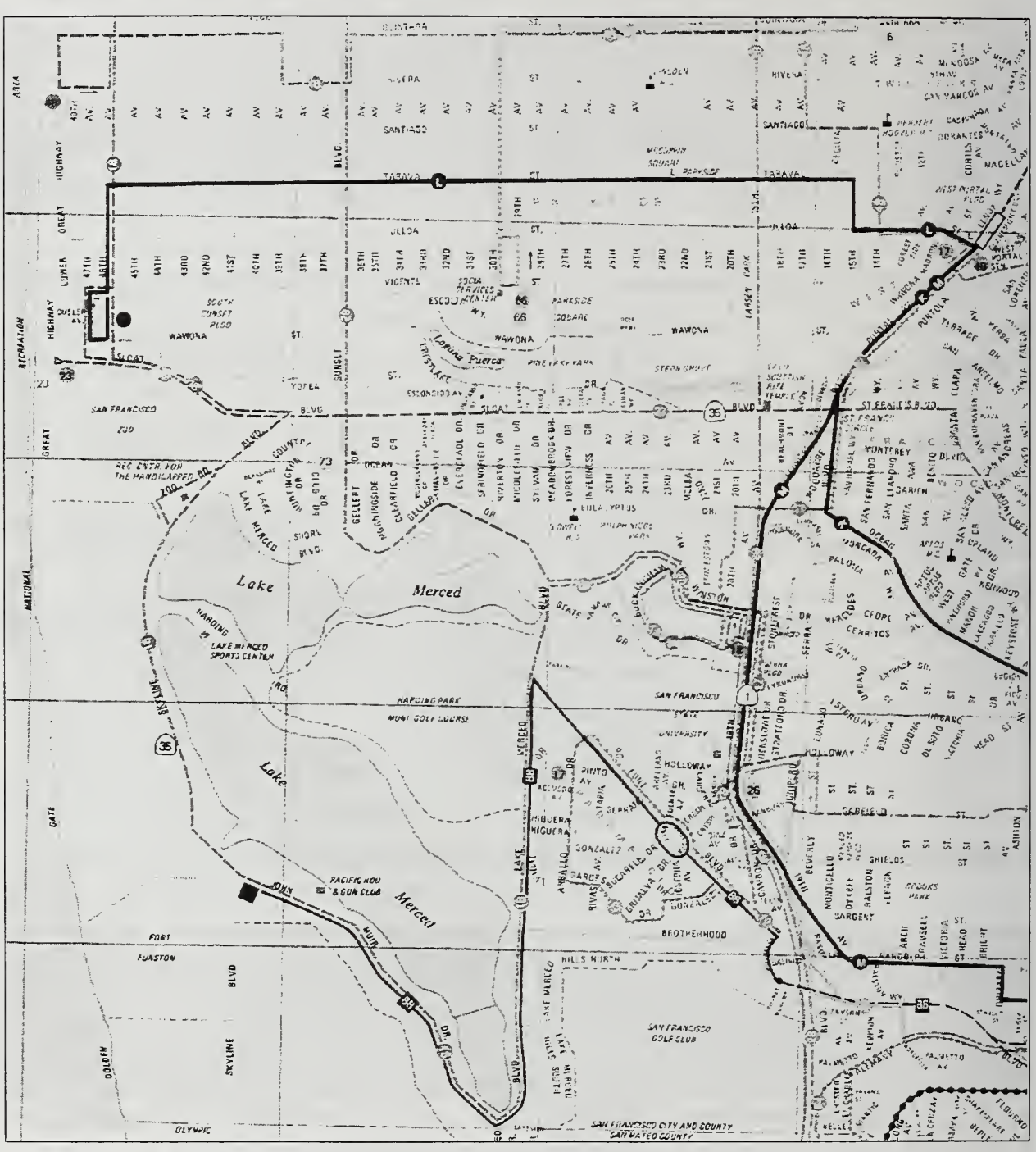
TABLE 9
MUNI MAXIMUM LOAD POINTS BY LINE
AFTERNOON PEAK PERIOD (2:00 PM TO 4:00 PM)
PEAK DIRECTION

Muni Line	Maximum Load Point	Peak Load	Load Factor[1]
17-Parkmerced	Eucalyptus/19th Ave.	23	.37
18-46th Avenue	46th/Quintara	29	.46
23-Monterey	Monterey/San Jose	37	.59
28-19th Avenue	19th/Quintara	43	.46
28L-19th Avenue Limited	19th/Quintara	32	.37
29-Sunset	Sunset/Noriega	50	.79
L-Taraval	Van Ness/Market	57	.48

[1] The following capacity assumptions were used to calculate load factor (ratio of passengers to passenger capacity): 63 passengers for a 40' coach (17,18,23,29), 94 passengers for a 60" coach (28, 28L), and 119 for an LRV (L).

Source: San Francisco Muni Transit Line Profiles, 1989-1993

Figure 18 MUNI Transit Service Map



Source: MUNI Transit Route Map

Great Highway have pedestrian pathways that are separated from the roadway. The pathway along The Great Highway borders the Pacific Ocean and recreational parking lots in the section south of Sloat Boulevard. The Skyline Boulevard pathway borders Lake Merced.

Sloat Boulevard, east of 45th Avenue, is a Neighborhood Pedestrian Network Connection Street, as designated by the *San Francisco General Plan.*[18] It has sidewalks on both sides of the street, six feet on the north side and nine feet on the south side.

Sloat Boulevard, The Great Highway south of Sloat, and Skyline Boulevard from Sloat to Lake Merced are designated as Citywide Bicycle Routes in the *San Francisco General Plan.* Skyline south of Lake Merced is designated as a Bicycle Path or for Special Treatment. The Great Highway has a separated bicycle/pedestrian path that runs parallel to the roadway. Skyline Boulevard has a bicycle lane striped on the roadway. Both of these facilities have high bicycle use levels.

IMPACTS

Master Plan Circulation Improvements

The *SF Zoo Master Plan* calls for the development of a new internal pedestrian circulation system and a new visitor entry to assist in organizing the visitor experience. See Figure 19 for a map of the proposed circulation system external to the Zoo and Figure 4, page 15, for the internal Zoo circulation system. A new main visitor entry off of The Great Highway connected to a central plaza and pedestrian spine into the Zoo would serve as the backbone of the system. A public parking area accommodating visitor shuttle buses, school buses, tour buses, disabled van and auto parking and automobiles (for a total of about 865 spaces) would anchor the west end of the spine and allow pedestrians to more easily access the main entry plaza.

The primary access for the Zoo would be from The Great Highway with dedicated entry and exit lanes. Visitors would be encouraged, by signage along Sloat and Sunset Boulevards, to enter the Zoo from northbound Great Highway. A 1,100-foot, two-lane drive would serve as the Zoo entry road. A 1,000-foot one-lane exit and acceleration drive would be provided for traffic to merge into the northbound Great Highway traffic from the primary parking area. Access to the new parking area would also be allowed via eastbound Sloat Boulevard (right turn only) for visitors arriving from The Great Highway, north of Sloat Boulevard. Left turns from Sloat Boulevard directly into the proposed parking lot would be prohibited. The new visitor plaza and parking area would accommodate 482 cars to the north of the main entrance drive and 383 spaces to the south of the drive.

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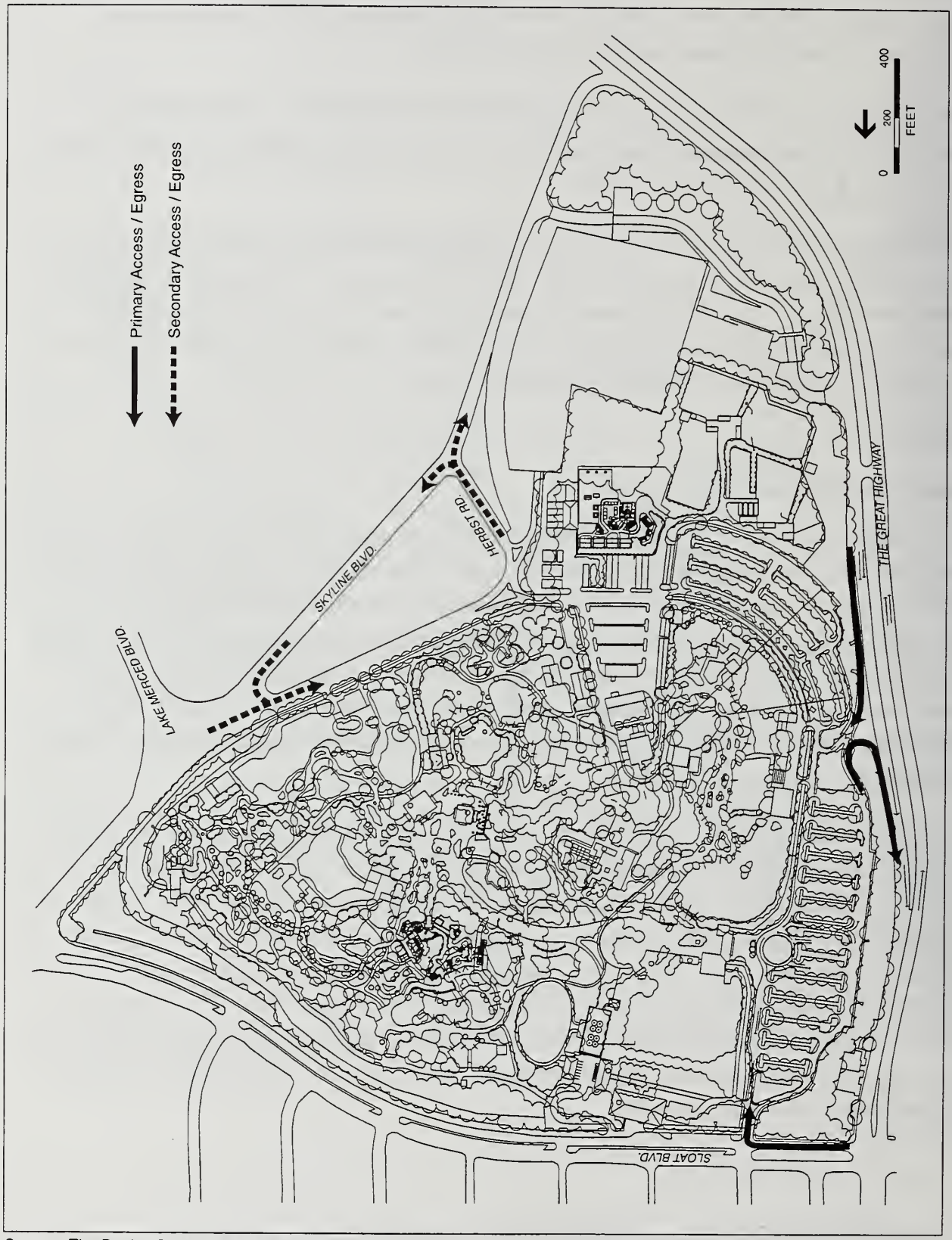
[18] *San Francisco General Plan, Transportation Element* June 1995. A neighborhood network connection street functions within a neighborhood and connects neighborhood destinations.

Figure 19 Zoo Master Plan Proposed External Circulation



Source: The Portico Group, December 1996

Existing parking along Sloat Boulevard and in the parking lot at the Sloat and Skyline Boulevards intersection would serve as secondary parking areas. A school bus loading zone is proposed near the Education Building, off of Sloat Boulevard. The existing pedestrian gate at 45th Avenue and Sloat Boulevard would be retained for special group use (e.g. school groups). Landscape and public safety improvements would be made to the on-street parking to better serve the residential community and commercial institutions, as well as Zoo overflow parking. Parking would be available along Herbst Road for peak-use days and special events. Primary service access and employee parking would continue to be located off of Zoo Road which is accessed from Herbst Road. Secondary service access would be provided from the South Gate or from Sloat Boulevard and The Great Highway.

Public transit access to the Zoo would be maintained from the existing Muni turn-around at the foot of Sloat Boulevard and The Great Highway. Pedestrians would be able to access the new main entrance gate from Sloat Boulevard at 47th Avenue, near the L-Taraval terminus. Additional bus stops would continue to be located along Sloat Boulevard and Herbst Road. The terminus of the L-Taraval would remain a transit access point. Internal to the park, a Zoo tram route would minimize conflicts with visitor pathways and provide a separate and unique experience.

Travel Demand

For analysis purposes, the typical number of visitors to the Zoo on an average day in 1997 was 4,000 and on the maximum peak visitor days, attendance reached approximately 20,000.[19] With the projected improvements proposed by the *SF Zoo Master Plan* in the next 20 years, the typical number of visitors per day to the park could increase to 7,000 to 10,000 and the maximum peak visitors day would range from the existing 20,000 visitors to a high of 30,000 visitors. The special event or free days that generate very high attendance at the Zoo, are expected to occur less than ten times in a given year. Table 10 summarizes the existing trips generated at the Zoo and the increases expected in association with the proposed improvements of the *Zoo Master Plan*.

Most of the visitors to the Zoo arrive by automobile. Visitor surveys conducted for the Zoo in 1987 and 1988 indicated that, on average, 91 percent of Zoo visitors arrived by auto, 5 percent arrived by transit, and 4 percent arrived by other modes (walking, bicycle, etc.).[20] The highest transit mode share of that period was achieved June, 1988 when 8 percent of visitors arrived by transit, 5 percent by other modes,

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[19] *San Francisco Zoological Gardens Master Plan Summary Report*, The Portico Group, June 1994. The San Francisco Zoological Society reported attendance of 19,540 visitors on a free day in April, 1997 and this was assumed in this EIR to be a representative maximum peak attendance. Attendance of 27,000 visitors was reported on a free day in July, 1997, but such high attendance levels are not assumed to represent a typical peak condition.

[20] Morey and Associates Visitor Surveys for the San Francisco Zoo, August 1987-August 1988.

TABLE 10
SAN FRANCISCO ZOO MASTER PLAN TRIP GENERATION

	Existing Conditions	Master Plan[1]
Typical Day Attendance	4,000	10,000[2]
Percentage of Visitors Arriving by Car	91%	91%
Average Vehicle Occupancy	3.7	3.7
Vehicle Trips Generated	980	2,460
Percent of Visitors Arriving by Transit	5%	5%
Transit Trips Generated	200	500
Percent of Visitors Arriving by Other Modes	4%	4%
Other Modes Trips Generated	160	400
Maximum Peak Day Attendance	20,000	30,000[2]
Percentage of Visitors Arriving by Car	91%	91%
Average Vehicle Occupancy	3.7	3.7
Vehicle Trips Generated	4,920	7,380
Percent of Visitors Arriving by Transit	5%	5%
Transit Trips Generated	1,000	1,500
Percent of Visitors Arriving by Other Modes	4%	4%
Other Modes - Trips Generated	800	1,200

1 The initial phase improvements are expected to be completed by 2006. The long term improvements were assumed to occur over a longer period of time, but were assumed to be in place by 2010 for the purposes of transportation analysis.

2 For transportation analysis purposes, the maximum attendance conditions were assumed.

Source: The Duffey Company from information contained in the *San Francisco Zoological Gardens Master Plan Summary Report*, The Portico Group, June 1994, *SF Zoo Master Plan Traffic Evaluation Draft Report*, Operations Research Consulting Associates, April 27, 1994, and the *San Francisco Zoo 2000 Environmental Evaluation Application Attachment Y*, 1988.

and 87 percent used private autos. The 1994 traffic evaluation performed for the *SF Zoo Master Plan* identified the average auto occupancy at 3.7 persons per vehicle.[21] During 1988 (a peak attendance period covering the later half of the 1980's) the auto occupancy averaged 4.3 persons per vehicle and peaked in June of 1988 at 4.8 persons per vehicle. The most conservative assumptions were used in assessing the potential impacts for the future condition, however, transit use could increase if the Zoo embarks on a more aggressive transit marketing program in the future.

A visitor survey conducted in August 1996, identified the trip origin of visitors to the Zoo. These assumptions were used to estimate trip distribution for Zoo trips. Visitors to the Zoo were assumed to arrive/depart as follows: 22% - San Francisco; 27% - South Bay, Peninsula, and Monterey County; 19% -

21 *SF Zoo Master Plan Traffic Evaluation Draft Report*, Operations Research Consulting Associates, April 27, 1994.

East Bay and Solano, Sacramento, and San Joaquin Counties; 9% - North Bay; and 23% from outside the Bay Area or Northern California.[22]

To determine the impact on the street network associated with the circulation changes and the anticipated increases in visitors to the Zoo, the peak hour of trip generation for the Zoo is evaluated against the peak hour of the access and egress streets serving the Zoo for the Year 2010. For the purposes of transportation analysis, all proposed transportation improvements were proposed to be in place by the Year 2010. An annual growth rate of one percent was assumed for background traffic on streets serving the Zoo. Both maximum typical day attendance conditions (10,000 visitors) and peak day attendance conditions were analyzed (30,000 visitors).

The Zoo is open to the public every day of the year from 10:00 AM to 5:00 PM. The peak hour of entry (generally occurring between 11:00 AM and 1:00 PM) and exit (3:00 to 4:00 PM) from the Zoo was determined based on the SF Zoo Master Plan visitor projections and the 1994 *SF Zoo Master Plan* Traffic Evaluation Draft Report.[23] It was assumed that the number of persons entering the Zoo during the peak hour of entry, represented 20 percent of the daily visitors. The ratio of visitors entering to exiting during the peak entry hour was 2.5 to 1. It was assumed that 20 percent of the daily visitors exited during the peak exit hour and the ratio between people entering to people exiting was 1 to 2. Table 11 summarizes the entering and exiting for the peak hour during a typical and a maximum peak-use day.

Traffic circulation patterns would change under the proposed *SF Zoo Master Plan*. Patrons now parking along Sloat Boulevard, would shift to The Great Highway to use the off-street parking area and would revert back to Sloat Boulevard only on moderate to heavy-use days when the new parking lot reached its capacity.

Intersections

Intersection analysis was conducted using the 1994 Highway Capacity Manual for signalized and unsignalized intersections. The calculated levels of service for the key intersections affected by Zoo traffic are summarized on Table 12.

On a typical attendance day in 2010 (10,000 visitors or less), intersections in the vicinity of the Zoo would operate at acceptable levels of service during the Zoo PM peak hour of operation. All intersections or approaches would operate at LOS C or better, with the exception of the northbound traffic on Skyline

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[22] Patricia Evans, Director of Marketing, San Francisco Zoo, phone conversations on March 20 and April 11, 1997. For analysis purposes, the San Francisco trips and those trips originating outside the Bay Area and Northern California were grouped for distribution purposes.

[23] *SF Zoo Master Plan Traffic Evaluation Draft Report*, Operations Research Consulting Associates, April 27, 1994.

TABLE 11
ZOO PEAK HOUR TRIP GENERATION - ENTRY AND EXIT[1]

	Existing		Master Plan	
	Enter	Exit	Enter	Exit
Zoo Trips - Peak Hour Entry				
(12:00 Noon to 1:00 PM)				
Typical Day	200	80	490	200
Maximum Peak Use Day	980	390	1,480	590
Zoo Trips - Peak Hour Exit (3:00 to 4:00 PM)				
Typical Day	490	200	245	490
Maximum Peak Use Day	490	980	740	1,480

Note: Attendance assumptions as represented in Table 9: Typical Day Existing Attendance - 4,000; Maximum Peak Day Existing Attendance - 20,000; Typical Day Attendance Future - 10,000; and Maximum Peak Day Attendance Future - 30,000.

[1] The peak hour of trip generation for the Zoo is 3:00 pm - 4:00 pm.

Source: Prepared by The Duffey Company from data obtained in the *SF Zoo Master Plan* Traffic Evaluation Draft Report, Operations Research Consulting Associates, April 27, 1994

TABLE 12
INTERSECTION LEVELS OF SERVICE
EXISTING/YEAR 2010 CONDITIONS
ZOO PM PEAK EXIT HOUR, 3:00 PM TO 4:00 PM

	EXISTING PEAK DAY		2010 TYPICAL DAY		2010 PEAK DAY	
Intersection	**LOS**	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**
Great Highway/ Sloat Boulevard (S)	C	22.8	C	21.6	F	71.2
Sloat Boulevard/ Skyline Boulevard (US)						
NB Skyline - LT	C	14.5	B	6.6	C	12.8
SB 39th - RT	A	3.8	A	3.8	A	3.9
EB Sloat - T	C	10.5	B	5.4	C	13.4
WB Sloat - LT	B	5.4	A	3.8	B	5.0
Skyline Boulevard/ Great Highway (US)						
NB Skyline - LT	D	21.1	D	25.6	F	>45.0
SB Skyline - T	C	15.2	B	5.5	C	12.8
EB Great Highway - LT	A	3.5	A	3.5	A	3.8

Notes: Delay = seconds per vehicle; S = Signalized intersection, US = Unsignalized intersection, NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound, LT = Left Turn, RT = Right Turn, T = Through.

Source: The Duffey Company.

Boulevard turning left on to The Great Highway. This leg of the intersection would operate at LOS D, as it currently does during peak-use days.

In 2010 during the Zoo PM peak hour of exit, on a peak attendance day of 30,000 visitors, the Sloat Boulevard and Skyline Boulevard intersection approaches would generally operate at LOS C or better, an acceptable level of service. The exception would be the northbound, left-turn movement from Skyline Boulevard to The Great Highway. This approach would degrade to LOS F with a large increase in left-turning vehicles that would be using The Great Highway as the primary access road to the new main entrance. The intersection at The Great Highway and Sloat Boulevard would also degrade to a LOS F as increasing volumes of traffic exiting the Zoo attempt to make a right turn on to Sloat Boulevard from northbound on The Great Highway. The large volumes of cars trying to make this movement would be subject to delays. This impact would be expected to occur less than 10 times a year on peak-use days and would be less-than-significant with the improvement measures proposed as part of the project.

Parking

A total of approximately 1,740 parking spaces are proposed to serve visitors to the Zoo. (See Figure 20) The new main entrance area off of The Great Highway would ultimately accommodate 865 visitor parking spaces, coupled with the existing 871 visitor parking spaces. An additional 120 spaces would be available for employees of the Zoo. This is a net increase of approximately 685 parking spaces over the existing inventory, as existing employee parking spaces at the Fleishhacker Pool site would be replaced with visitor parking. The new parking spaces are intended to expand the amount of parking to accommodate the increasing number of visitors and to minimize the occasions when Zoo parking overlaps with the parking needs of neighborhood businesses on Sloat Boulevard and residents in the area.

The number of parking spaces required to serve the projected visitors is a function of the number of daily visitors, the percent of visitors arriving by auto, the number of persons per vehicle, and the duration of the stay of visitors. For the purposes of this analysis, It was assumed that 91% of the visitors would be arriving by auto and that the average vehicle occupancy would be 3.7 based on past surveys conducted at the Zoo. Based on industry standards, it was assumed that a maximum of 45% of the daily visitors would be parked at the Zoo at the peak of parking occupancy.[24]

Based on these assumptions, the future parking demand was estimated for different attendance day scenarios. See Table 13 for a summary of projected parking demand. The number of parking spaces proposed can be expected to meet the needs of the visitors, assuming existing mode share and vehicle

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[24] San Francisco Zoo 2000 Environmental Evaluation Application Attachment Y, 1995.

Figure 20 Zoo Master Plan Proposed Parking

Source: The Portico Group, December 1996

TABLE 13
MASTER PLAN PARKING DEMAND

	Number of Parking Spaces		
Daily Attendance	**Peak Parking Demand**	**Parking Available**	**Parking Surplus/Deficit**
7,800	865	1,750	+885
10,000	1,110	1,750	+640
10,800	1,525	1,750	+225
10,000	1,660	1,750	+110
15,800	1,750	1,750	--
20,000	2,210	1,750	-460
25,000	2,770	1,750	-1,020
30,000	3,320	1,750	-1,570

Source: The Duffey Company

occupancy characteristics up to a maximum peak attendance day of 15,800 visitors. The new main entrance parking area would fill at an estimated attendance level of 7,800 visitors and visitors would shift to the Sloat Boulevard parking areas. At attendance levels exceeding 13,800, parking in the Herbst Road area would be required to serve public need. If the peak visitor attendance levels projected are realized, it could be expected that on approximately 60 to 90 days per year, the demand for parking spaces would exceed the supply affecting parking in the adjacent neighborhood.

While parking demand that exceeds the available supply would not be considered a significant impact because of the City's transit-first policy, there could be potential traffic impacts in the vicinity of the Zoo as patrons searched for parking on these peak use days. Strict parking control management practices will need to be put in place and effective transportation demand management measures will need to be implemented to increase transit usage and vehicle occupancy if the maximum peak-use days are expected to be accommodated.

Transit

The typical attendance day in the future will generate about 100 transit trips exiting the Zoo during the PM peak exit hour (3:00 - 4:00 PM). On maximum peak attendance days, 300 transit trips would be exiting the Zoo during the PM peak exit hour (assuming 5% of Zoo visitors take transit).

The #18-46th Avenue and the #23-Monterey Muni bus lines provide service to the Zoo every 20 minutes during the mid-day on weekdays and on weekends. Between 4:00 and 6:00 PM, the frequency of service increases to every 15 minutes. The L-Taraval provides service every 10-12 minutes during mid-day on weekdays and on weekends. Service increases to every 6 minutes between 4:00 and 6:00 PM.

The capacity, for the Zoo peak hour of exit, of these lines immediately serving the Zoo is 1090 passengers and the peak hour reserve capacity, for the Zoo peak hour of exit, of the line (based on maximum loads) is estimated at 570 passengers. The #23-Monterey and the L-Taraval lines have relatively few passengers as they leave the Zoo. As they approach the peak segment of the line, however, available capacity diminishes. At the same time, the passenger demand diminishes on the three key lines as transit riders transfer to other bus lines, e.g. to the 28-19th Avenue line. Based on existing modal split assumptions, it is estimated that the additional trips projected to be generated on a typical day (100 transit riders) and peak attendance day (300 transit riders) can be accommodated on the existing Muni lines.[25] The shortfall of parking experienced on maximum peak use days may result in additional shifts to transit. If this occurs, demand for transit may exceed the available capacity. These potential impacts to the transit system are expected to occur less than 10 times per year.

Pedestrian and Bicycle Facilities

The typical attendance day in the future will generate about 80 trips by other modes of transportation entering or exiting the Zoo during the peak hour. On maximum peak attendance days, 240 trips by other modes would be entering or exiting the Zoo during the peak hour. A large share of these trips are assumed to be pedestrian and bicycle trips, although specific counts by mode are not available.

Pedestrian access to the Zoo will be improved with the proposed Master Plan projects as a more focused pedestrian access will be provided directly from a protected parking area. Pedestrian movement within the Zoo will benefit from the creation of a new central spine for pedestrian circulation and orientation. Sloat Boulevard will continue to be used for Zoo parking on the peak attendance days, which are limited in number. Access to the new entrance gate will be provided at 47th Avenue.

The bicycle access to the Zoo is good under current conditions as bicycle pathways are provided on The Great Highway and Skyline Boulevard. The width of Sloat Boulevard, although it does not have dedicated bicycle lanes, can also accommodate bicyclists. Bicycle capacity and facilities are assumed to be adequate to accommodate the Master Plan proposed improvements. Bicycle parking in a secured area is proposed at the new visitor entry plaza and parking area.

Construction Impacts

The movement of construction vehicles and equipment in and out of the Zoo during the initial 5-10 years of development along the west end of the Zoo could affect the surrounding roadway system. Most of the

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[25] Using existing load factors and service frequencies calculated for Muni lines directly serving the Zoo (Tables 7 and 8), a minimum reserve capacity of 570 passengers for the Zoo peak hour of exit in the peak direction exists on the 18, 23, and L lines. The reserve capacity during the PM peak hour of the MUNI system (between 4:00 pm to 6:00 pm) in the peak direction is substantially less.

construction will occur internal to the Zoo and will occur on weekdays. Construction vehicles could continue to occupy parking spaces in the improved area at the west end of the Zoo.

No significant transportation impacts would occur with the implementation of the *SF Zoo Master Plan*. The following improvement measures are recommended to minimize the potential impacts on the limited number of peak use days.

- Adjust the signal timing at The Great Highway/Sloat Boulevard intersection to permit right turns from northbound on The Great Highway to Sloat Boulevard during the same phase that the westbound Sloat Boulevard traffic movements occur. This would improve the intersection service to LOS D by providing more capacity for the increased right turn volumes on northbound The Great Highway.

- Use traffic control officers at the Skyline Boulevard/Great Highway intersection to facilitate traffic flow on the days when the highest peak use attendance is anticipated, e.g. free days.

- Monitor the intersection of the Great Highway and Skyline Boulevard to ensure that the overall operation of the intersection continues at an acceptable level of service. If additional approaches begin to degrade, installation of a traffic signal may be warranted.

- Implement the comprehensive transportation demand management strategy adopted by the Zoo that identifies measures to increase transit, pedestrian, and bicycle use as a means of getting to the Zoo. Measures to be included are: a visitor discount program for Muni patrons, offer free Muni or BART passes to employees, provide bicycle racks, and designate a Zoo transportation manager. Additional measures to be evaluated include: visitor bus shuttle services during peak periods (summer months); increased marketing of alternatives to the auto; parking fees; increased transit service levels on peak use days; and widening pedestrian walkways along Sloat Boulevard.

- Install secure bicycle racks ("U" type racks are recommended) in the new main entrance area to meet city code and in adequate numbers to support an aggressive transportation demand management program.

- Appropriate signs should be installed along Sloat Boulevard, The Great Highway, and Skyline Boulevard to direct traffic to the new Zoo main entrance. An electronic "FULL" sign visible from The Great Highway and a sign on Sloat Boulevard at Skyline Boulevard are recommended.

- Provide an approximately 1,100-foot long entry drive to the Zoo from The Great Highway. The design includes a deceleration ramp with a 400- foot taper feeding into two 650- foot vehicle storage lanes before entering the parking area. This will accommodate 60 vehicles and will minimize the potential for traffic queuing back out onto The Great Highway.

- Provide an exclusive right turn lane on Sloat Boulevard west of the new Zoo parking entrance to provide adequate queuing for traffic entering the Zoo parking lot from Sloat Boulevard. Prohibit left turn movements from westbound Sloat Boulevard into the parking lot.

- Manage the parking lot with parking crews on peak use days to ensure that cars waiting to enter the lot do not back-up on to The Great Highway. As the main parking lots fill, close-off full areas and reroute traffic to parking on Sloat Boulevard and to Herbst Road, as necessary. Appropriate signing should be installed in advance of parking entrances to alert drivers that parking lots are full.

- Design traffic flow out of the main parking area to minimize delays and conflicts. The acceleration ramp from the Zoo exit road to The Great Highway would be 700-feet plus a minimum taper of 300-feet to allow traffic to safely merge on to The Great Highway. Ensure adequate provision is made for southbound traffic exiting the parking facility by the addition of additional northbound right turn capacity at The Great Highway and Sloat Boulevard intersection.

MITIGATION MEASURES

No significant transportation impacts are expected from implementation of the project and no mitigation measures would be required.

E. AIR QUALITY AND CLIMATE

SETTING

Meteorology

The Bay Area's climate, as with all of California coastal environs, is dominated by the strength and position of the semi-permanent high pressure center over the Pacific Ocean and Hawaii. It creates cool summers, mild winters, and infrequent rainfall; it drives the cool daytime sea breeze and maintains comfortable humidities and ample sunshine. Temperatures in the San Francisco area average 58 degrees Fahrenheit annually, ranging from the mid-40s on winter mornings to the mid-70s in late summer afternoons. The strong onshore flow of wind in summer keeps cool air and frequent cloudiness over the Bay Area until September when the offshore Pacific high pressure center weakens and migrates southward. Warmest temperatures generally occur in September and October. Temperature extremes, reaching 90 degrees or dropping to freezing, are rare in San Francisco. Rainfall in San Francisco averages 18 inches per year and is confined primarily to the "wet" season from late October to early May. Except for occasional light drizzles from thick marine stratus clouds, summers are almost completely dry.

Winds in the San Francisco area display several characteristic regimes. During the day, especially in summer, winds are from the southwest/west at 10 to 14 miles per hour as air is funneled through the Golden Gate. At night, especially in winter, the land becomes cooler than the water and an offshore flow off the hills develops over portions of the area. In San Francisco, however, the marine intrusion is so strong that the onshore flow persists both day and night during the warmer months. On the west side of San Francisco in both winter and summer, the background pollution upwind of the project area is generally sufficiently low such that the project area experiences excellent air quality and rarely exceeds clean air standards.

Ambient Air Quality Standards

The Clean Air Act Amendments of 1970 established national ambient air quality standards, and individual states retained the option to adopt more stringent standards and to include other pollutants. California had already established its own air quality standards when Federal standards were established, and because of the unique meteorological problems in the state, there is considerable diversity between State and Federal standards currently in effect in California, as shown in Table 14. The ambient air quality standards are intended to protect the public health and welfare.

TABLE 14
CALIFORNIA AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	SAAQS[1,3]	NAAQS[2,3]
Ozone	1 hour	0.09 ppm	0.12 ppm
Carbon Monoxide	1 hour 8 hour	20 ppm 9.0 ppm	35 ppm 9 ppm
Nitrogen Dioxide	1 hour Annual Average	0.25 ppm n/a	n/a 0.053 ppm
Sulfur Dioxide	1 hour 24 hour Annual	0.25 ppm 0.04 ppm n/a	n/a 0.14 ppm 0.03 ppm
Suspended Particulate Matter (PM_{10})	24 hour Annual Arithmet. Mean Annual Geomet. Mean	50 ug/m^3 n/a 30 ug/m^3	150 ug/m^3 50 ug/m^3 n/a
Sulfates	24 hour	25 ug/m^3	n/a
Lead	30 day Calendar Quarter	1.5 ug/m^3 n/a	n/a 1.5 ug/m^3
Hydrogen Sulfide	1 hour	0.03 ppm	n/a
Vinyl Chloride	24 hour	0.010 ppm	n/a

[1] SAAQS stands for State Ambient Air Quality Standards (California). SAAQS for ozone, carbon monoxide, sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, and suspended particulate matter are values that are not to be exceeded. All other California standards shown are values not be to equaled or exceeded.
[2] NAAQS stands for National Ambient Air Quality Standards. NAAQS, other than ozone and those based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one.
[3] ppm = part per million by volume; ug/m3 = micrograms per cubic meter; n/a = not applicable

SOURCE: BAAQMD CEQA Guidelines, Assessing Air Quality Impacts of Projects and Plans, Bay Area Air Quality Management District, April 1996.

Ambient Air Quality

The 1977 Clean Air Act required that regional planning and air pollution control agencies prepare a regional Air Quality Plan to outline the measures by which both stationary and mobile sources of pollutants can be controlled in order to achieve all standards within the deadlines specified in the Clean Air Act. For the Bay Area region, the Association of Bay Area Governments (ABAG), the Metropolitan Transportation Commission (MTC), and the BAAQMD jointly prepared a *Bay Area Air Quality Plan* of 1982, which predicted attainment of all national clean air standards within the basin by 1987.

The Bay Area Air Quality Management District (BAAQMD) operates a regional monitoring network which measures the ambient concentrations of six criteria air pollutants: ozone (0_3), carbon monoxide (CO), fine particulate matter (PM_{10}), lead (Pb), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). The San Francisco air basin was redesignated in June 1995 as an "attainment" area for the national ozone standards. Air quality attainment means that the standards are met as required by National Ambient Air Quality Standards and the California Clean Air Act (AB-2595). State ozone standards are exceeded in portions of the Bay Area Air Basin, especially the Santa Clara and Livermore valleys. The Bay Area is now an attainment area for the state CO standard and has submitted a redesignation request for the national CO standard. With regard to PM_{10} , the state standard has been exceeded fairly frequently in recent years. The national standard was exceeded in 1990 and 1991, but has not been exceeded since then. Lead, nitrogen dioxide and sulfur dioxide state and national standards have not been exceeded in recent decades.

Existing and probable future levels of air quality in the City can be generally inferred from ambient air quality measurements conducted by the BAAQMD at its two San Francisco monitoring stations. The Potrero Hill station at 10 Arkansas Street measures all criteria pollutants, including regional pollution levels (O_3), as well as primary vehicular emission levels near busy roadways (CO). The station at 939 Ellis Street at BAAQMD headquarters measures only carbon monoxide. Table 15 summarizes five years of published data (1991 to 1995) from these monitoring stations. During this five-year period, there was no violation of the one-hour or the eight-hour CO standards at the Arkansas Street monitoring station. The State PM_{10} standard was violated six days in 1994, five out of 61 measurement days in 1993; during 1992, the PM_{10} standard was violated nine days out of 61 measurement days. In 1995, there was no violation of PM_{10}. O_3, NO_2, and particulate sulfate measurements were within allowable maximum concentrations during the survey period.

Comparison of these data with those from other BAAQMD monitoring stations indicates that San Francisco's air quality is among the least degraded of all developed portions of the Bay Area. Three of San Francisco's four prevailing winds - west, northwest, and west-northwest - blow from the Pacific Ocean, reducing the potential for San Francisco to receive air pollutants from elsewhere in the region.

The region has made significant progress in reducing CO levels in the Bay Area. CO is a non-reactive air pollutant, the major source of which is motor vehicles. CO concentrations are generally highest during periods of peak traffic congestion. The last violation of the eight-hour CO standard in the City was in 1989.

TABLE 15
SAN FRANCISCO AIR POLLUTANT SUMMARY, 1990-1994

		Monitoring Data by Year[1]				
Pollutant	**Std.[2]**	**1991**	**1992**	**1993**	**1994**	**1995**
Ozone						
Highest 1-hr. average, ppm[3]	0.09	0.05	0.08	0.08	0.06	0.09
Number of violations		0	0	0	0	0
Carbon Monoxide						
Highest 1-hr. average, ppm	20.0	9.0	7.0	7.0	n/a	n/a
Number of violations		0	0	0	n/a	n/a
Highest 8-hr. average, ppm	9.0	6.5	5.1	5.1	4.4	4.4
Number of violations		0	0	0	0	0
Nitrogen Dioxide						
Highest 1-hr. average, ppm	0.25	0.12	0.09	0.08	0.09	0.09
Number of violations		0	0	0	0	0
Sulfur Dioxide						
Highest 1-hr. average, ppm	0.09	0.04	0.04	0.04	n/a	n/a
Number of violations		0	0	0	n/a	n/a
Particulate Matter						
Highest 24-hr. average, ug/m³	50	109	81	69	65	58
Number of violations[4]		15	9	5	6	0
Annual geometric mean, ug/m³	30	29.7	27.6	25.1	24.7	n/a
Lead						
Highest monthly average, ug/m³	1.5	0.09	0.02	0.02	n/a	n/a
Number of violations		0	0	0	n/a	n/a

[1] All data are from the monitoring station located at 10 Arkansas Street in San Francisco, approximately 6 miles east of the project site.
[2] State standard, not to be exceeded, except for Lead standard, which is not to be equaled or exceeded.
[3] ppm = parts per million; ug/m³ = micrograms per cubic meter.
[4] Samples typically taken every six days.
Note: Underlined values are in excess of applicable standards. N/A = not available.

SOURCE: California Air Resources Board, *Air Quality Data Summaries*, 1991-1995; Bay Area Air Quality Management District

The primary sources of particulates (PM_{10}) in San Francisco are construction and demolition activities, combustion of fuels for heating, and vehicle travel over paved roads.[26] Airborne dust levels measured in San Francisco show occasional violations of the California PM_{10} (inhalable- or respirable-sized particles) standards; however maximum PM_{10} levels have declined over the five-year period shown in Table 15. In general, particulate levels are relatively low near the coast, increase with distance from the coast, and peak in dry, sheltered valleys. The national standard was exceeded a few times in 1990 and 1991, but has not been exceeded since then. Federal guidelines allow for no more than one violation per year averaged over a three-year period in defining a "non-attainment" area.

[26] BAAQMD, *Air Quality Handbook*, 1991 Bay Area Average Emissions by Source Category, Appendix IV, 1993.

The automobile and other mobile sources are the dominant contributors to the regional pollution burden for NO_2 and CO. These sources also contribute a substantial fraction of reactive organic gases, the other important precursor to regional smog formation. On-road sources (of which existing travel to and from the San Francisco Zoo is a small fraction of all regional travel) generate 24 percent of reactive organic gases, 53 percent of NO_2, and 67 percent of all regional CO emissions.

Local Air Quality Monitoring and Animal Sensitivity

The Westside Pump Station is located immediately west of the Fleishhacker site, at the southeast corner of Sloat Boulevard and the Great Highway. In February 1992, a PM_{10} monitor was installed at the Westside Pump Station as part of the mitigation monitoring for the Lake Merced Transport construction project. Prior to that, PM_{10} was monitored at two sites to the east (downwind) of the Fleishhacker site as part of the mitigation monitoring program from the Oceanside Water Pollution Control Plant (OWPCP) construction project. Between 1989 and 1994, PM_{10} was monitored at Fort Funston (south of the project site) and was used as the upwind control monitor for both projects. Both monitoring programs focused on monitoring exposure of animals at the San Francisco Zoo to PM_{10}, because the animals are considered sensitive receptors. Monitoring data at the Westside Pump Station (upwind of the site) and Fort Funston (upwind control) indicate that average PM_{10} levels in the project vicinity during the Lake Merced Transport construction project (February 1992 to March 1993) were as listed in Table 16.

During this period, there were three violations at the Fort Funston monitor of the California Ambient Air Quality PM_{10} Standard of 50 ug/m^3 (over a 24-hour collection period) and 35 violations at the Westside monitor. While Fort Funston monitoring data indicate that PM_{10} levels are lower at Fort Funston than at the Westside Pump Station, there are three factors that should be considered: 1) the Westside monitor was located immediately downwind of the Great Highway and the beach, which are sources of PM_{10}; 2) Westside data reflect construction activities occurring upwind of the Westside site; and 3) the Fort Funston monitor was located in a very protected location, upwind of roadway sources and away from beaches.

IMPACTS

The project would increase emissions of air pollutants from increased operation of stationary sources and increased vehicular traffic to and from the project site. The primary stationary sources on the project site would be well pumps.

The traffic analysis does not identify substantial increases in localized traffic on roadways or at intersections analyzed (peak traffic conditions would occur on 10 or fewer days annually). Stationary source and traffic-related emissions from the proposed Zoo Master Plan would not change substantially

TABLE 16
PM_{10} MONITORING DATA FROM AREAS NEAR FLEISHHACKER SITE

Location	Average PM_{10} Concentrations in Micrograms Per Cubic Meter (ug/m^3)			
	Arithmetic Mean[1]	Geometric Mean[2]	Minimum Concentration[3]	Maximum Concentration[3]
Westside Pump Station[4]	41.6	36.6	15.4	78.4
Fort Funston[5]	19.3	16.7	7.9	38.9

[1] The arithmetic mean is the average of a field of values displaying linear distribution. It is defined by the summation of n number of values divided by n. The National Ambient Air Quality annual arithmetic mean PM_{10} standard is 50 ug/m^3.
[2] The geometric mean is statistical value that represents an "average" of number data points with non-linear distribution. The geometric mean is determined by the nth root of the product of n number of values. The California annual geometric mean PM_{10} standard is 30 ug/m^3.
[3] Results of the PM_{10} monitoring were used to assess the compliance of all site activities with the California Ambient Air Quality standard of 50 ug/m^3 PM_{10} over a 24-hour collection period.
[4] February 1992 to March 1993 monitoring data.
[5] 1989 to 1994 monitoring data.

SOURCE: Environmental Science Associates, *Oceanside WPCP Construction Project, Environmental Compliance Summary Report, January 1989 - December 1994*, November 1994.

from existing and future conditions without the project. As described above in the Setting section, the Zoo is located adjacent to the Pacific Ocean and is subjected to prevailing off-shore winds throughout most of the year. These winds must be buffered by a series of vegetative windbreaks and structural windscreens (berms and fences), to reduce ground-level wind speeds and provide a comfortable environment within the Zoo. The proposed windbreaks would be designed as a series of north-south tree rows, oriented perpendicularly to the prevailing wind flow. They would control wind by obstructing, filtering and deflecting it at the westernmost boundary, guiding upward and over the site. Specific design features of the proposed windbreaks, including species type, profile, height, width, spacing, and density, are discussed in detail in the *San Francisco Zoo Forest Management Plan*, December 1994, The Portico Group.[27]

Section 295 of the *Planning Code* prohibits the issuance of building permits for structures that would shade property under the jurisdiction of, or designated to be acquired by, the Recreation and Park Commission unless the Planning Commission, in consultation with the Recreation and Park Commission, determines that such shade would have an insignificant adverse impact on the use of such property. Section 295 applies only to structures which exceed a height of 40 feet; project facilities would not exceed 40 feet.

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[27] This report is on file and available for public review in Project File No. 95.469E:*SF Zoo Master Plan*, at the San Francisco Planning Department, 1660 Mission Street.

New structures would create shadows around the immediate perimeter but not in amounts or in areas that would have significant shadow effects.

Construction Impacts

Dust generated by construction and demolition activities would be intermittent and could contribute to ambient PM_{10} concentrations. This potential impact would be mitigated to a less-than-significant level by dust suppression Mitigation Measures identified below.

Dust emissions would be associated with a variety of construction activities, such as excavation, demolition, pipeline or utility trenching, or the transport or storage of sand and soils, or other materials in the project area. These activities could result in a localized dust nuisance, including the respirable fraction known as particulate matter in the form of dust (PM_{10}).

Dust emission from construction activities would vary from day to day depending on a number of factors such as wind conditions, soil moisture, and the depth of the excavation or screening buffer around the project site. The U.S. Environmental Protection Agency (EPA) has published emissions factors for materials removal and subsequent replacement (i.e., excavation and backfilling) which indicate an average total suspended particulate (TSP) emissions level of 0.07 pound of TSP per ton of soils material during excavation and handling.[28] These factors represent uncontrolled conditions which do not account for standard control procedures required by air quality regulatory agencies. The above TSP factor represents an average value, with values as high as 0.44 pounds per ton observed in some EPA dust emission programs.

The largest dust particles would be expected to settle out within the construction areas, but some quantities of dust would be carried beyond the construction site. The prevailing winds would generally carry dust emissions in a west-to-east direction in the Zoo, exposing receptors east of project sites to dust emissions. Dust particles are typically filtered efficiently by humans, although the smallest particles can enter deep lung tissue. These smallest particles have a low irritant response because they are chemically or biologically benign. There is a slightly increased health risk from breathing otherwise benign dust due to small amounts of active micro-organisms in soil, but the risk factor is low. Dust is, therefore, more of a nuisance as it settles out on parked cars, outdoor foliage and furniture, than it is a measurable health risk. Some Zoo animals are highly sensitive to dust emissions. Animal behavior would be monitored for sensitivity to dust particles and steps would be taken to protect the animals as outlined in the mitigation measures below. Through implementation of these mitigation measures, no significant impact would result.

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[28] U.S. Environmental Protection Agency,*AP-42, Compilation of Air Pollutant Emission Factors,* 1985.

Because of the normal high winds in the western part of the Zoo, and also frequent background levels of PM_{10} that are high, there would be a high potential for a violation of the California 24-hour PM_{10} standard (but not the federal standard), during construction. Use of a dust suppressant (a fine water spray mist trained on dirt piles during excavation, and onto haul trucks during loading and unloading) could reduce project-related PM_{10} emissions by 50 percent and reduce exceedances of the State standard.

The BAAQMD has identified a set of feasible PM_{10} control measures for construction sites that, if implemented, would result in less-than-significant impacts. Those measures appropriate to the Zoo are listed at the end of this section and are supplemented with dust suppression measures used during previous construction projects at the Zoo.[29]

Combustion emissions from construction equipment and vehicles, such as delivery trucks, haul trucks, backhoes, trenchers, air compressors, and generators, would be associated with the proposed *SF Zoo Master Plan* projects. Equipment exhaust contains both pulmonary irritants and hazardous compounds, which may affect sensitive receptors such as Zoo animals, young children, senior citizens, or those susceptible to respiratory disease.

Assuming that a backhoe is representative of the level of emissions associated with operation of various types of construction equipment anticipated to be used for the proposed construction activities, a unit value of emissions for a backhoe was scaled according to EPA emission factors for "Gasoline and Diesel Industrial Engines".[30] Table 17 shows that the estimated exhaust emissions at a distance of 60 feet from the backhoe would be adequate separation from a potential receptor to provide sufficient mixing to prevent violation of clean air standards. Larger equipment would have high exhaust stacks and higher exit velocities which would increase the buoyancy and transport distance of the emissions further. Therefore, single pieces of heavy equipment to be used in the SF Zoo would not violate ambient air quality standards.

Delivery and haul trucks would generate exhaust emissions while idling at the project site as well as while traveling along haul routes. On a local level, receptors located along haul routes would be subject to increased CO exposure equivalent to 60 automobiles passing per hour or one car per minute, assuming a peak daily volume of 160 trucks over an 8-hour period, or 20 trucks per hour. CO emissions from one truck is equivalent to emissions from three automobiles. CO exposure increases on the magnitude of one additional car per minute would not noticeably increase CO hourly exposure at any of the possible receptors along the haul routes leading to the Zoo.

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[29] City and County of San Francisco Department of Public Works, Bureau of Engineering, Specification No. 6099F, San Francisco Zoo Avian Conservation Center and Mammal Conservation Center Special Provisions, Volume 1, General Requirements, September 29, 1995.

[30] US Environmental Protection Agency, AP-42,*Compilation of Air Pollutant Emission Factors, Section 3.3*,1985

TABLE 17
EQUIPMENT EXHAUST EMISSIONS IMPACT ON LOCAL AIR QUALITY

Pollutant	Estimated near-field Exhaust Emissions From Backhoe		
	One-Hour Standard (ugm^3)	One-Hour Impact /a/ (ugm^3)	% of Standard
Carbon Monoxide	23,000	906	3.9%
Nitrogen Oxides (Nox)/b/	470	198	42.1%
Sulfur Dioxide	655	165	25.2%
Inhalable Particulates (PM_{10})	150	12	8.3%

ug/m3: micrograms per cubic meter
/a/ Above non-project background level. Assumes that about 80 brake-horsepower-hours of backhoe operation.
/b/ Assuming 10% of "fresh" Nox is Nox, 90% is NO.

NOTE: Ambient air quality impact is calculated based on the US EPA Dispersion Model. Levels are measured at 609 feet from the equipment.
SOURCE: Geier & Geier Consulting, Inc., 1995

MITIGATION MEASURES

The potential air quality and climate impacts would not be significant with implementation of the following mitigation measures during construction to minimize impacts to PM_{10} emissions.

- The project sponsor shall require that the general contractor sprinkle demolition areas with water routinely during demolition activity; water during pavement cutting, excess soils loading and hauling, and temporary stockpiling; sprinkle all active construction areas with water at least twice per day to reduce dust generation by about 50 percent; water three times daily or apply soil stabilization to unpaved access roads, parking areas, and staging areas at construction sites; cover stockpiles of soil, sand, and other materials; cover trucks hauling debris, soil, sand or other material; shut down idle construction equipment; encapsulate any excavated materials that are potentially hazardous because of harmful mineral content or are a potential nuisance because of organic content; and sweep daily (with water sweepers) all paved access roads, parking areas, staging areas, and construction sites and adjacent public streets if visible soil material is carried off the site. Ordinance 175-91 passed by the Board of Supervisors on May 6, 1991 requires that non-potable water be used for dust control activities. However, water from the Zoo reservoir is available for use by contractors for watering demolition and construction sites.
- Animal behavior will be monitored by animal keepers to determine if sensitivity to dust impacts (respiratory problems) are observed. Steps will be taken to protect the animals and correct the emission problems through measures noted above.

- The project sponsor shall require the project contractor to maintain and operate construction equipment so as to minimize exhaust emissions of particulates and other pollutants, by such means as a prohibition on idling motors when equipment is not in use or when trucks are waiting in queues, and require implementation of specific maintenance programs to reduce emissions from equipment that would be in frequent use for much of the construction period.

F. NOISE

SETTING

Introduction

Environmental noise is usually measured in A-weighted decibels (dBA).[31] It typically fluctuates over time, and different types of noise descriptors are used to account for this variability. A typical noise descriptor is the energy-equivalent noise level (L_{eq}). The L_{eq} is the equivalent continuous sound level which has the same energy content as the varying sound level over the period monitored. Other useful noise descriptors include the day-night average noise level (L_{dn}) and the community noise equivalent level (CNEL). The L_{dn} is based on human reaction to cumulative noise exposure over a 24-hour period. For the L_{dn}, noise between 10:00 p.m. and 7:00 a.m. is weighted by adding 10 dBA to take into account the greater annoyance of nighttime noises. CNEL is similar to L_{dn}, but an additional 5 dBA "penalty" is added to evening noise (7:00 p.m. to 10:00 p.m.). The L_{dn} and CNEL are considered equivalent for most planning purposes.

Noise levels are measured on a logarithmic scale, and therefore, are not added in the usual arithmetic manner. A doubling of sound energy results in a three-dBA increase in noise levels, which is the smallest change in noise level detectable by the average person. A noise level increase of 10 dBA is perceived as being twice as loud. Generally, in areas where existing noise levels are dominated by traffic, a doubling in the volume of vehicular traffic will cause ambient noise levels to increase by three dBA.

The noise level experienced at a receptor depends on the distance between the source and the receptor, presence or absence of noise barriers and other shielding devices, and the amount of noise attenuation (lessening) provided by the intervening terrain. For line sources, such as motor vehicle traffic, noise decreases by about 3.0 to 4.5 dBA for every doubling of the distance from the roadway. For point or stationary noise sources, such as electric motors, a noise reduction of 6.0 to 9.0 dBA is experienced for each doubling of the distance from the source.

The amount of noise attenuation (reduction) depends to a large extent on the sound absorption characteristics of the intervening terrain. Soft earth with vegetative cover provides a 4.5 dBA attenuation with distance, while hard exposed surfaces provide a noise attenuation of only 3.0 dBA. Noise barriers or shielding devices that break the line of sight between the source and the receptor would generally provide a noise attenuation of about 5-10 dBA.

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[31] A decibel (dB) is a logarithmic unit of sound energy intensity. Sound waves, traveling outward from a source, exert a sound pressure level (commonly called "sound level") measured in decibels. A dBA is a decibel corrected for the variation in frequency response of the typical human ear at commonly encountered noise levels.

Noise Regulations, Plans and Policies

California State Noise Standards

Figure 21 sets forth the recommended noise levels compatible with different types of land use, based on guidelines of the Office of Noise Control, State Department of Health Services and published in the Environmental Protection Element of the San Francisco General Plan.

San Francisco Noise Ordinance

During construction, powered construction equipment other than impact tools are required to comply with the San Francisco Noise Ordinance (codified in Article 20 of the San Francisco Police Code, Section 2907b), which limits construction noise to 80 dBA at 100 feet from the source. The Noise Ordinance (Section 2908) also prohibits construction work at night from 8:00 p.m. until 7:00 a.m., if noise from such work would exceed the ambient noise level by five dB at the property line, unless a special permit is authorized by the San Francisco Department of Public Works. Under Section 2907c, impact tools and equipment must have intake and exhaust mufflers, and tools such as jackhammers must be equipped with acoustically-attenuating shields or shrouds.

Noise Sensitivity of Zoo Animals and Results of Noise Monitoring

A primary objective of the Zoo is the long-term well-being of the animals in its care. During past, present, and future construction projects at the Zoo and its environs, special care has been and will be taken to protect the Zoo animals from exposure to high noise levels, as well as from the impulsive and vibrational effects associated with construction activities. As a general rule, Zoo animals tend to be more sensitive to loud noise during their breeding seasons, which vary throughout the year depending on species. In addition, higher noise sensitivity tends to be exhibited by neonatal, geriatric and newly-acquired individuals of all species.

In 1978, extensive noise monitoring took place during the construction of the Oceanside Water Pollution Control Plant (OWPCP). The monitoring revealed that some Zoo animals, such as birds and gorillas, were sensitive to noise, especially to impulsive noise during construction. This was particularly true during breeding seasons. The sensitivity of birds of prey (raptors) has previously been documented by the San Francisco Zoological Society and substantiated in their literature review and monitoring of construction activities at the Zoo.[32] Impulsive noise is created by various pieces of construction equipment, including

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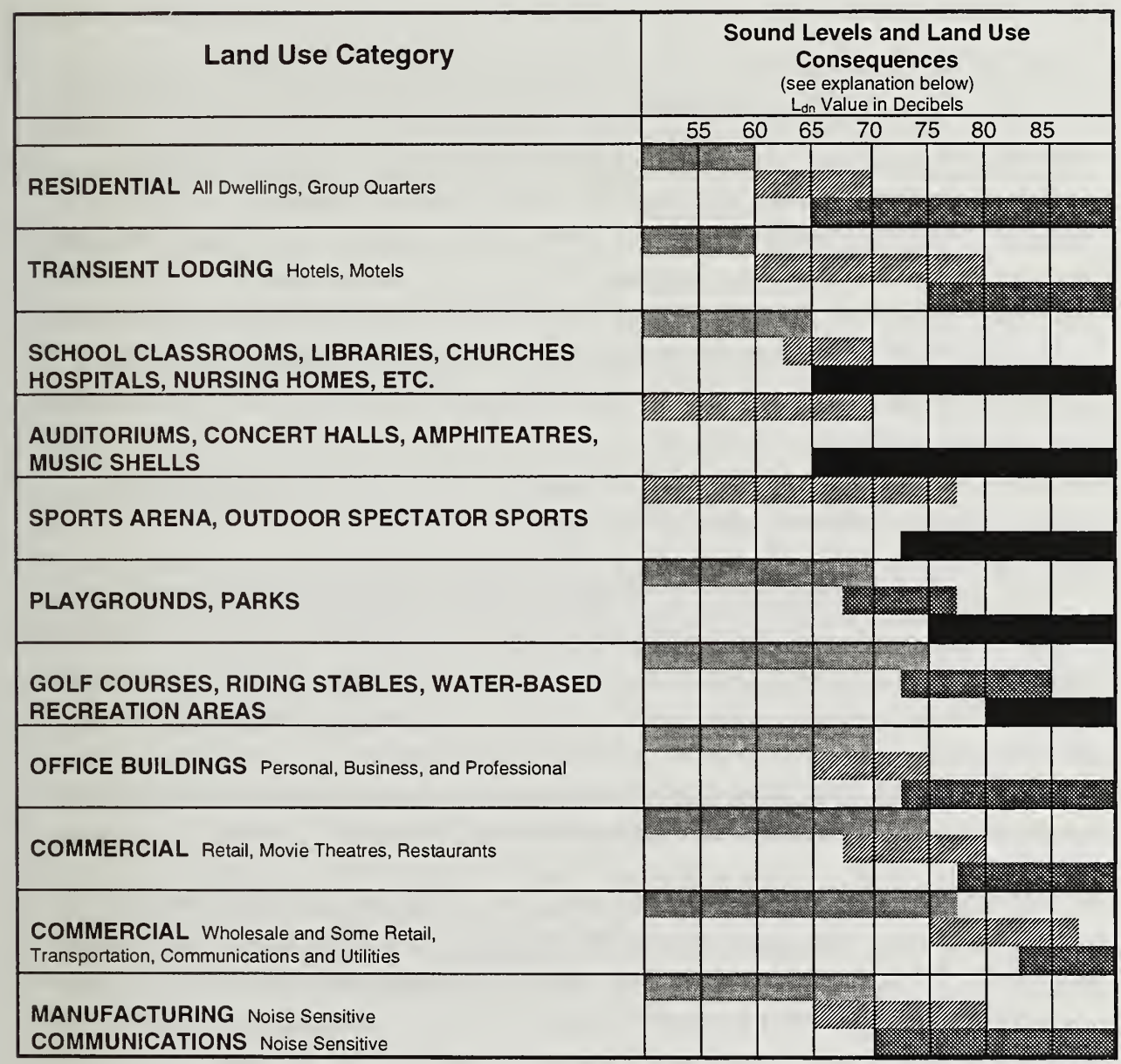
[32] Letter from Mr. John Aikins, Director of Avian Conservation Program, San Francisco Zoo, dated March 21, 1987, regarding environmental concerns related to the Southwest Water Pollution Control Plant.

Figure 21 Noise Levels Compatible with Land Use Types



Satisfactory, with no special noise insulation requirements

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features in the design

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must made and needed noise insulation features included in the design.

New construction or development should generally not be undertaken

jackhammers, drilling equipment, and truck back-up beepers. Effective mitigation measures have included construction of noise barriers and gradual habituation of animals to higher noise levels over several days.

In December 1993, as part of the San Francisco Zoo Infrastructure Master Plan project, zoo keepers at the Zoo were surveyed regarding the sensitivity of the animals in their care to construction-related noise, visual distraction and odors.[33] The survey revealed that some animals at the Zoo exhibit adverse reactions to construction activities, particularly birds, penguins, rhinos and elephants. Common animal responses to the stress of nearby construction may include flighty behavior, increased aggression, self-destruction or mutilation, pacing, loss of appetite, and hiding. The survey revealed that the Avian facilities, in particular, needed to be relocated to protect birds from noise and visual disturbance during construction within the Zoo and from outside the Zoo close to exhibits.[34] Furthermore, according to the Zoological Society, the endangered status of some birds (e.g., bald eagles, peregrine falcons, etc.) and the sensitivity during breeding, placed added responsibilities on the Zoo to protect these species. Construction of the new Avian Conservation Center was completed in September 1996 and the location and protective enclosures minimize exposure of birds to noise within the Zoo.

In accordance with the Zoo's environmental policies and practices, noise monitoring took place in April 1994 during construction of the Feline Conservation Center (FCC), near the Rhino and Zebra exhibits, and across Herbst Road at the fence line of the Recreation Center for the Handicapped.[35] Short-term spot monitoring showed noise levels varying from 64 to 70 dBA, L_{eq} and maximum noise levels of 79 to 83 dBA. Noise plots indicated that construction work was performed between the hours of 7:00 a.m. and 5:00 p.m. in accordance with the Noise Ordinance. Spot monitoring of construction equipment indicated that noise levels were in compliance with the Noise Ordinance.

Grading operations for the FCC resulted in increases of up to 11 dBA over the selected baseline hourly noise level of 64 dBA. Drilling operations resulted in increases of up to 14 dBA at the fence line of the Rhino exhibit. To the human ear, an increase of 10 dBA is generally perceived as a doubling of loudness. The Rhino and Zebra populations were likely exposed to noise levels at least twice as loud as they usually experience during the periods of grading and drilling at the construction site. Zoo keepers who monitored animal behavior during this period reported no noticeable change in the Rhino and Zebra populations in response to elevated noise levels.

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[33] Zoo Animal Sensitivity Questionnaire, San Francisco Zoo, December 1993. Copies of the results of this survey are on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

[34] Associated BioTechnology, *Mitigation Procedures to Protect Zoo Animals during Infrastructure Construction*, February 17, 1994. A copy of this report is on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

[35] Environmental Science Associates, *Noise Monitoring of Feline Conservation Center Construction Activities*, May 1994. A copy of this report is on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

Baseline noise measurements were taken in 1996 for the wet weather lift station construction at two locations west of the Children's Zoo and south of Sloat Boulevard.[36] Both locations were on the boundary fence between the parking lot and the Children's Zoo. Weekend noise data were continuously collected from 11:00 a.m. on June 7th through 11 a.m. on June 10th, revealing overall noise levels of 55.2 dBA; 24-hour weekday noise measurements showed noise levels ranging from 53.4 dBA to 55.6 dBA. Noise levels during construction reached 80 dBA at 100 feet and no animal disturbance was reported by zoo keepers. No complaints from residents along Sloat Boulevard, adjacent to construction activity, were reported.

IMPACTS

Future noise sources associated with the proposed project would include temporary / intermittent noise from project construction and demolition activity, increased vehicular traffic on nearby roadways, and noise from new stationary sources such as heating, ventilation and air conditioning equipment within the Zoo.

Approach to Analysis

Noise impacts from traffic associated with the project are assessed by comparing existing roadway traffic volumes on the Great Highway and Sloat Boulevard with the projected traffic from the project. Construction noise impacts are assessed by estimating the noise levels generated by a typical mix of construction equipment at the nearest noise-sensitive use and comparing the results to existing noise levels. This methodology is also used to assess the impact from stationary noise sources.

It is generally reported that a change in noise levels of less than three dBA is not discernible to the general population; an increase in average noise levels of from three to five dBA is clearly discernible to most people. An increase over ambient noise of five dBA or greater is considered to be the minimum required increase for a change in community reaction. While San Francisco has no quantified threshold for significant noise impacts, construction specifications for the Avian Conservation Center and for the Infrastructure project included a threshold level of 80 dBA measured at the closest Zoo exhibit fence line as an indicator of significance.

Traffic Noise

A doubling of traffic volumes in the area would be necessary to produce an increase in ambient noise levels noticeable to most people (3 dBA). An increase of 10 dBA in ambient noise levels is perceived as a two-fold increase in loudness. None of the proposed *SF Zoo Master Plan* actions would result in a

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[36] Orion Environmental Associates, *Zoo Infrastructure Baseline Noise Monitoring* June 19, 1996. A copy of this letter report is on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

doubling of traffic on adjacent streets. No significant noise impacts would result from the proposed *SF Zoo Master Plan.*

Construction Period Noise

Construction and demolition noise levels at and near any given location on the project site would fluctuate depending on the particular type, number, and duration of use of various pieces of construction equipment. Table 18 shows typical noise levels generated for common pieces of construction equipment. The proposed project would not require pile driving. The significance of construction noise would depend upon the distance (and the presence or absence of barriers) between construction sites and the closest receptors. Sensitive receptors would include visitors to the Zoo, zoo employees, and some Zoo animals. Other nearby land uses, including the Recreation Center for the Handicap and residential neighborhoods in the Sunset District, would be affected to a lesser degree by construction noise.

TABLE 18
TYPICAL CONSTRUCTION EQUIPMENT NOISE LEVELS

Equipment	Noise Level at 50 feet (dBA, Leq)
Backhoes	71-95
Dozers	74-93
Scrapers	77-93
Truck	70-96
Paver	82-93
Pumps	69-80
Generators	69-82
Compressors	68-95
Jack hammers	78-98
Pile drivers[1]	90-105

[1] Pile drivers would not be required for construction of SF Zoo Master Plan projects.

SOURCE: Handbook of Noise Control, Cyril M. Harris, 1979.

As described in the Project Description, the most intensive and focused period of construction would occur in the first stages of Master Plan implementation (1998-2000) when a new visitor entry plaza, visitor spine and animal exhibits would be developed at the western most end of the Zoo. During this period of project construction, visitors would continue to use the Sloat Boulevard entrance to the Zoo (adjacent to the Mothers Building). Upon entering the Zoo, visitors would be directed away from construction sites to areas open to the public. During this phase of construction, visitors and regular Zoo employees would be no closer than 100 feet, and generally more than 500 feet, from ongoing construction activities. Consequently, while construction noise would be perceptible to some persons within the Zoo, particularly near the main entrance, noise levels would be attenuated due to the distance between the noise source and the receptors' location.

As previously noted in the Setting section, the Zoo has taken extensive precautions to protect sensitive animal species from exposure to loud construction noise. Zoo keepers regularly monitor animal behavior, feeding patterns, and other signs of potential environmental stress. During implementation of the *SF Zoo Master Plan*, the Zoo would employ specific measures to protect sensitive animals from exposure to loud noise. These include the slow habituation of animals to increased noise levels over several days and the use of visual awareness of construction equipment as warranted.

MITIGATION MEASURES

With the inclusion of the following specified mitigation measures, no significant impacts are expected.

- The contractor(s) will be required to carry out construction activities in a manner such that noise criteria specified in the Noise Ordinance (Section 2907 of the Police Code) are not exceeded. The contractor(s) will use appropriate construction methods and equipment and will install acoustic barriers as necessary. Jackhammers will be provided with intake and exhaust mufflers, and, if necessary, acoustical attenuating shields or shrouds recommended by the manufacturer and approved by the Director of Public Works as the best available means of accomplishing maximum noise level reduction. The contractor(s) will submit the plans for mitigation of noise impacts to the construction manager for approval. Periodic measurement of noise levels will be made by the construction manager who will be provided contractual authority to require modification or stoppage of construction activity which exceeds noise criteria. The contractor(s) will use the best practicable noise mufflers on all construction equipment. Construction will progress in such ways as to habituate Zoo animals to construction noise, and to minimize construction during breeding seasons. Whenever any unusually noisy construction activity which might exceed the noise criteria is anticipated, Zoo staff will be notified in advance. Sound levels at sensitive sites in the Zoo will be monitored during potentially noisy operations nearby. The responses of sensitive animals will be monitored and any behavioral changes that may be related to construction noise will be noted and construction will be halted until measures can be implemented to protect animals, such as slowly habituating animals to construction noise.
- The contractor will be restricted from making sudden or impulsive noise in the areas adjacent to the living quarters of animals.
- Construction specifications will require the contractor to start noisy equipment and machinery 50 feet or more from animal exhibits before moving equipment to the vicinity of animal exhibits.

G. UTILITIES, WATER USE AND PUBLIC SERVICES

This section addresses all utilities at the Zoo, including water, sewer, electricity and gas, and also covers police and fire services for the Zoo. Because the Zoo is located on City park property, under the jurisdiction of the Recreation and Park Commission, the utilities are managed by the City's Public Utilities Commission.

SETTING

The San Francisco Zoo Infrastructure Master Plan project was approved in 1994 by City agencies and is under construction. Pursuant to Section 15150 of the *CEQA Guidelines*, the Negative Declaration on the Infrastructure Master Plan is incorporated by reference into this EIR, and its provisions are summarized where applicable.[37] The Infrastructure Master Plan project is replacing earthquake-damaged and out-of-date utilities at the Zoo, including potable water and groundwater transmission systems, natural gas lines, electrical wiring, and sewer and drainage systems. Many of these facilities were originally constructed over 70 years ago and are no longer adequate to serve the needs of the Zoo.

The Infrastructure Master Plan includes a central underground utility corridor with lateral lines connecting to specific exhibits and facilities. The Infrastructure Master Plan was designed to accommodate existing needs at the Zoo, as well as future projects envisioned in the *SF Zoo Master Plan* (the subject of this EIR). Above-ground facilities associated with the Infrastructure Master Plan are limited to mechanical and electrical equipment, main valves, and switching gears. Construction of the Infrastructure Master Plan is occurring within the confines of the Zoo, with one exception: a 500-foot segment of sewer along Sloat Boulevard (leading to the Great Highway) is replacing the existing Zoo connection to the Westside Transport facility, a major underground sewage storage facility which flows to the Oceanside Water Pollution Control Plant (OWPCP).

The San Francisco Public Utilities Commission (PUC) has designed and is implementing the replacement of infrastructure at the Zoo. The following goals and objectives were established for the project at the beginning of the Zoo Infrastructure Replacement project:

1. Eliminate existing potential public health risks, including cross connection of potable and non-potable water systems and sewer overflow problems. Utility systems will be in compliance with California Administrative Code Title 17 for proper backflow prevention practices.

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[37] 94.336E: San Francisco Zoo Infrastructure Replacement, Final Negative Declaration, November 16, 1994, City and County of San Francisco. Copies of this document and its supporting technical memoranda and studies are on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

2. Meet water conservation goals of the San Francisco Water Department through the use of reclaimed water, if and when it becomes available.

3. Comply with Board of Supervisors' Ordinance 391-91 by connecting the existing irrigation system to receive OWPCP reclaimed water.

4. Increase the water quality and reliability of the groundwater system at the Zoo through design and implementation of a covered storage reservoir (PUC project).

5. Meet the 1994 well standards of the California Department of Water Resources (pursuant to Bulletin 74-90) for sanitary well seals and monitoring. Replacement wells will be monitored for flow rate, drawdown, total extraction, and water quality (PUC project).

6. Minimize the use of water from Hetch Hetchy. The Zoo will have a water system using "best available technology," which in turn will serve to educate the public about water conservation and reclamation.

7. Eliminate frequent maintenance of sanitary and storm water systems because of pipe deterioration and improper sizing.

8. Provide for emergency power for the wastewater pump systems so that flooding problems could be minimized.

9. Design the natural gas system to withstand the corrosive ocean environment.

10. Design the new utility systems for ease of maintenance. There will be flexibility in the systems so that if utility sections must be closed in the future for maintenance, the Zoo would not need to be shut down.

11. Locate utility system access points to minimize disruption to public areas and sensitive animal exhibits during routine maintenance of utilities.

12. Minimize disruption from construction activities to the animals living at the Zoo, and to visitors.

Water Supply and Use

The water supply system is planned as part of the Infrastructure Master Plan. The Zoo's water supply infrastructure consists of three separate water systems: potable water, groundwater, and recycled water. The potable water distribution system serves domestic (human consumption) and fire flow demands, and serves as a backup to the groundwater system. The groundwater distribution system primarily serves animal exhibits for washdown and pool water. The planned recycled water distribution system will serve

future irrigation demands throughout the Zoo. Until recycled water is available, however, groundwater is used to supply the recycled water distribution system and meet irrigation needs. Irrigation is performed during the hours of 8:00 p.m. and 6:00 a.m., to prevent concurrent demands on the system.

Potable Water

The potable water system, connected to the City's distribution system through three 6-inch and one 2-inch meters, supplies water to all Zoo food service facilities, drinking fountains, public and employee restrooms, animal exhibit washdown areas, pool refilling, and fire protection facilities. It also provides landscape irrigation for the eastern portion of the Zoo. The SFWD water distribution system maintains a pressure range of 65 to 70 pounds per square inch (psi) in the Merced Manor Reservoir service area, which includes the Zoo. The Zoo's water distribution system has historically supplied water at pressures ranging from 45 to 60 psi, due to pipeline tuberculation, leaks, and the configuration of the system. As reported by the Clean Water Program in 1990, improvements to the system made in 1988 have alleviated the majority of existing problems, and water pressure is currently maintained at about 60 psi on an average day.

Table 19 estimates the maximum current and projected water demands at the Zoo. The largest volume of potable water use at the Zoo corresponds with peak visitor periods, including summer weekends, holidays, and monthly free days. Future demand accounts for increased use as projected in the Zoo Master Plan.

Groundwater

The existing groundwater system at the Zoo was originally constructed in the 1930s, and is now considered to be in poor condition. The groundwater system consists of two wells (with a total capacity of about 1,100 gallons per minute (gpm)) which pump to an uncovered 175,000-gallon irrigation water storage pond. Stored water is subsequently distributed through the groundwater pipe network by booster pumps. When operative, the groundwater system delivers irrigation water to the western portion of the Zoo, to irrigate landscaping along parts of the Great Highway, and to wash down exhibits.

For the purposes of analysis, it was assumed that peak demand for washdown and pool filling would not occur at the same time as peak irrigation demand. At present, peak demand for groundwater is about 1,250 gpm for irrigation and about 970 gpm for washdown and pool filling. In the future (before recycled water becomes available), it is estimated that peak demand will reach about 1,500 gpm for irrigation and about 1,515 gpm for washdown and pool filling. Groundwater pumping would be monitored for use rates

TABLE 19
ESTIMATED MAXIMUM DAY WATER DEMANDS AT SAN FRANCISCO ZOO

Area/ Source	Existing Demand (gpm)	Future[1] Demand (gpm)	Peak Use Periods
Potable Water (City Water)			
Restrooms	100	367	10 a.m. to 5 p.m.
Cafes	--	40	10 a.m. to 5 p.m.
Other	30	40	8 a.m. to 5 p.m.
Subtotal	**165**	**478**	
Groundwater (Well Water)			
Washdown	220	280	8 a.m. to 10 a.m. 3 p.m. to 5 p.m.
Pool Filling/Backwashing	600	1,200	various times
Leakage/Overflow	150	--	all hours
Irrigation	1,250	--[2]	8 a.m. to 12 p.m.
Subtotal	2,220	1,515	
Recycled (Reclaimed) Water			
Irrigation	--	1,500	8 a.m. to 12 p.m.
Emergency (City water)			
Fire Demand	2,500	2,500	During a fire

1 Future water demands were based on the number and types of new exhibits, the estimated maximum number of visitors, and the future landscaping plan as presented in the *SF Zoo Master Plan*
2 Well water will serve as irrigation back-up only, after recycled water is brought on line.

Source: San Francisco Zoological Gardens Infrastructure Master Plan, City and County of San Francisco Department of Public Works, Draft Report, December 1994 and Final Report, August 1995, Kennedy / Jenks Consultants-AGS, Inc., An Association

and for water quality and coordinated with the City PUC as part of the Westside Basin Management Plan and Lake Merced Project Plan. In the long-term future, recycled water will be used for all irrigation, and peak demand for groundwater is expected to drop to about 1,515 gpm for exhibit pools and washdown.

Recycled Water

The City and County of San Francisco, through the Department of Public Works and the Water Department, has prepared a *Recycled Water Master Plan (RWMP)* and a *Groundwater Master Plan (GWMP)*. These two companion planning documents are intended to provide guidance for the long-range efficient use of the City's local water resources, including recycled (reclaimed) water and groundwater. These plans have been prepared to comply with Article 22 of the *San Francisco Public Works Code*, known as the Reclaimed Water Use Ordinance. In addition to identifying long-term goals for the use of

alternative water supplies, the plans include specific near-term projects that would be implemented to achieve these goals.

As described in the Project Description section of this EIR, one of the near-term projects called for in the *Recycled Water Master Plan* is the Recycled Water Treatment Plant (RWTP) construction, proposed to be located at the Fleishhacker site adjacent to the Zoo. The proposed layout and elevation of the RWTP are shown in Figure 11, page 27, and its potential impacts on the Zoo's Master Plan are addressed in the Land Use and Planning section of this EIR.

To comply with the Reclaimed Water Use Ordinance, the Infrastructure Master Plan will provide a recycled water distribution system within the Zoo. Once the *Recycled Water Master Plan* is approved and implemented, the Zoo will use reclaimed water received from that system for unrestricted landscape irrigation, including lawns, within exhibits, and grazing areas.

The recycled water to be used in this system will meet the State Department of Health Services' tertiary treated recycled water standard and all public health standards for this application. The recycled water distribution system at the Zoo is being designed pursuant to Department of Public Works specifications, intended to minimize public exposure to recycled water.[38]

Sewers and Drainage Systems

The San Francisco Zoo is served by a combined sanitary / storm sewer collection drainage system. The sanitary system laterals receive domestic wastewater from buildings, exhibit washdowns, pool drainage, and stormwater runoff from exhibit areas. The storm sewer laterals collect storm runoff primarily from non-exhibit areas. Additional flow enters the system from the Eastside Storm Sewer and from infiltration and overflow at nearby Friendship Lagoon. Sewer and storm lateral flows are collected in the combined main system, transported to pump stations near the Fleishhacker site (within the confines of the Zoo), and pumped into sewer mains along Sloat Boulevard. These sewer mains drain into the Westside Transport facility, a major underground storage facility which feeds the nearby Oceanside Water Pollution Control Plant (OWPCP).

Most of the water used by the Zoo is ultimately discharged to the Zoo's combined sanitary / storm sewer main system. The major exception is water used for irrigation. Some additional water is lost by seepage and evaporation from ponds, pools and lakes.

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38 Kennedy/Jenks Consultants, San Francisco Zoo Infrastructure Master Plan,*Technical Memorandum 1D*, December 28, 1993. Copies of this and other technical memoranda are on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

An estimate of existing wastewater flow rates was made based on water use records, pool drainage frequency schedules, volumes of the pools, hose discharge rates, number of restroom facilities, number of visitors, and measured background flow rates. An estimate of existing and projected wastewater flow rates is presented in Table 20. Future flow rates account for increased visitor attendance and increased exhibit facilities.

TABLE 20
ESTIMATED EXISTING AND FUTURE WASTEWATER FLOW RATES (GPM)[1]

Wastewater Source	Average Daily (10 a.m. to 5 p.m.)		Peak Daily (8 a.m. to 10 a.m.)		Maximum Day (Summer Free Day)	
	existing	future	existing	future	existing	future
Restrooms	10	10	15	15	100	150
Cafes	5	5	0	0	35	40
Other	5	5	30	40	35	40
Infill/Overflow	85	20	85	20	35	20
Washdown	30	40	220	310	100	150
Pool Drainage	350	450	1,050	1,365	350	150
TOTAL	485	530	1,400	1,750	720	850

[1] "Average Daily" flow represents the average amount of wastewater typically produced between the hours of 10:00 a.m. and 5:00 p.m. during dry weather conditions; "Peak Daily" reflects the peak daily wastewater flow produced during dry weather conditions during morning clean-up and maintenance periods before the Zoo opens to visitors; and "Maximum Day" represents the maximum amount of wastewater produced during normal Zoo operations on a peak summer free day, when 15,000 or more visitors may be expected.

Source: San Francisco Zoo Infrastructure Master Plan, Technical Memorandum No. 1E, December 30, 1993, Kennedy / Jenks Consultants.

Electricity and Natural Gas

Electricity

Electric power service is provided to the San Francisco Zoo by Pacific Gas & Electric (PG&E), through a eighteen metered service points and distribution centers located throughout the Zoo. The distribution centers include step-down transformers (seven) and distribution switchboards. PG&E has one high voltage line passing through the Zoo. At present, this system is considered adequate for the minimum needs of the Zoo, although problems of equipment corrosion and maintenance exist. The existing electrical load at the Zoo is about 450 kW (kilowatts).

The Zoo has made provisions for emergency and standby power generators, located at the animal hospital, administrative center trailers, and the dry weather pump station. The provisions are based on the availability of mobile standby generators owned by the San Francisco Recreation and Park Department, which can be used at the various locations.

As part of the Infrastructure Master Plan project, electrical conduit will be installed along with other Zoo utilities for future power distribution. The projected electrical load is estimated at 1,700 kW (compared to

450 kW now) and service will be provided by PG&E to transformers located along the perimeter of the Zoo so that PG&E would not need to extend or maintain lines internal to the Zoo as they currently do. The Zoological Society would maintain lines within the Zoo. Two new transformers will be installed by PG&E to provide low voltage service connection at the southwest area of the Zoo (one near the South Gate entrance and one near the future Orangutan Forest exhibit).[39]

Natural Gas

Natural gas is delivered to the Zoo through nine metered regulators off of a PG&E main line which enters the Zoo from Zoo Road on the south side of the Zoo, and then distributes the gas throughout other parts of the Zoo. Gas pressure and quantity in these mains are considered more than adequate for all present and future demands the Zoo will require. The existing load is 10,640,000 Btu/hour and the estimated future gas load with the Zoo Master Plan would be 13,326,000 Btu/hour (about a 25% increase). The gas distribution system would consist of a system of looped gas lines (3/4 inch diameter polythylene) within the planned utility corridor.[40]

Solid Waste

Solid waste collected throughout the City (including the Zoo) by Golden Gate and Sunset Scavenger Companies is transported to the solid waste transfer station at the San Francisco - Brisbane border, and from there hauled by the Sanitary Fill Company to the Altamont Landfill northeast of Livermore in Alameda County. San Francisco has a contract for disposal of all of its solid waste at the Altamont Landfill until 2013. The City currently does not have under consideration disposal solutions beyond those for 2013.[41]

The City is obligated by State law to reduce the amount of waste going to landfill. Curbside recycling for residents is already part of the City's strategy to reduce that volume. In addition, in order to comply with another State law (Public Resources Code, Chapter 18, Section 42900 *et seq.*), all new development, improvements, and certain alterations, dating from September 1, 1993, are required to provide space for recyclables containers.

Animal waste is composted and delivered to Golden Gate Park for use in landscaping. The San Francisco Zoo recycles solid waste from visitor concessions (paper products and aluminum) and compacts waste for twice weekly pickup by the Sunset Scavengers. Other solid waste at the Zoo is collected in a dumpster located behind the Mothers Building for pickup by the Sunset Scavengers once every eight days.

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[39] Meeting Minutes Memo, May 9, 1996, PG&E, Olivia Chen Consultants.
[40] Correspondence dated July 31, 1996 between Olivia Chen Consultants and the Department of Public Works.
[41] Keller, ibid.

Police And Fire Services

Police services for the Zoo are provided by SFPD Taraval Station at 24th Avenue and Taraval Street (with a response time of three to four minutes), and the National Park Police. The closest fire station is located at 390 Buckingham Way.

IMPACTS

The proposed project would increase demand for and use of public services on the site and increase water and energy consumption, but not in excess of amounts expected and provided for in the area. This would be a less-than-significant impact.

As attendance levels rise over the course of project implementation, there is expected to be a corresponding increase in the amount of solid waste generated at the Zoo. This increase would be offset to some degree by improvements in the collection of recyclable solid waste, which would be implemented as part of the Master Plan.

The Sanitary Fill Company indicates that the present facility could handle the increase in solid waste introduced by increased attendance levels at the Zoo. That increase, as part of the total projected for the City, would be small and in itself would not have a substantial impact. However, it would add waste to the landfill, and further challenge the City in meeting its solid waste reduction goal of 50 percent.

The San Francisco Zoo Infrastructure Master Plan was approved in 1994[42], and is currently being implemented. The Infrastructure Master Plan project is replacing earthquake-damaged and out-of-date utilities at the Zoo, including potable water and groundwater transmission systems, natural gas lines, electrical wiring and control equipment, and sewer and drainage systems. The Infrastructure Master Plan was specifically designed to accommodate the existing and future infrastructure requirements of the Zoo, including those described as part of the Zoo Master Plan. The need for police and fire service at the Zoo would not substantially change from existing demands for service.

Construction Impacts

The Zoo Master Plan project would generate construction and demolition debris during the construction phases of the project. Demolition debris, such as concrete and asphalt, is currently processed and recycled by several companies for reuse. Material that could not be recycled would be transported to

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42 94.336E: San Francisco Zoo Infrastructure Replacement, Final Negative Declaration, November 16, 1994, City and County of San Francisco.

Altamont Landfill in Livermore, or other available facilities. Recycling of demolition debris, as feasible, would reduce impacts to a less-than-significant level.

MITIGATION MEASURES

The impacts on utilities, water use, and public services are not significant and would not require mitigation measures.

H. BIOLOGICAL RESOURCES

SETTING

Introduction

The Zoo encompasses approximately 75 acres, including 30 acres of landscaped forests, fields, and open areas; several artificial fountains, ponds, and watercourses; 18 acres of developed areas such as animal exhibits and structures; and 14 acres of paved roads and unpaved trails and paths. Prior to development in 1929, the area that is now the San Francisco Zoo supported sand dunes and coastal grasslands.[43]

Landscaping work during Zoo establishment included stabilization of sand drifts, extensive grading and drainage work, and establishment of ornamental trees and shrubs. The ornamental trees and shrubs planted at the Zoo were selected: 1) to serve as windbreaks, 2) for aesthetic and recreation purposes, 3) to serve as backdrops for zoo exhibits, and 4) to screen service areas. Artificial fountains, watercourses, and ponds were constructed using clay and cement to create impermeable surfaces to hold water from groundwater wells.

Intensive landscaping activities have displaced all of the native habitats and most native species from the Zoo property. Wildlife species that now inhabit the Zoo include raccoons and skunks; migrant and resident songbirds, raptors, and waterfowl; amphibians such as bullfrogs and Pacific tree frogs; and feral animals (untamed wild animals like cats). Overall habitat suitability for wildlife is considered low as a result of several factors including: presence of exotic Zoo wildlife species; predation by and competition with feral animals such as cats and raccoons; routine landscaping activities that maintain and remove understory shrub and tree vegetation that provide foraging and nesting habitat values; and the limited amount of artificial water sources available to wildlife.

The San Francisco Zoo's value to native and naturalized plant species is considered minimal because the Zoo is intensively landscaped and maintained. No habitats considered suitable to support native plant species occur at the Zoo.

Definitions

Several terms used in this section have specific meaning pertaining to state and federal laws and policies. These terms are defined below.

Sensitive Species: For the purpose of this report, sensitive species are defined to include:

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[43] Smith, S.G. 1994. Golden Gate Park Master Plan Background Report, Forest and Wildlife. Prepared for the San Francisco Recreation and Parks Department.

- species that are listed or proposed for listing as threatened or endangered under the federal Endangered Species Act (50 CFR 17.11 for wildlife, 50 CFR 17.12 for plants; various notices in the Federal Register for proposed species);
- wildlife that are Candidates for future listing as threatened or endangered under the federal Endangered Species Act (50 CFR Part 17, February 28, 1996);
- plants that are Candidates for future listing as threatened or endangered under the federal Endangered Species Act (50 CFR Part 17, February 28, 1996);
- species that are listed or proposed for listing by the state of California as threatened or endangered under the California Endangered Species Act (California Administrative Code, Title 14, Section 670.5);
- wildlife species that are designated as fully protected by the California Department of Fish and Game (DFG) (California Administrative Code, Title 14, Section 670.5); and
- plants considered by the California Native Plant Society (CNPS) to be rare, threatened, or endangered in California and elsewhere[44]; and

Important Habitats. For the purpose of this section, important habitats are defined to include habitats that are considered relatively scarce, are vulnerable to elimination, support unique or biologically important plant or wildlife species, or have important ecological functions (e.g., soil stabilization or water filtration).

Wetlands. Wetlands are a type of important habitat that may be subject to regulation by the U.S. Army Corps of Engineers (Corps) and the U.S. Environmental Protection Agency, pursuant to Section 404 of the Clean Water Act. Wetlands are defined for regulatory purposes as:

> . . .areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated conditions (33 CFR 328.3, 40 CFR 230.3).

Method for Identifying Biological Resources

Biological resources of the San Francisco Zoo were investigated to determine resources that occur in the Zoo and have potential to be affected by implementation of the Zoo Master Plan. Information on Zoo biological resources was gathered through a review of existing field studies that were performed in support of the Zoo Forest Management Plan[45]; a records search of the San Francisco south U.S. Geological

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[44] Skinner, M. and B. Pavlick. 1994. Inventory of rare and endangered vascular plants of California. California Native Plant Society, Special publication No. 1. Sacramento, CA.

[45] The Portico Group. 1994. San Francisco Zoo Reforestation Plan. Prepared for the City and County of San Francisco Planning Department. San Francisco, CA

Survey (USGS) quadrangle using DFG's Natural Diversity Data Base (CNDDB)[46]; and contacts with individuals familiar with Zoo and study area resources.[47]

A reconnaissance-level site investigation was conducted at the Zoo by biologist Loran May on October 31, 1996. The purpose of the reconnaissance-level survey was to identify suitable habitats (if any) to support sensitive plant or wildlife species known from the region, based on similarity to habitats known to support the species. The entire Zoo was investigated on foot. Special attention was given to ruderal and less-intensively landscaped areas such as the former Fleishhacker Pool, where native plant species could occur.

Information on common and sensitive wildlife species at the adjacent Lake Merced was also investigated. Biological resources of Lake Merced are well documented as a result of public interest and official and unofficial site investigations by amateur and professional wildlife biologists, ornithologists, and herpetologists. Pertinent information on Lake Merced that was reviewed during preparation of this document includes:

- information provided by the Golden Gate Audubon Society on a proposed project at Lake Merced[48];
- Christmas bird count/bird census information prepared by the Audubon Society for Lake Merced[49]; and
- an annotated checklist of reptiles and amphibians in the City and County of San Francisco, prepared by B. H. Banta and D. Morafka in 1966.[50]

The results of the biological resource investigation are presented below.

Common Habitats

Two types of habitat were encountered at the Zoo: intensively landscaped habitats and artificial waterways. Each of these habitats is discussed below.

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46 California Natural Diversity Data Base. 1996. Records search of the San Francisco south U.S. Geological Survey quadrangle.

47 Robinette, David. Assistant Director/General Curator, San Francisco Zoo. Field Meeting on October 31, 1996.

48 Murphy, D. 1985. Unpublished letter dated June 4, 1985 addressed to the San Francisco Recreation and Parks Department regarding proposed work at Lake Merced.

49 White, Harry. Gardener, San Francisco Zoo. Amateur Ornithologist. Telephone conversation on November 18, 1996..

50 Banta, B.H. and D. Morafka. 1966. An annotated checklist of the recent amphibians and reptiles inhabiting the City and County of San Francisco, California.

Intensively Landscaped Areas

The Zoo supports approximately 30 acres of intensively landscaped habitats, including: lawns; special planting areas; and evergreen landscaped forests (forests include mixed stands of Monterey pine *(Pinus radiata)*, Monterey cypress *(Cupressus macrocarpa*), and eucalyptus *(Eucalyptus globulosus, Eucalyptus* spp.). Because these areas are heavily utilized by Zoo visitors and are routinely landscaped and maintained, these habitats provide few values to common wildlife species. These areas support mostly non-native landscaped tree, shrub, and herbaceous plant varieties, and therefore, are considered to have limited habitat values for native plant species. Refer to Appendix C for a list of plant species observed during the October 31, 1996 reconnaissance survey.

Artificial Waterways

The existing Zoo landscaping includes a well, pump station, and groundwater reservoir located at the northwest corner of the property that provides water to various Zoo exhibits. Artificial waterways within the Zoo include cement moats around the animal exhibits; fountains, the clay-lined Friendship Lagoon, and several cement- and clay-lined artificial watercourses that run through exhibits, such as the musk ox paddock, and public pathways of the Zoo. These artificial waterways were incorporated into the Zoo landscape for aesthetic reasons, to serve as focal points in public gathering areas, and to separate Zoo exhibit areas from public areas. Because the waterways are entirely supported by artificial (pumped) water, the areas are not considered jurisdictional wetlands, as defined above.

Artificial fountains, ponds, and watercourses of the Zoo provide limited benefits to native wildlife species, including a year-round source of drinking water for upland species, and marginal habitat areas for amphibians such as bullfrogs and Pacific tree frogs. The Friendship Lagoon, the largest artificial waterbody at the Zoo, also provides habitat for migratory and resident waterfowl such as mallards, gulls, egrets, herons, and coots. The edges of the lagoon support planted trees and shrubs that provide cover and foraging habitat for various common avian species. Watercourses at the Zoo do not support any native plant habitats.

Sensitive Plant Species

A list of sensitive plant species with potential to occur at the Zoo was compiled based on a record search of the CNDDB (CNDDB 1996). Of the sensitive plant species identified near the Zoo, none was considered to have potential to occur based on the condition of the Zoo grounds and lack of native plants and native habitats[51].

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[51] Siggs, J. Botanist. Member, California Native Plant Society. Telephone conversation on November 13, 1996.

The San Francisco Zoo supports almost exclusively non-native ornamental plant varieties; a few hardy non-native and naturalized grassland species were observed as a sparse understory in forested areas. The Zoo is considered to have no suitable habitat for native and naturalized plant species. Specifically, the Zoo lacks:

- serpentine outcrops and serpentine-derived soils upon which the Presidio clarkia and San Francisco owl's clover are dependent; and
- remnant sand dunes, coastal grasslands, or ruderal sandy habitats known to support San Francisco gumplant, San Francisco lessingia, and San Francisco Bay spineflower.

Two additional species, marsh sandwort and San Francisco popcornflower are presumed by CNDDB to be extirpated from San Francisco[52], and are therefore not expected to occur at the Zoo.

Common and Invasive Plant Species

Several grass species associated with disturbed areas were observed growing as a sparse understory in forested areas. Species observed include: grasses such as soft chess (*Bromus hordeaceous*), ripgut brome (*Bromus diandrus*), and Bermuda grass (*Cynodon dactylon*) growing as a sparse understory in forested areas. Annual weedy forbs such as cheeseweed (*Malva parviflora),* wild geranium (*Geranium molle),* sonchus (*Sonchus oleraceous*), wild lettuce (*Lactuca serriola),* wild mustard (*Brassica* sp.), wild radish (*Raphanus sativa*), burr clover *(Medicago polymorpha),* and storksbill (*Erodium* sp.) were also observed in these areas.

Several invasive plant species were planted or have established themselves on the Zoo grounds, including: German ivy (*Senecio macounii*), English ivy (*Hedera helix*), vinca (*Vinca major*), acacia (*Acacia* sp.), iceplant (*Carpobrotus chilensis),* and pampas grass (*Cortaderia jubata*). In and around the perimeter of the Friendship Lagoon, one invasive cultivar, yellow water iris (*Iris pseudacorus*), was observed. Some or all of these species may have been introduced by gardeners into the Zoo landscaping.

Wildlife Species

The Zoo Animal Collection includes 262 species, some of which are threatened and endangered. These are described under Project Description, page 9, and potential impacts to these species are addressed in

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[52] Skinner, Ibid

this EIR under Construction Air Quality Impacts and Construction Noise Impacts. In addition to the Zoo Collection, the Zoo supports numerous common wildlife species, including songbirds and waterbirds, amphibians, and mammals such as raccoon and skunk (Appendix C).

Feral Animals

Due to its proximity to urbanized areas, the Zoo supports feral animals and is an abandonment site for domestic pets. In addition to dogs and cats, turtles, chickens, turkeys, and rabbits have been introduced by Zoo visitors. Domestic cats and raccoons are of particular concern. Feral animal control continues to be a concern, and control activities are ongoing by Zoo staff, City and County Animal Control, and the Society for Prevention of Cruelty to Animals.

Wildlife Species of Local Interest

Several migrant wildlife species that are uncommon in San Francisco pass through the Zoo property during winter and spring, and therefore could occur at the Zoo property for a short period of time. Wildlife species of local interest include hummingbirds, such as Anna's hummingbird; barn swallows; and songbirds such as yellow rumped warbler, hooded oriole and brown creeper. Although these wildlife resources are not federally or state-listed, they are of interest to the public.

Sensitive Wildlife Species

The CNDDB has records for the following species in the vicinity of the Zoo: two sensitive invertebrates, Pacific sand beetle (*Lichnanthe ursina)* and Tomales isopod (*Caecidotea tomalensis)*; one sensitive fish species, the tidewater goby (*Eucyclogobius newberryi)*; four sensitive bird species, the saltmarsh common yellowthroat (*Geothlypis trichas sinuosa),* bank swallow (*Riparia riparia),* California black rail (*Laterallus jamaicensis)*, and peregrine falcon *(Falco peregrinus);* and one amphibian, the California red-legged frog (*Rana aurora draytonii)*[53] (Appendix C).

Of these species, only saltmarsh common yellowthroat is known to occasionally be observed at the Zoo.[54] This species has been sited at the Friendship Lagoon and at waterways in front of the bear exhibit and the lion and tiger grottos. These areas have slow-moving water and dense vegetative cover near the

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[53] California Natural Diversity Data Base. 1996. Records search of the San Francisco south U.S. Geological Survey quadrangle.
[54] White, Ibid

water's edge, habitat conditions favored by this species. The species infrequently nests in these areas, when other suitable habitats in the region are occupied.[55]

None of the remaining species identified by CNDDB are known to occur at the Zoo and no suitable habitat to support these species is known on the Zoo grounds. Specifically, the Zoo lacks:

- suitable cliff and rock outcrops for bank swallows,
- sand dunes for Pacific sand beetle,
- cattail marsh vegetation for Tomales isopod,
- lagoons and stillwater streams for tidewater goby,
- suitable nesting habitat for peregrine falcon, and
- pickleweed and saltwater marsh for California black rail.

The Friendship Lagoon historically supported California red-legged frogs as recently as the mid 1960s. However, in the 1960s or early 1970s, the lagoon was reportedly drained and re-landscaped as part of maintenance, eliminating suitable habitat and extirpating the species onsite[56]. Because the Friendship Lagoon currently lacks suitable emergent marsh vegetation and overhanging native willows, and because there is no CNDDB occurrence record for red-legged frogs at the Zoo, the species is now considered unlikely to occur on the Zoo grounds[57].

Infrequent sightings of non-captive peregrine falcons are reported at the Zoo.[58, 59] This species does not breed or forage in habitats present at the Zoo (outside of the captive species in the Avian Conservation Center).

In addition to these sensitive wildlife species tracked by the CNDDB, raptors are also considered a sensitive wildlife resource. Raptors are considered sensitive by the California Department of Fish and

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55 Ibid

56 Ely, Ed. Herpetologist. Self-employed consultant. Telephone conversation on November 13, 1996..

57 Ibid.

58 Murphy, D. 1985. Unpublished letter dated June 4, 1985 addressed to the San Francisco Recreation and Parks Department regarding proposed work at Lake Merced.

Game and are protected under the State Fish and Game Code (Section 3503.5). Removal or destruction of active raptor nests is considered a violation of the Fish and Game Code. The San Francisco peninsula is located along an important migratory route for raptors flying from as far north as Washington to as far south as Baja, Mexico[60]. Several raptor species migrate across zoo grounds. One raptor species, the red-shouldered hawk, is reported to occasionally nest in large trees at the Zoo[61,62]. Other raptors that could potentially nest at the Zoo include barn owl, great-horned owl, American kestrel, and red-tailed hawk.

IMPACTS

Criteria for assessing potential impacts are described below for construction-related and temporary disturbances.

Construction-Related Impacts. Substantial reduction or adverse modification of a habitat of recognized value to a sensitive plant or wildlife species or to an individual of such species would be considered a significant impact.

Temporary Disturbance Impacts. Biological resources at the Zoo are accustomed to routine disturbance from intense recreational use and ongoing Zoo maintenance activities, and are therefore assumed to be less sensitive to temporary disturbances such as noise, dust, and vehicle traffic than biological resources that occur in more rural or pristine environments. Therefore, temporary disturbance would be considered significant only if the disturbance represented a substantial increase in existing disturbance conditions, was prolonged (e.g., long-duration increase in noise levels), or resulted in permanent alteration of the natural functions of a habitat of recognized value to a sensitive plant or wildlife species (e.g., permanent loss of foraging or nesting habitat, hydrological functioning).

Summary of Impacts on Important Habitats and Sensitive Plant Species

The Zoo does not support important natural habitats, therefore no impact is expected to result from project implementation.

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59 Robinette, David. Assistant Director/General Curator, San Francisco Zoo. Field Meeting on October 31, 1996

60 Smith, S.G. 1994. Golden Gate Park Master Plan Draft Background Report - Forest and Wildlife. Prepared for San Francisco Recreation and Parks Department. Unpublished report dated March 1994.

61 Robinette, ibid.

62 White, ibid.

Summary of Impacts on Sensitive Wildlife Species

The Zoo occasionally supports two naturally occurring sensitive wildlife species, nesting red-shouldered hawks and nesting saltmarsh common yellowthroat. None of the other species considered in this report as having potential to occur in the region are known to occur at the Zoo, therefore no impact is expected to result from project implementation.

These two nesting species are acclimated to ongoing recreational and maintenance disturbances associated with the Zoo. The incremental increase in noise disturbance resulting from proposed Zoo improvements (e.g., construction of new project facilities and demolition of other project facilities) is not expected to result in significant impacts on nesting saltmarsh common yellowthroat or red-shouldered hawk because anticipated noise disturbances are not expected to be prolonged or represent a substantial increase over existing noise levels. Impacts to these species from facilities improvements and Zoo reforestation are discussed below.

Implementation of the Zoo Forest Management Plan has potential to harm or harass nesting saltmarsh common yellowthroat by removing dense vegetation used by the species at the Friendship Lagoon, in front of the bear exhibit, and at the lion and tiger grottos. Implementation of the Zoo Forest Management Plan has potential to harm or harass nesting raptors, including red-shouldered hawks by removing trees that support raptor nests. Large trees present at the Zoo could be used for nesting by several raptor species. The removal or destruction of active raptor nests is considered a violation of the California Department of Fish and Game Code (Section 3503.5).

MITIGATION MEASURES

The potential impact on biological resources would not be significant with the implementation of the following required mitigation measures.

To reduce the potential for impacts on nesting saltmarsh common yellowthroat, the following improvement measures would be implemented.

- Facility improvements in the vicinity of the Friendship Lagoon, bear exhibit, and lion and tiger grottos would be restricted to the non-breeding season (late October to early March). Proposed facility improvements would be reviewed, and modified as necessary to ensure that the existing vegetation cover and water used by the species is retained wherever possible. If facility improvements cannot be accomplished during the non-breeding season, a qualified specialist or zookeeper would identify and demarcate any active nests present in advance of construction activities. Construction areas would be surveyed during the breeding season (late March to early October) to identify active nests that could be affected by planned facility improvements. The specialist will determine suitable methods to

reduce or minimize impacts to nesting saltmarsh common yellowthroat, in consultation with the California Department of Fish and Game and the U.S. Fish and Wildlife Service (USFWS).

Suitable methods to reduce or minimize impacts include one or all of the following:

1. Establish buffer zones around active nests based on site-specific conditions,

2. Restrict construction activities with potential to harm or harass nesting saltmarsh common yellowthroat.

3. Prohibit dewatering and removal of vegetation until after adult saltmarsh common yellowthroat have abandoned the nest site and the young birds have fledged, as determined by the specialist or zookeeper.

The following improvement measures are intended to reduce potential for impacts on nesting raptors to a less-than-significant level.

- Reforestation efforts would be restricted to the non-breeding season (July to January). If reforestation cannot be accomplished during the non-breeding season, a qualified specialist or zookeeper would identify active raptor nests within the Zoo. Where active nests are located in trees scheduled for removal, the specialist will determine suitable methods to reduce or minimize impacts on nesting raptors through consultation with DFG and USFWS. Suitable methods to reduce or minimize impacts are likely to include one or all of the following:

    1. Wherever possible, tree removal activities throughout the Zoo will occur during the raptor non-breeding season (July-January).

    2. If removal of trees is unavoidable during the raptor nesting season (February through late June), a focused survey will be conducted by a qualified specialist or zookeeper prior to tree removal. All trees to be removed will be surveyed to identify any active raptor nests present.

    3. Where active nests are found, a minimum 500-foot buffer zone will be established around the active nest sites. Buffer zone may be adjusted at the recommendation of the qualified specialist or zookeeper, based on site-specific conditions. No tree removal activities will be undertaken within the buffer zone until young raptors have fledged or adults have abandoned the nest site (as determined by a qualified specialist or zookeeper).

I. GEOLOGY, TOPOGRAPHY AND GROUNDWATER

SETTING

Regional Geology

The City of San Francisco is located on the northern tip of the San Francisco Peninsula, within the California Coast Ranges geologic province. The Coast Ranges are a northwest trending series of ranges and valleys. The general geologic setting of the City is characterized by bedrock hills bounded by broad valleys underlain by unconsolidated deposits. The bedrock consists of consolidated rocks from the Franciscan Complex and the Great Valley Sequence of the late Jurassic and Cretaceous age.[63] The Franciscan Complex generally consists of graywacke (sandstone), shale, chert, greenstone, and melange; in certain places, serpentine, an asbestos-containing rock-type, is found within the shale matrix. The Great Valley Sequence generally consists of sandstone and shale. Bedrock outcrops in hilly areas account for approximately 24 percent of the land surface in San Francisco. The unconsolidated sediments comprise the seven groundwater basins within the City.[64]

On the west side of San Francisco, the unconsolidated sediments consist of the following units, described from the oldest (deepest) to the youngest (most shallow):

- The Merced Formation, consisting of Pliocene age shallow marine and estuarine deposits with thin interbedded muds and peats, some thicker beds are known to exist. Tilted fine-grained strata within this unit may impede horizontal groundwater flow.

- The Colma Formation, consisting of Pleistocene age fine-grained sand, silty sand, and occasional beds of clay as much as five feet thick. These materials were probably eroded from the Merced Formation and redeposited. The Colma Formation crops out in areas near Lake Merced.

- Dune sands, consisting of Pleistocene age well-sorted fine to medium sand. Prevailing westerly winds have swept the sand from Ocean Beach and Bakers Beach to locations throughout the City. This unit underlies more than half of San Francisco and can be up to 150 feet thick.

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63 Schlocker, J., Geology of the San Francisco North Quadrangle, California, *U.S. Geological Survey Professional Paper 782* p. 109p., 1974.

64 Philips, Steven P., Hamlin, Scott N. and Yates, Eugene B., 1993. Geohydrology, Water Quality and Estimation of Ground-Water Recharge in San Francisco, California, 1987-92. U.S. Geological Survey, Water Resources Investigations Report 93-4019. Prepared in cooperation with the San Francisco Water Department.

Local Geology and Topography

A geotechnical study for the Zoo's Infrastructure Master Plan project was completed in 1995.[65] The report found that most of the Zoo property is underlain by dune sands, ranging in thickness from less than 10 feet to greater than 40 feet. The dune sand is underlain by very dense sand, silty sands, and clay of the Colma Formation, then with sandstones of the Merced foundation. Franciscan Complex forms the bedrock in the area, approximately 600 to 1,000 feet beneath the surface. Much of the soil at the site, as determined by analytic testing, is classified as moderately corrosive.

The Fleishhacker Site is immediately underlain by artificial fill placed along the Great Highway between the Zoo and Lake Merced. In the vicinity of the Zoo, the thickness of the fill ranges from approximately two to over twenty feet. The fill is generally composed of sand, with occasional gravel, reworked from the wind-deposited sand dunes which blanket most of the Sunset District. The fill is underlain by loose to very dense dune sand with essentially no silt or clay.

The Zoo topography ranges in elevation from approximately 8 feet along the Great Highway to about 90 feet at the southwestern end near the armory. Most of the Zoo is flat at approximately 23-foot elevation and its surface soils are loose to dense sands and sitting sands.

Regional Seismicity

The distribution of earthquakes in northern California is strongly influenced by the major active faults in the region.[66] Figure 22 is a regional fault map showing active faults in the San Francisco Bay region. The active faults considered to have the greatest potential to cause damage in the City are the San Andreas Fault, Seal Cove-San Gregorio Fault, Hayward Fault, and Rodgers Creek Fault.[67] Table 21 summarizes these faults and the moment magnitude[68] of a characteristic earthquake that could occur along each fault. Characteristic earthquakes on these faults would be expected to cause moderate to heavy damage along

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[65] Kennedy/Jenks Consultants-AGS, Inc., An Association, 1995. Final Report, Infrastructure Geotechnical Study, Infrastructure Master Plan, San Francisco Zoological Gardens, San Francisco, California, June 1, 1995. A copy of this report is on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

[66] Faults are considered active based either on historical fault rupture or geologic evidence that clearly demonstrates rupture during Holocene time (approximately within the last 11,000 years).

[67] Association of Bay Area Governments, 1995. *The San Francisco Bay Area -- On Shaky Ground.* Association of Bay Area Governments, Publication Number P95001EQK, April 1995.

[68] The moment magnitude reflects the energy released by an earthquake. It is used by modern seismologists in place of the more familiar Richter magnitude because the Richter magnitude has difficulty differentiating the size of earthquakes with magnitudes greater than 7.5. The moment magnitude is proportional to the area of the fault surface that has slipped and to the length of the fault. Weak faults tend to generate earthquakes with moment magnitudes of 5 to 6, while stronger faults can store up enough energy to generate earthquakes of moment magnitude of 7 or more. The Loma Prieta Earthquake of October 1989 had a moment magnitude of 6.9.

Figure 22 Regional Fault Map

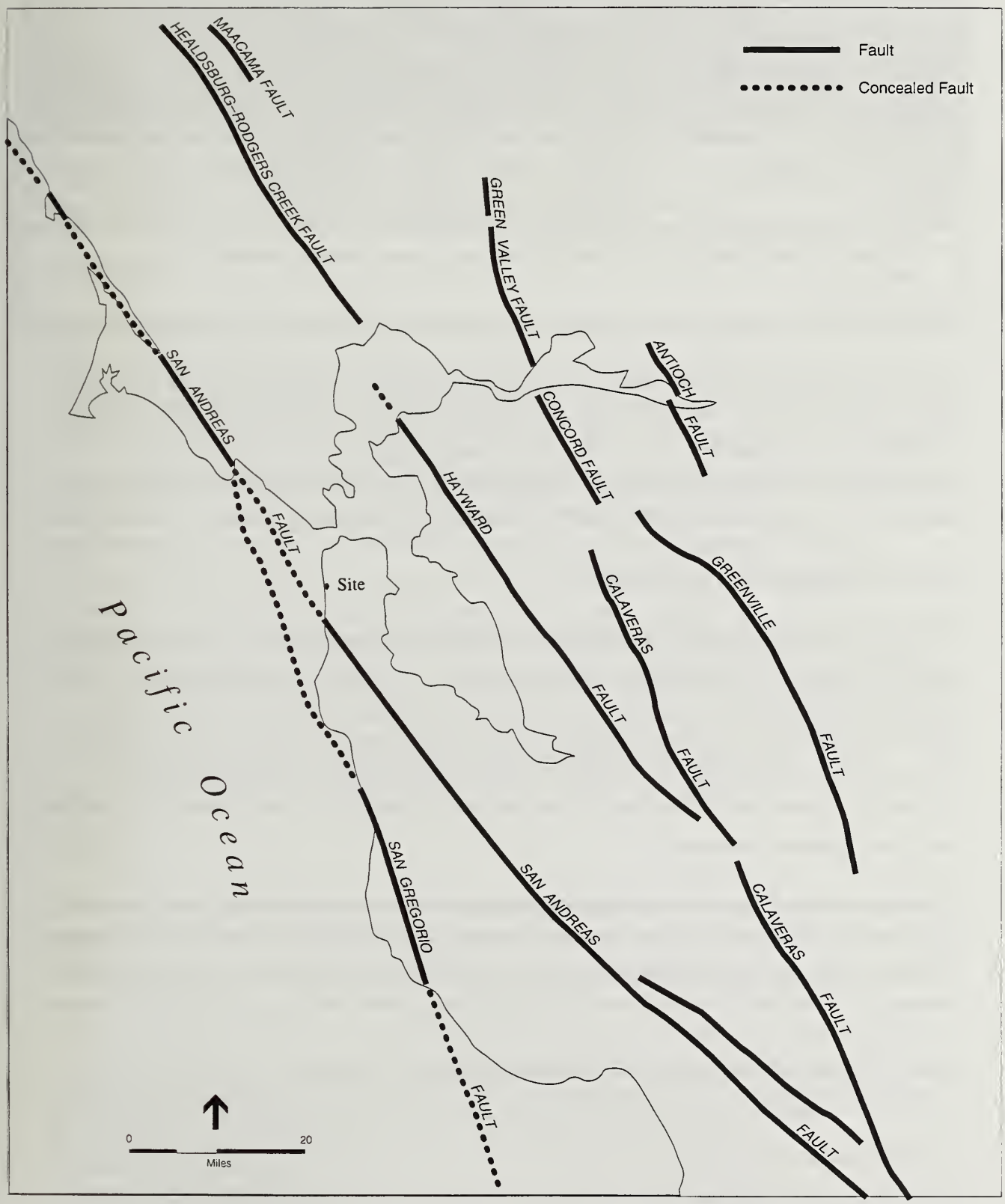

TABLE 21
DISTANCE BETWEEN FAULTS AND SF ZOO SITE

Fault	Approximate Distance to Site (Miles)	Maximum Historical Earthquake[1]		Maximum Credible Earthquake (Moment Magnitude)
San Andreas	2.5 (west)	8.0+	1838,1906	8.5
Seal Cove-San Gregorio	5.0 (west)	6.1	1926[2]	7.4
Hayward	18.0 (east)	7.0± 0.5	1836, 1838	7.5
Calaveras	29.0 (east)	6.5+ 0.5	1861	7.5

[1] Richter magnitude (approximate) and year of occurrence(s).
[2] Earthquake occurred in Monterey Bay and may have been generated by San Gregorio Fault or Monterey Bay Faults.

SOURCE: M&E, 1978

the Bay margin of San Francisco as well as non-structural damage throughout much of the rest of the City. Other active faults in this region which are expected to cause less damage in the City include the Calaveras, Concord, Maacama, Green Valley, West Napa and Greenville faults. Characteristic earthquakes on these faults would be expected to cause non-structural damage along the Bay margin. Damage would not be expected throughout the remainder of the City although unsecured objects may fall.

Local Seismicity and Geologic Hazards

The potential seismic hazards in San Francisco are principally strong ground shaking motion, liquefaction, densification, subsidence, soil lurching or lateral spreading, and minor slumping or slope instability. The potential for fault rupture in San Francisco is low because no known active fault cross the area; the nearest potential fault rupture, as delineated by Alquist-Priolo Studies Zone maps, is the San Andreas Fault located about three miles west of the City. Other hazards related to earthquakes that were considered but determined to be absent from the proposed project site are major landsliding, subsidence, and tsunami (seismic sea wave).[69]

The Loma Prieta Earthquake generally caused structural and non-structural damage in some portions of San Francisco. This level of damage is typical of moderate-sized earthquakes. Damage that occurred at distances of up to 50 miles from the epicenter is evidence that the proposed project may be adversely affected by earthquakes occurring on any of the region's major faults. An earthquake of similar or larger magnitude could occur again on the San Andreas, Hayward, Rodgers Creek or other active Bay Area faults. Other active faults in the region could produce smaller earthquakes.

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[69] URS Consultants/John A. Blume and Associates,*San Francisco Seismic Safety Investigation*, 1974.

Liquefaction occurs when a saturated soil, such as sand, is subjected to a shock and an increase in pore water pressure. The saturated soil loses a substantial amount of strength and may become liquid. Potential consequences of liquefaction include the loss of bearing capacity, differential settlement, lurching, lateral spreading, and increased lateral earth pressures. These can cause serious building foundation failures and naturally buoyant structures such as underground storage tanks may be raised above ground. Preliminary studies indicate that the entire eastern half of the Zoo is susceptible to the effects of liquefaction in the event of a maximum credible earthquake (8.7 on the Richter scale) , and it is assumed that the western half of the Zoo is equally susceptible.[70]

Groundwater

Groundwater data from a 1976 investigation of the Fleishhacker site at the western side of the Zoo by Harding Lawson Associates (HLA)[71] reported that water was encountered at depths between 5.6 and 8.6 feet above mean sea level (msl) in observation wells. Static groundwater level in a shallow observation well along the Great Highway at the neighboring Oceanside WPCP construction site was reported to be 5.5 feet above msl in December 1991.[72] Groundwater observations at the Oceanside WPCP site also indicated that the groundwater gradient is directly westward to the Pacific Ocean. Some of the same HLA wells monitored in 1976 were again monitored in 1992-1993 during the Lake Merced Transport construction project and found to have groundwater levels ranging from 6.4 to 8.3 feet above msl. An observation well (a static piezometer) was installed at the northwest corner of the Fleishhacker pool site (immediately east of the Westside Pump Station berm) for monitoring dewatering effects of the Lake Merced Transport construction project. After dewatering ceased, water levels in the observation well rose to 3.9 feet above msl.[73] Ground surface elevation in the center of the Fleishhacker pool is approximately 6.7 feet above msl. Therefore, based on monitoring data, depth to groundwater is likely to be approximately one to two feet below the ground surface in the center of the site.

IMPACTS

Because of project site conditions, some potential geologic impacts can be eliminated as non-existent or negligible at the project site. These include significant changes in topography; hazards of landslides or mudslides; effects on deposition or erosion of beach sands; and effects on unique geologic features.

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[70] Rutherford & Chekene, 1989. *Preliminary Investigation - Schematic Design, Phase 1 Zoo 2000 Project*, April 1989. Kennedy/Jenks Consultants-AGS, Inc., An Association, 1993. Technical Memorandum No. 1, Utility Assessment/Conceptual Planning, Infrastructure Master Plan, San Francisco Zoological Gardens, San Francisco, California. Copies of these reports are on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

[71] Harding Lawson Associates, *Westside Transport Soil Investigation, Phase I*, prepared for City and County of San Francisco, Department of Public Works, 1976.

[72] Unpublished groundwater level monitoring data collected by Orion Environmental Associates, 1990.

[73] Unpublished groundwater level monitoring data collected by Orion Environmental Associates, 1991-1993.

In the event of an earthquake, the Zoo site could be subjected to ground shaking, soil liquefaction, soil densification and subsidence, soil lurching, and lateral spreading. The potential for seismic ground shaking, soil liquefaction, and soil densification was addressed in the geotechnical reports prepared for the Infrastructure Master Plan project and the Recycled Water Master Plan project. The impacts related to these seismic hazards are discussed below. The potential for soil lurching and lateral spreading would need to be evaluated in a design-level geotechnical report for building site.

Seismic Ground Shaking

The development of the *SF Zoo Master Plan* would increase the number of people (workers and visitors) present at the site over time. The Zoological Society estimates that 90% of the visitors to the Zoo are either residents of the City or peninsula cities, and therefore would be exposed to the same earthquake risk whether or not they were visiting the Zoo. The average number of daily visitors to the Zoo is expected to increase from approximately 4,000 to between 7,000 and 10,000, and peak-day visitor numbers are projected to increase from about 15,000 to 20,000 and to as many as 30,000. In addition, the number of Zoo employees and volunteers is projected to increase from the current 730 to approximately 1,010 (although not all employees and volunteers are on site at the same time).

The greatest earthquake hazards would occur if a major earthquake struck during regular business hours when visitors were present, especially during peak days. The overall effects and related hazards would vary depending on when a major earthquake occurs. Because of the age of the existing buildings at the Zoo, some may not meet seismic reinforcement standards under the current Building Code and, therefore, may expose the occupants to a higher risk than associated with newer buildings. Unreinforced concrete structures include: The Lion House, Pachyderm Building and the Aviary. Under the Master Plan, these buildings would be demolished and replaced with new buildings which would meet current building code requirements and developing design concepts, reducing the overall risk.

Severe ground shaking such as associated with the San Andreas 1906 earthquake could cause major structural damage and injury at the Zoo. Because San Francisco, with the exception of the bedrock outcrop areas, is underlain by unconsolidated sediments, the City as a whole could experience strong seismic shaking during an earthquake on an active fault in the region. Structures built on areas with thick deposits of soft sediments would likely experience stronger shaking due to the amplification of the shaking intensities.

Peak ground accelerations measured during the 1989 Loma Prieta earthquake ranged from 0.08g to 0.24g in the City and County of San Francisco. Average values for the maximum estimated bedrock acceleration for the San Francisco area ranges from 0.48g to 0.70g. A maximum credible earthquake occurring on the San Andreas fault (approximately two miles from the Zoo) would generate a peak bedrock acceleration of 0.67g and a peak ground surface acceleration of approximately 0.52g at the

project site. The *San Francisco Building Code* requires that structures be designed to withstand peak ground accelerations of 0.4g. All projects built under the *SF Zoo Master Plan* would be built to this standard which would reduce the potential for damage due to seismic shaking.

Seismic Liquefaction

Soil liquefaction is a phenomenon in which saturated (submerged) cohesionless soils can be subject to a temporary loss of strength due to the build-up of excess pore water pressure, especially during cyclic loadings such as those induced by earthquakes. In the process, if not confined, the soil acquires a mobility sufficient to permit both horizontal and vertical movements. The major damage associated with the Loma Prieta earthquake that heavily damaged structures in the Marina District was due to liquefaction.

Subsurface analyses indicate that the entire eastern half of the Zoo is susceptible to liquefaction when subjected to a maximum credible earthquake, and an area along the water fowl/flamingo lake is susceptible to liquefaction even during an earthquake of magnitude 6 or less (this area corresponds to the trace of an old drainage channel which connected Lake Merced to the ocean).[74] The analyses indicate potentially liquefiable soils are present from the ground surface to a depth from 10 to 20 feet below the existing ground surface. The potential consequences of liquefaction in these areas include lateral spreading, lurching, bearing capacity failure, increased lateral earth pressures, settlement, and flotation of underground structures. These effects and their severity depend upon the detailed soil characteristics, the types of structures, and the severity of the earthquake, and they could occur during or following an earthquake. For planning and preliminary design purposes, and to ensure the most conservative analysis, it is assumed that the western half of the Zoo site is also subject to the effects of liquefaction.

Construction Impacts

Construction of buildings, exhibits, roadways, walkways, parking areas, and other improvements would disrupt and displace site soils, increasing the potential for water and wind erosion of graded soil and imported fill. This, in turn, would increase the potential for discharge of sediments into storm drains and surface waters.

Because the project site is relatively flat, erosion hazards are low. Over the phased construction periods, the Zoo may excavate for purposes of either building construction, or site grading (no specific excavation plan is available, and subgrade improvements are not identified in the Master Plan). Excavation would occur in phased stages of construction and all excavated soils would be used on-site for landscaping. However, the potential remains that disturbed soils, stockpiles of excavated soil or imported soil,

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[74] Rutherford & Chekene, 1989. *Preliminary Investigation - Schematic Design, Phase I Zoo 2000 Project*, prepared for the San Francisco Zoological Society, April 1989. Copies of this report are on file and available for public review at the San Francisco Planning Department, 1660 Mission Street.

surcharge material (if employed) or other loose soil would be directed into storm drains, potentially clogging them, or becoming washed off of the site. Eventually these materials would be discharged into Lake Merced or the Pacific Ocean.

To prevent or minimize the potential impacts of liquefaction, special seismic resistant design would be required for some structures, and soil densification, or removal and treatment of liquefiable soils would be required.

- Detailed, site-specific geotechnical investigations shall be conducted for all proposed project sites by a qualified geotechnical consultant prior to final design of proposed facilities. The geotechnical investigations and studies will include field exploration, subsurface exploration, laboratory testing and engineering analysis to evaluate the following: soil and rock stability; slope stability; on-site drainage for subsurface structures; soil characteristics for corrosivity, permeability, liquefaction and densification; soil lurching and lateral spreading; differential settlement; and foundation support and design. The studies will include development of construction, excavation, and design measures required to ensure public safety, structural integrity, and protection of existing structures during construction and operation. Precautions, such as underpinning or shoring, as determined by site-specific geotechnical investigations, may be necessary to prevent settlement of existing nearby structures during and after construction. The project sponsor will implement all recommendations of the geotechnical investigations and studies during final design and construction of proposed facilities.

- The Zoo's evacuation and emergency response plan will be periodically reviewed and updated by Zoo management, in consultation with the Mayor's Office of Emergency Services, to insure coordination between the City's emergency planning activities and implementation of the Zoo Master Plan.

- Employ best construction methods to reduce the potential for silt to enter the stormwater collection systems. These methods may include use of haybales and drainage ditches to divert runoff in construction areas into temporary siltation basins; performing as much foundation construction as possible during the dry season (May to October); watering of soils prone to wind erosion during construction; and covering stockpiles of soil with impervious tarpaulins. Surcharge materials (if employed) should be stabilized by appropriate methods, such as use of jute-netting or hydroseeding to ensure that it will not erode excessively.

MITIGATION MEASURES

With regulatory standards followed in the construction of the project, no additional mitigation measures would be required.

J. HAZARDS

SETTING

This section describes the hazardous materials/wastes regulatory framework and existing conditions at the San Francisco Zoo that could be affected by implementation of proposed Zoo Master Plan projects. Information is principally based on previous studies and documentation provided by the project sponsor, the San Francisco Zoological Society.

Definition of Hazardous Material/Waste

Hazardous materials/wastes are generally considered substances with certain chemical or physical properties which may pose a substantial present or future hazard to human health or the environment when improperly handled, stored, disposed or otherwise managed. In general, discarded, abandoned, or inherently waste-like hazardous materials are referred to as hazardous wastes. A material is hazardous waste if it poses a threat to human health.[75] Hazardous materials and hazardous wastes are defined in the *California Code of Regulations*, Title 22, Section 66260 through 66261.10. As defined in Title 22, hazardous materials are grouped into four general categories: toxic (causing human health effects); ignitable (having the ability to burn); corrosive (causing severe burns and damaging materials); and reactive (causing explosions and generating toxic gases). A hazardous waste can be present in a liquid, semi-solid, solid, or gaseous form.

Regulatory Framework

Hazardous materials and hazardous wastes are controlled by federal, state, regional and local regulations, with the objective of protecting public health and the environment. In general, these regulations provide definitions of hazardous substances, establish reporting requirements, set guidelines for handling, storage, transport, remediation and disposal of hazardous wastes, and require health and safety provisions for both workers and the public. Sites that comply with hazards regulations are identified on periodically updated lists at the federal, state, and local levels.

Agencies enforcing these regulations in San Francisco include: the U.S. Environmental Protection Agency (EPA); the Department of Toxic Substances Control (DTSC), Cal EPA (state); the Bay Area Air Quality Management District (BAAQMD) (regional); the San Francisco Department of Public Health (DPH),

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75 California Code of Regulations, Title 22, Section 66261.2.

Bureau of Toxics, Health and Safety Services and the Bureau of Environmental Health Management (local); and the San Francisco Fire Department (SFFD).[76]

Site History

The original Zoo began around 1925 at the Fleishhacker Playfield, on previously undeveloped sand dunes. Significant periods of construction at the Zoo occurred during the late 1920s, the 1930s, and the 1960s.

The area occupied by the San Francisco Zoo and its environs has not historically contained industrial or commercial uses typically associated with the generation of hazardous materials or hazardous wastes. Therefore, the potential for exposure of people or the environment to pre-existing hazards during implementation of the Zoo Master Plan is inherently low. However, building materials containing hazardous materials were used in the construction of some older buildings within the Zoo, and have the potential to pose public health hazards. These include asbestos, polychlorinated biphenols (PCBs), mercury, and lead. There is also a 1000-gallon, above-ground gasoline storage tank located near the employee/service entrance on the south side of the Zoo.

The Zoo also uses hazardous materials in the operation and maintenance of the Zoo exhibits. Materials such as paints, solvents, fertilizers, pesticides and fuel for machinery and vehicles are used in day-to-day Zoo operations and maintenance activities.

Potentially hazardous materials are stored at the Zoo hospital and maintenance yard and are registered with the City and County of San Francisco, Department of Public Health (DPH). Registered hazardous materials stored at the maintenance yard and hospital include:[77]

- the animal hospital and Animal Resource Center (oxygen, chlorine);
- an electrical shop (e.g., moisture repellent, degreaser, coating);
- a paint shop (e.g., paints, resin, solvent, sealer, cleaning agents, catalyst, varnish and stain, pool chlorine, floor finish, rust remover, etc.);
- a carpenter shop (e.g., adhesives, resins, vehicle fuel and oil);
- a stationary engineers shop (e.g., lubricating oil, vehicle fuel, oxygen and acetylene gas);

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[76] A description of the major hazardous material and waste regulations and the agencies responsible for their implementation is available in the background files at the Office of Environmental Review, Planning Department at 1660 Mission Street.

[77] City and County of San Francisco, Department of Public Health, Bureau of Toxics, Health & Safety Services, Hazardous Materials Division, "Hazardous Materials Registration Certificate," CCSF/ Rec & Park Maintenance, April 28, 1995 - April 28, 1997.

- a plumbing shop (e.g., oils, plastic pipe cement);
- a main warehouse/storeroom (e.g., cleaning agents, floor wax, tree sealer, oxygen and acetylene gas);
- a hazardous waste storage shed (used motor oil, batteries, empty paint cans).

When properly handled, stored, disposed and otherwise managed, these materials are not considered hazardous to workers or the public. Each of the maintenance shops has, or is preparing, an emergency response plan as required by the San Francisco Health Code and State regulations. The Zoo does have an emergency response/evacuation plan on file with DPH.

In addition to receiving emergency response training, Zoo maintenance and operations workers are trained by the San Francisco Recreation and Park Department Industrial Hygienist regarding sites of known hazardous materials in the Zoo, and the proper routine handling of hazardous materials such as pesticides. Standard operating procedures manuals have been developed for the Zoo's Pesticide Spray Program and Infection Control Program.[78]

If hazardous materials are present at the proposed construction of Zoo Master Plan project sites, special measures may be required to protect human health and the environment during demolition. Specific handling and disposal methods may also be required for excavated soil.

IMPACTS

Some older buildings at the project site could contain hazardous materials. These materials could cause adverse health impacts if human exposure is permitted during demolition or renovation. The most common hazardous materials found in older buildings are asbestos and polychlorinated biphenyls (PCBs).

Several Zoo buildings are known to contain asbestos.[79] However, the fact that a building contains asbestos does not necessarily mean the building poses a hazard. In many cases, the asbestos within buildings is inaccessible, or else it is sealed within another material and thus unable to present an exposure hazard. Upon building renovation or demolition, however, asbestos fibers could be released unless proper precautions are taken. State regulations (Section 19827.5 of the California Health and Safety Code) limit emissions of asbestos from asbestos-related demolition or construction activities, and specify precautions and safe work practices that must be followed to minimize the potential release of asbestos fibers, including: training, licensing, medical examinations, and monitoring of employees

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78 Hilary Stoermer, Assistant Industrial Hygienist, San Francisco Recreation and Park Department, personal communication, October 31, 1995.

engaged in activities that could disturb asbestos; specifying precautions and safe work practices that must be followed to minimize the potential release of asbestos fibers; and requiring notice to federal and local government agencies prior to beginning renovation or demolition which would be capable of disturbing asbestos. If any friable asbestos-containing materials are identified, legal and adequate abatement practices would be implemented, prior to demolition or renovation.

PCBs are another potential hazardous class of compounds found in older buildings. While manufacture of PCBs has been banned since 1977, some older pieces of electrical equipment still contain PCBs. Various pieces of PCB-containing equipment are located in buildings at the Zoo.[80] In addition to asbestos and PCBs, older buildings at the Zoo are suspected of containing lead based paint, which can pose a human health hazard, especially to young children, if ingested.

Each structure to be renovated or demolished shall be inspected by a qualified environmental specialist retained by the Zoo for the presence of asbestos, PCBs, lead, and other hazardous materials. If found, these materials will be managed as required by law and according to Title 8, Section 1529 of the California Administrative Code.

Actions would include asbestos surveys and abatement, removal of old transformers, and inspections for chemical spills, contamination, and lead within and around structures. Asbestos removal contractors must be certified as such by the State Contractors Licensing Board. Hazardous materials in buildings would be properly identified and abated or removed prior to demolition or renovation.

Removal of hazardous building materials at the project site (if determined to be present) would reduce the health threats posed by hazardous wastes at the site and prevent workers and the public from encountering such materials in the event of any future excavation at the site. Proper handling and disposal of contaminated materials would protect the environment and preempt potential health, safety, and environmental effects related to the contamination.

MITIGATION MEASURES

Regulatory standards would be followed in the handling and disposal of hazardous materials. Therefore, no significant impacts would occur and no mitigation measures would be required.

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79 Marla Jurosek, Assistant Director Operations and Capital Projects, personal communications, January 1997.
80 Ibid

K. CULTURAL RESOURCES

This section of the EIR addresses historic properties and archaeological resources for the entire Zoo Master Plan site, including the expansion area to the west of the existing Zoo. While analyses of site specific development projects generally rely on existing information regarding historic architectural resources, historic architectural surveys are generally conducted as part of the analysis of planning documents. Because the *SF Zoo Master Plan* provides program level direction to guide future investments at the Zoo, an Historic Landscape and Architecture Survey Report was prepared as a technical background study for this EIR.[81] In addition, a site visit was conducted with representatives of the Landmarks Preservation Advisory Board, and the Planning Department staff, and the historic property consultants on November 8, 1996.

RESEARCH METHOD

Archival research was conducted primarily at various libraries of the University of California, Berkeley, the San Francisco Zoo's archives and the archives of the San Francisco Recreation and Park Department at McLaren Lodge in Golden Gate Park. In addition, several individuals knowledgeable about the history of the San Francisco Zoo were interviewed and several detailed surveys of the structures and landscape features at the San Francisco Zoo were conducted during May and June, 1996. These surveys included photographing and physically examining all buildings and landscape features over fifty years old, noting later alterations, assessing overall historic integrity, and writing detailed descriptions.

Buildings and landscape features over fifty years old were evaluated as potential historic resources under the eligibility criteria of the California Register of Historical Resources. While no official designation or determination has been made, the background study identifies the San Francisco Zoo as potentially eligible for listing under Criterion A of the California Register because of its significance as a social, educational and recreational institution in the history of San Francisco. In general, an historic resource is eligible under criterion A if it has associations with historic trends that have made significant contributions to the broad patterns of our history. For almost 70 years, the Zoo has educated people about wild animals while also providing the city with a park for family outings, thereby providing important social, educational and recreational opportunities for the entire Bay Area. The building of the "second" Zoo was also one of the largest Works Progress Administration (WPA) projects in San Francisco, and thus a significant local source of employment during the depression. The background study identifies seventeen structures and landscape features constructed between 1925 and 1940 that may contribute to the potential San Francisco Zoo

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[81] Historic Landscape and Architecture Survey Report, July 31, 1996, by Laurence H. Shoup and Ward Hill. This report is available for review at the Planning Department, 1660 Mission Street, File 95.469E.

Historic District. Only two of the buildings, the Aviary and the Lion House, which are strong examples of the Moderne Style, appear individually to be potentially eligible for the California Register under Criterion C.[82]

SETTING

Historic Landscape Design And Buildings

The history of the San Francisco Zoo conforms in many ways to the evolution of zoos generally, and the principle that zoos were often redesigned to keep abreast of new ideas on the care and management of animals. There have actually been three generations of San Francisco Zoos, with a fourth now in the offing. The first, now almost entirely gone, was a menagerie of caged animals, together with a small number of buildings. The second, much of which still exists, was largely a series of moated enclosures. The third, which also still stands, is a combination of the first two zoos, with animals from the same part of the world grouped together. The fourth, now proposed for development, features wild animals in more natural habitats, and promotes global conservation through education and the propagation and management of wildlife.

This section of the report describes the extant landscape design and buildings associated with each of the three periods of the zoo's development. Only the surviving features dating from the 1920s and 1930s (the periods of the first and second zoos, respectively) that may be affected by the proposed Zoo Master Plan projects are described in detail. The location of the various buildings and features described in this section are indicated on Figure 23.

The First Zoo

The surviving features of the first San Francisco Zoo (the 1920's) are in the vicinity of the Mothers Building, which is the most important building surviving from this first period in the Zoo's development (Figure 24). The Mothers Building (constructed in 1925) was listed on the National Register of Historic Places on December 31, 1979 as the Delia Fleishhacker Memorial Building. The building was originally constructed as a memorial to Herbert Fleishhacker's mother, Delia Fleishhacker, and was used as a resting place for mothers and children visiting the playground and zoological gardens. The Mothers Building has interior murals and exterior mosaics by WPA artists. It has been used as a visitor center and is currently a gift shop selling Zoo related merchandise to visitors. Other buildings from the period of the first Zoo, near the main entrance, are the small snack building southeast of the Mothers Building, a restroom building east of the snack building, the carousel southwest of the snack building, and the pump

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82 California Register Criteria Eligibility for Historic Properties. Under Criterion C, a property is significant if it embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the name of an important creative individual, or possesses high artistic value.

Figure 23 Location of Architectural Resources Evaluated

Source: Kennedy/Jenks Consultants - AGS Inc. An Association

Figure 24 Mothers Building

Figure 25 Snack Building

house (originally known as the "heating plant") a couple of hundred feet west of the Mothers Building (Figures 25, 26, 27). Three "first zoo" buildings exist at the south side of the Zoo: the Zoo Commissary, a public restroom, and the Zoo Director's House (Figures 28, 29, 30). These three buildings, today surrounded by new "third zoo" exhibits, are not contiguous to the main area of the first zoo near the Mothers Building.

The principal landscaping features surviving from the first Zoo are the open lawn area (in front of the Mothers Building) with a curving path around its perimeter. A small playground (with modern equipment) occupies an area on the south end of the lawn where the first Zoo originally had a considerably larger children's playground.

Three Mediterranean style buildings surviving from the first Zoo have textured stucco exterior walls and red tile roofs compatible with the style of the 1925 Mothers Building:

The Snack Building

The small (approximately 30 by 15 feet), octagonal shaped snack building has a prominent, moderately pitched, hipped roof covered with red, terra cotta tiles (Figure 25). The wood-frame structure is covered with textured stucco. Italian Renaissance style medallions in cast concrete are located on the main facade between the snack counter openings. The original window frames have been replaced with modern aluminum frames.

The Restroom Building

This small (about 25 by 25 feet) Mediterranean Revival building houses men's and women's rest rooms (Figure 26). The building has a gently pitched roof covered with red, terra cotta tiles and is a stud-wall, wood-frame construction on a perimeter concrete foundation. The exterior walls are covered with a heavily textured stucco and the small, wood sash casement windows have exterior bars. A wall with a curved and notched top projects from the building at the entrance to the individual restrooms.

The Pump House

The single-story pump house is a wood-frame, stucco building (approximately 90 x 40 feet) consisting of two, parallel sections - one with a flat roof and the other with a gable roof (Figure 27). The roof of the gabled section (converted into a restroom in recent years) is covered with red, terra cotta tiles and has a molded cornice, while the flat roof section has a red tile parapet only. A recent concrete ramp has been constructed in front of the building (east facade). The building has a single, round-arch opening on the south facade, and a number of one-over-one, wood-sash, double-hung windows on the other facades.

The other structures from the first Zoo affected by implementation of the *SF Zoo Master Plan* are:

Figure 26 Public Restroom

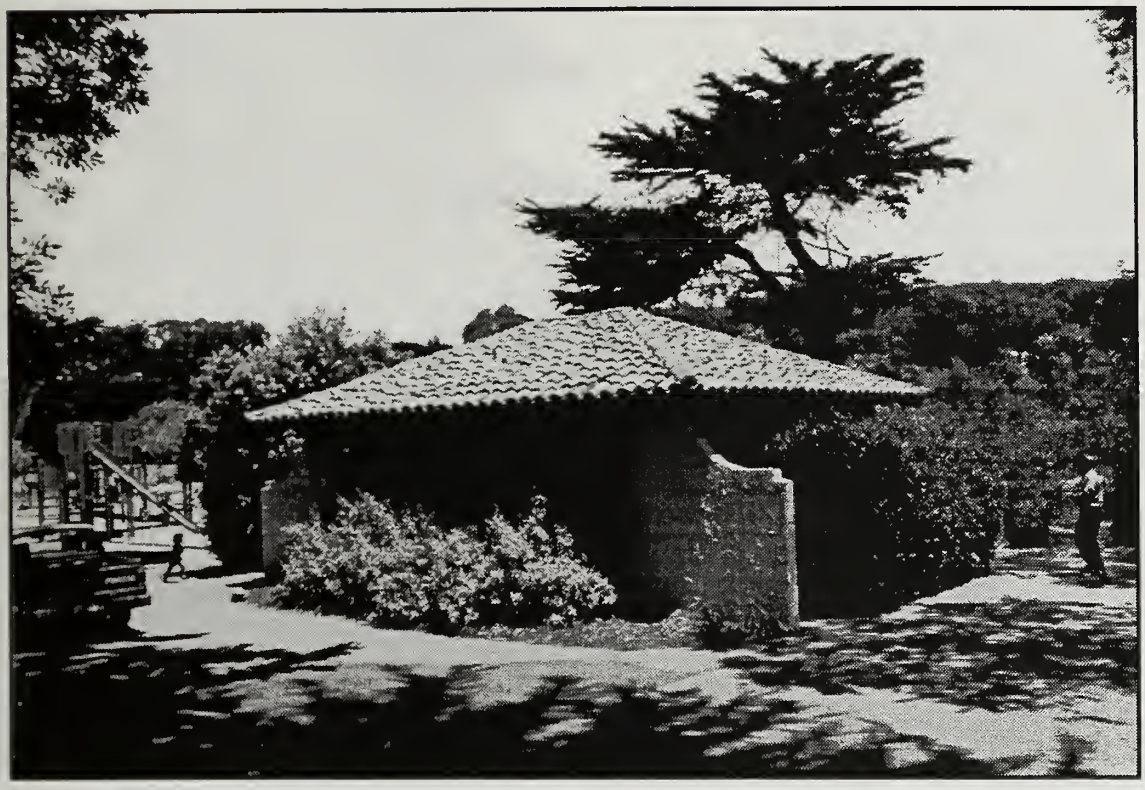


Figure 27 The Pump House

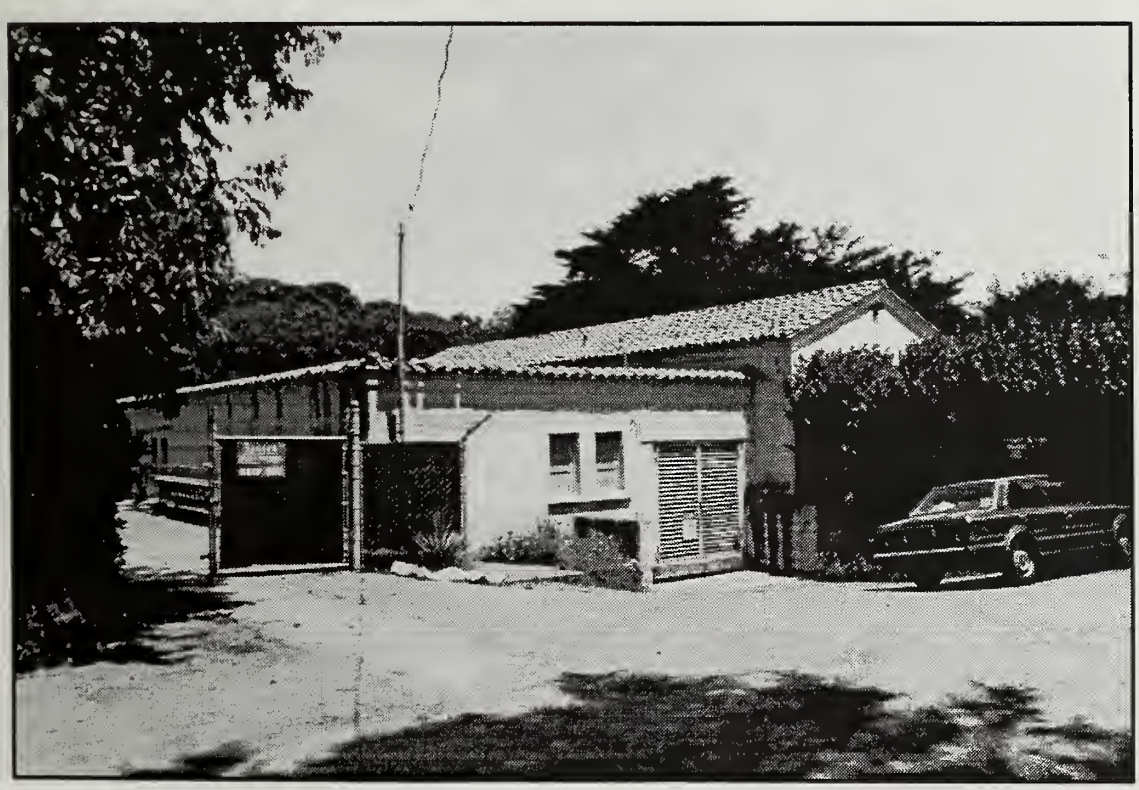


Figure 28 Commissary

Figure 29 Public Restroom

Figure 30 Zoo Director's House

Figure 31 Landscaping in the Vicinity of the Bear Dens

The Commissary

The original Zoo Commissary is a concrete structure with red tile roof, located adjacent to the existing hospital. The building style is Mediterranean Revival with a gently pitched roof. It houses food production and food storage facilities for the Zoo.

The Zoo Director's House

The Zoo Director's House is a single story stucco building located near the south entrance of the Zoo. The former residence facility has been converted to offices and meeting space. It has a composition roof.

The Second Zoo

Lewis Hobart's 1936 plan for the San Francisco Zoo combined an informal area of curving, picturesque paths (from the Friendship Lagoon to the paddock area) with a more formal, axial arrangement of buildings and landscape features in the vicinity of the Lion and Pachyderm Houses. The landscape plan included a wall of eucalyptus trees around the zoo's perimeter along Sloat Boulevard and Herbst Road, providing an enclosure of greenery separating the Zoo environment from the outside city. Inside this enclosure of large eucalyptus, the trees planted along the paths in the zoo exhibit area are smaller, deciduous varieties. Landscaping in the vicinity of the bear dens is shown on Figure 31. The Hobart plan included an extensive waterway of lakes and joined the Friendship Lagoon to a smaller lake in the vicinity of the paddocks (Figures 32 and 33). Three bridges cross the waterway from the Aviary to the eastern end of the bear dens. Two parallel pathways follow the curve formed by the Aviary, bear dens and paddocks. Four other curved paths, perpendicular to the two main paths, pass through the paddock area, converging at the circular fountain at the eastern end of the main plaza. The circular fountain is the central design element of Hobart's plan where the plan's formal and informal parts merge together.

West of the area of curving paths and natural plantings, Hobart designed the more formal area of the Zoo around a central plaza with a long, rectangular pool through its center (Figure 34). At the eastern end of the pool is a large, circular fountain, and at the western end was a circular pool for turtles. A cross axis to the main axis formed by the plaza and the pool runs from the oval shaped south entrance area, through the circular fountain, to the oval shaped area where Monkey Island and its surrounding water moat were originally located. The large, circular fountain at the east side of the plaza pool is situated in the center of this ancillary axis (Figure 35). A pair of small mammal grottos flank each side of the large circular fountain and a stairway, flanked by lion statues, leads from the fountain to the paddock area (Figure 36). On each side of this plaza are the two largest, most monumental buildings in the zoo - the Lion and Pachyderm Houses. The formality of the design of this area was accentuated by the two parallel rows of small trees that flanked the length of the pool. The trees in the plaza were removed a number of years ago. The rectangular pool has recently been renovated as a penguin pool, and the smaller pond on the pool's

Figure 32 Friendship Lagoon

Figure 33 Pond in Paddock Area

Figure 34 Central Pool

Figure 35 Fountain and Allee of Trees (view from the south)

Figure 36 Fountain and Central Plaza

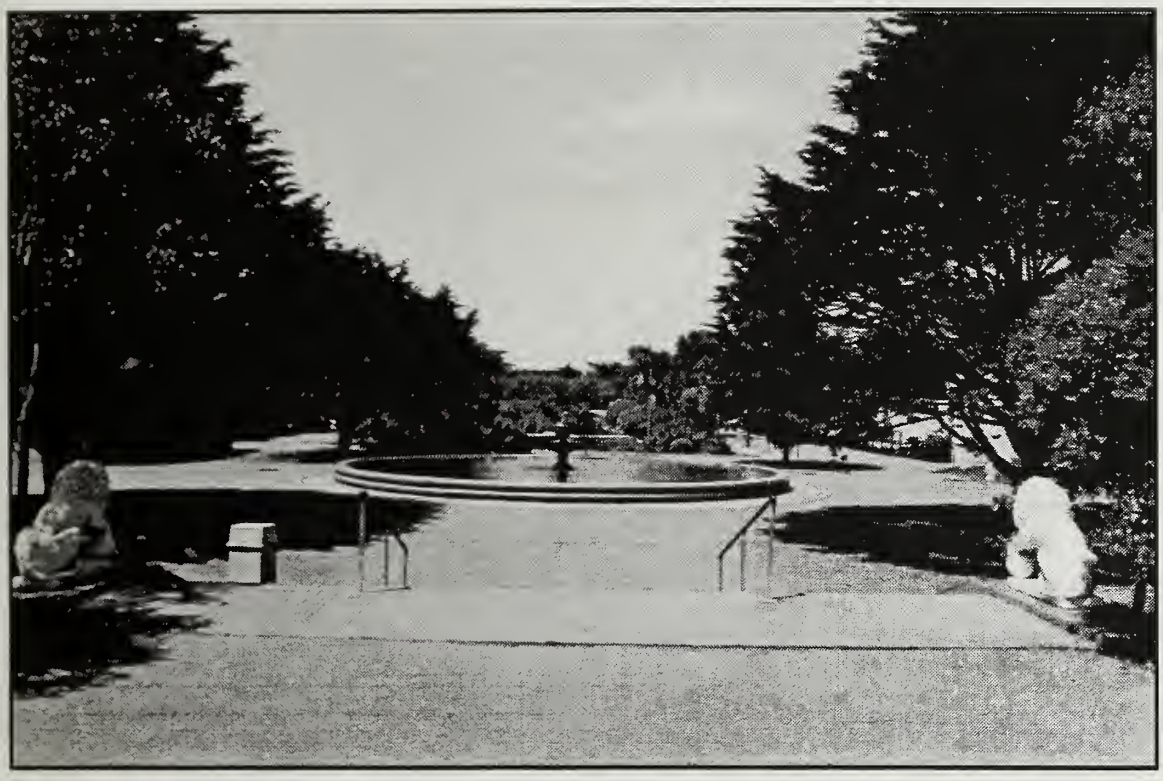


Figure 37 Stone Entryway off Sloat Boulevard

western end has been extensively altered for an otter exhibit. Monkey Island was demolished in 1995, and the Island has since been left undeveloped.

Landscape features not shown on Hobart's plan are the existing extensive stone walls built at the main entrance to the Zoo at Sloat Boulevard (Figure 37). Apparently, after Hobart had finished his plot plan, the location of the main entrance to the Zoo had changed. WPA photographs show workers constructing these entrance walls in the 1930s, and undoubtedly this area of the "second zoo" was also designed by Lewis Hobart.

The Aviary

The Aviary is set in an area of large, mature trees and adjacent to the large aquatic bird pond (Figures 38 and 39). The Aviary building is divided into three areas : the single story public space, a multi-story interior flyway and a contiguous, steel-frame outdoor flyway. The Aviary is a reinforced concrete structure on a perimeter concrete foundation. The exterior concrete walls are covered with smooth plaster.

Projecting from the Aviary's south facade, the single story public space has pairs of double, wooden doors flanked by simple fluted pilasters at its east and west ends (Figure 38). At the base of the pilasters is a narrow band of dark tiles continuing to the base of the windowless south facade. A series of low concrete seats project from the south facade. Recessed into the building, the blue paneled doors are below an angled, stepped ceiling and recessed panels (Figure 39). The doors of the Aviary open into a small vestibule (about 16 by 19 feet) connecting to the main public area, a long, free span space (34 by 90 feet) with a floor of hexagonal, terra cotta tiles. Built-in concrete seats, covered with green and blue decorative Spanish tiles, are located at the end of the public space. The stone wall planters are later additions. The interior flyway is a concrete frame structure with a steel truss, gable roof covered with asphalt roofing paper. The flyway is separated from the public space by a low, tile-covered wall. Except for the windowless north facade, the interior flyway is enclosed on three sides with large areas of glazing (multi-light, steel frame windows). A small, concrete service area projects from the north side of the interior flyway. The west facade and east facade of the indoor flyway have large, steel sash windows divided into frames.

The Seal Pool

The seal pool is about 50 feet east of the Aviary's outdoor flyway (Figure 40). An irregular shaped area, the seal pool has a low chain link fence around the perimeter of the moat separating the enclosure from the public area. The enclosure itself is an open, concrete and steel structure with a pool on the west side, adjacent to a flat concrete sunning area. The back section of the enclosure is concrete, imitation stone.

Figure 38 Aviary - West Facade

Figure 39 Aviary - East Entrance

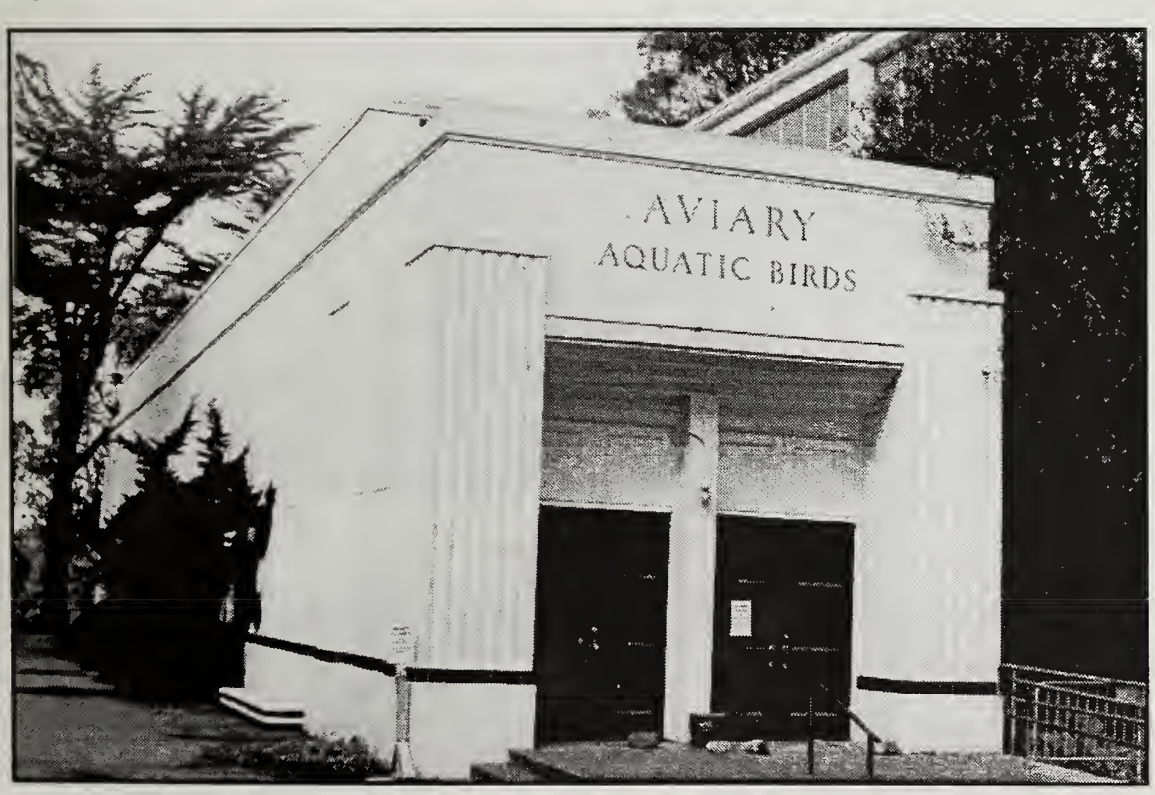


Figure 40 Seal Pool

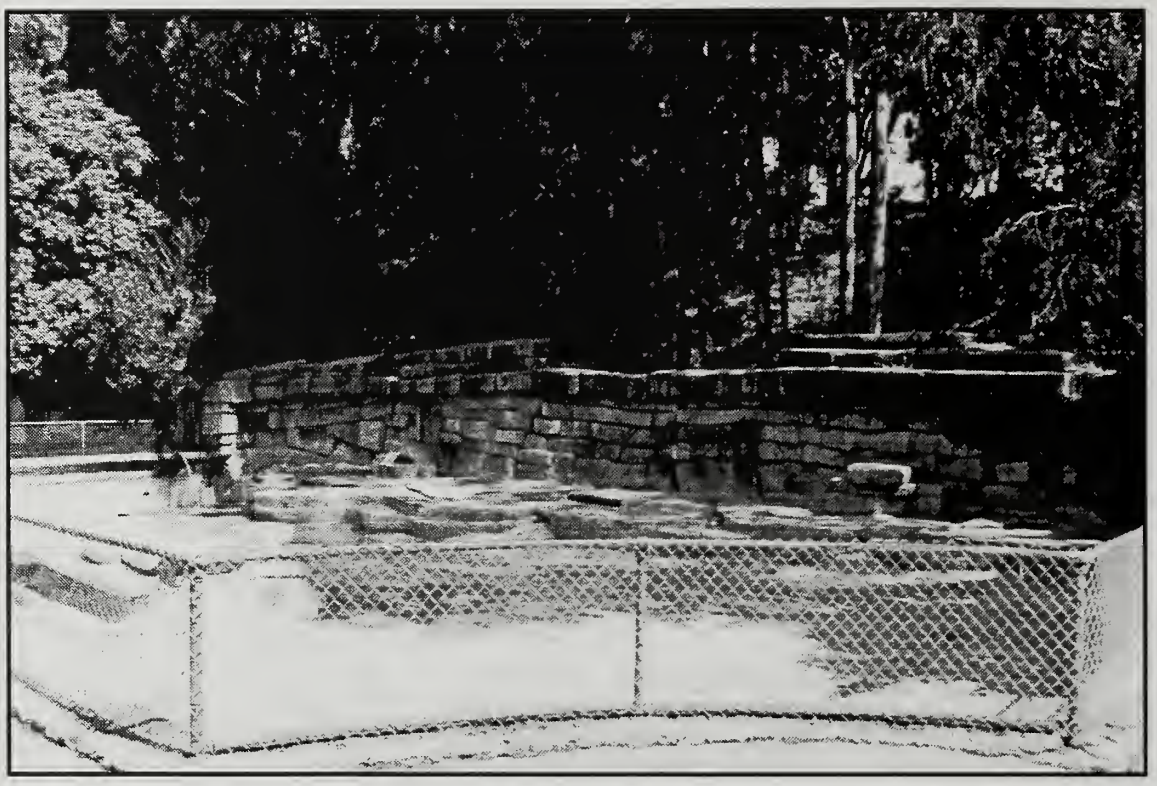
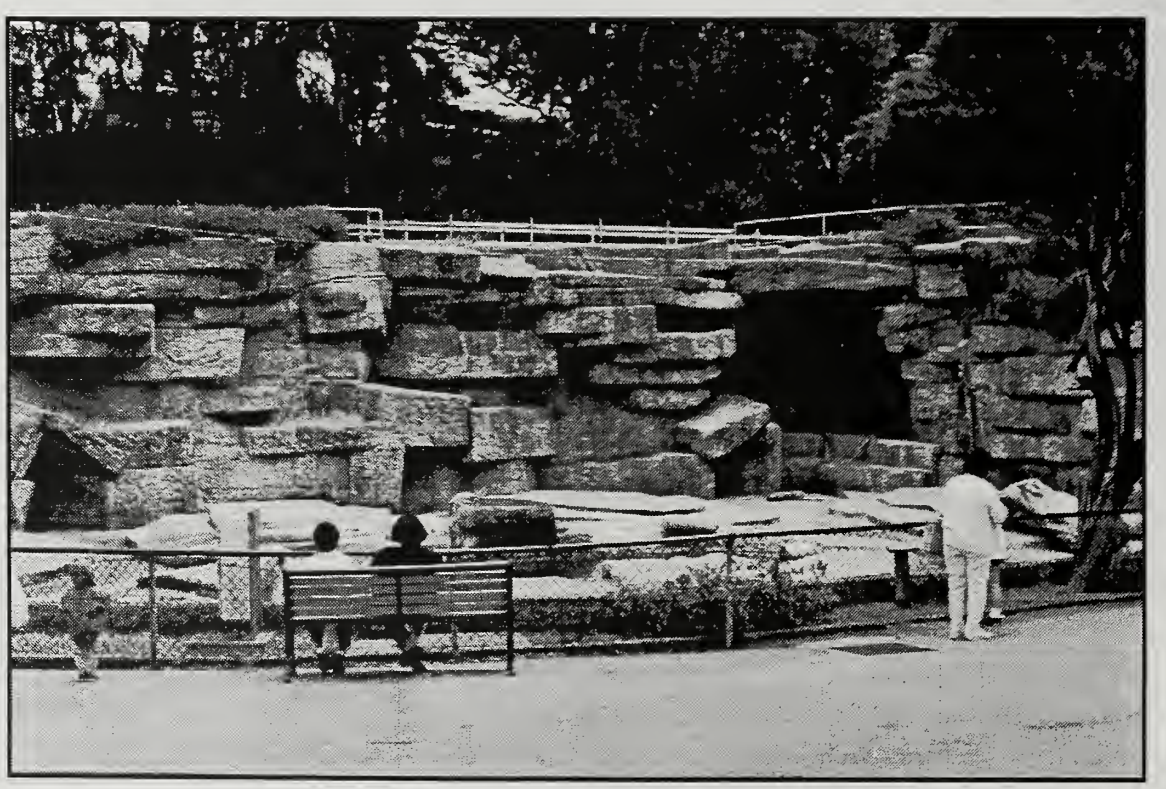


Figure 41 Polar Bear Grotto



The Bear Grottos

To the east of the seal pool, the five contiguous bear dens or grottos consist of a long, ellipsoidal-shaped, steel and concrete structure about 80 feet wide and 500 feet long (Figures 41, 42). A deep concrete moat runs in front of the dens adjacent to the foot path for the public. Each den provides a naturalistic setting for the bears with a pool and rough, imitation stone platform terraced at various levels. The platform is surrounded on three sides by jagged, dramatically exaggerated, imitation stone walls rendered in reinforced concrete over steel. The five bear dens have two interior dens (all about 20 by 8 feet) accessed from openings in the outdoor dens. A narrow passage runs along the back of the dens as access for Zoo employees.

The Terrace Restaurant

The Streamline Moderne style terrace restaurant is a reinforced concrete structure with a flat roof and wide eaves (Figure 43). The center of the front facade has three, large glazed openings (each with center doors) separated by thick concrete columns. Single windows flank the major central openings. The windows and metal framing on the front facade appear to be more recent alterations. The exterior concrete walls have rounded corners and a smooth base below a series of vertical lines incised into the concrete. The restaurant's interior appears to have been recently remodeled.

The Paddock Sheds

The five paddock sheds or barns (17 by 36 feet) are arranged to the south of the bear dens. The paddock sheds contain feeding troughs and storage in the enclosures for hoofed animals, including mountain goats, llamas and water buffaloes. Each paddock shed is constructed primarily of reinforced concrete and the shed roof is constructed of wood rafters covered with roofing paper. The three central openings on the front facade lead into the feeding troughs. The openings (each about 6.5 feet wide) are separated by concrete columns and have wooden doors on overhead steel tracks.

The Small Mammal Dens

The two pairs of small mammal dens flank the circular fountain on an axis with the south gate and the central pool between the Lion and Pachyderm Houses. Now abandoned, these dilapidated enclosures (about 20 by 70 feet) have painted concrete walls. A small moat and a low concrete wall separates the dens from the public walkway in front. The concrete of the back wall of one den is molded to resemble stalactites and stalagmites. The dens each have a small pond and two of the dens also have small trees.

The Lion House

The Lion House (175 by 42 feet) is a reinforced concrete frame structure covered with textured plaster (Figure 44). The concrete framing members are set on concrete footings. Set parallel to the central pool between the Lion House and the Pachyderm House, the Lion House was designed with four grottos along

Figure 42 Bear Grotto

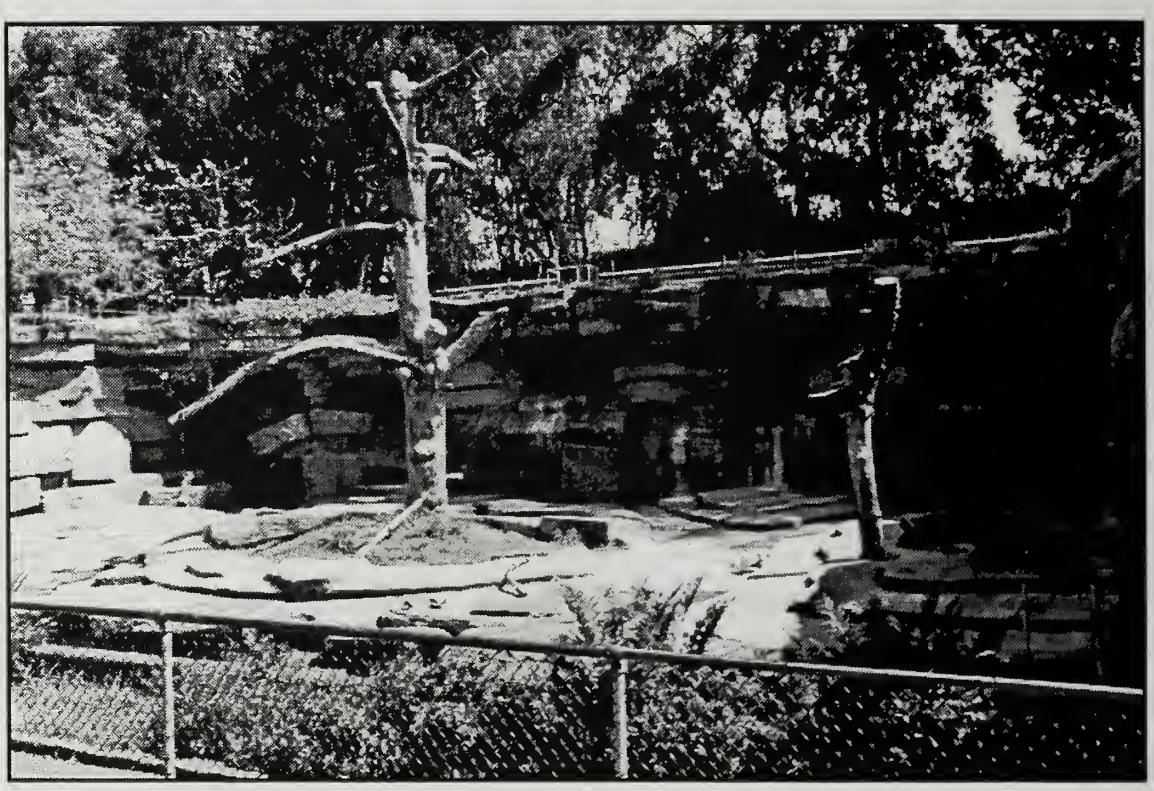


Figure 43 Terrace Restaurant

Figure 44 Lion House - East Facade

Figure 45 Lion Den

the south facade, a series of small cages along the north facade (largely removed and replaced with plantings) and the long, rectangular public space in between the grottos and the cages. The western end of the north facade also has three openings to view the lion grotto. These openings were originally covered with metal grilles and were replaced recently with fixed pane glass.

Several of the original, north facade cages (now housing primates) remain near the north entrance to the Lion House. The grottos on the south and west facades are trapezoidal shaped enclosures with walls of imitation stone rendered in rough concrete (Figure 45). A concrete moat separates the enclosure from the public walkway. Each lion grotto has a small pool. In recent years, the bare concrete floors of the grottos have been planted with a variety of grasses, shrubs and small trees.

From the back of the grottos, tunnels connect to the Lion House. The public space of the Lion House has two entrances set in stepped recesses. The east facade has three, double wooden doors centered between pairs of fluted pilasters and heavy cast concrete molding above the doors, separated by square columns with a tile base. A simple molding forms a cornice on the east vestibule and the panels on the doors have a simple, zig-zag, Art Deco pattern. The north entrance has a pair of double doors similar to the entrance doors on the east. The interior of the Lion House is primarily one large, free span space (about 130 by 40 feet) for public viewing and circulation (Figure 46). The space has a quarry tile floor and simple plaster walls.

The Pachyderm House

The reinforced concrete Pachyderm House has a flat roof with small gables projecting above the east and west side of the building (Figure 47). The building has a metal roof and a concrete foundation. The building has two public entrances at each end of the symmetrical, main, north facade, and six pachyderm yards arranged around the other three facades. The exterior walls are covered with a smooth plaster. The pachyderm yards vary significantly in size with the large elephant yard at the center of the south facade and the smallest yard for the pigmy hippo at the southeast corner of the building (Figures 48 and 49). The yards typically have stark concrete floor and walls, and a pool in one corner. The elephant yard has recently been renovated with a natural setting of a waterfall, rocks, trees and sand. A dry concrete moat separates the outdoor yards from the public paths. Metal doors open from the outdoor yards to passages leading to interior stalls.

The public entrances to the Pachyderm House are from two, double door pavilions on the north facade (Figure 50) separated by three large, multi-light windows. The wooden, paneled entrance doors are set into stepped recesses. Projecting pylons flank the doors, and above them are stylized cast concrete lentils. The entrance doors lead into a small vestibule, then a long, free-span area (160 by 30 feet) formerly open to the public (Figure 51). Seven interior stalls separated by a dry moat and a low metal fence are arranged around the perimeter of the interior public area. A series of six, round concrete

Figure 46 Interior of Lion House Public Area

Figure 47 Pachyderm House - North Facade

Figure 48 Pachyderm House - Elephant Yard

Figure 49 Pachyderm House - Hippopotamus Yard

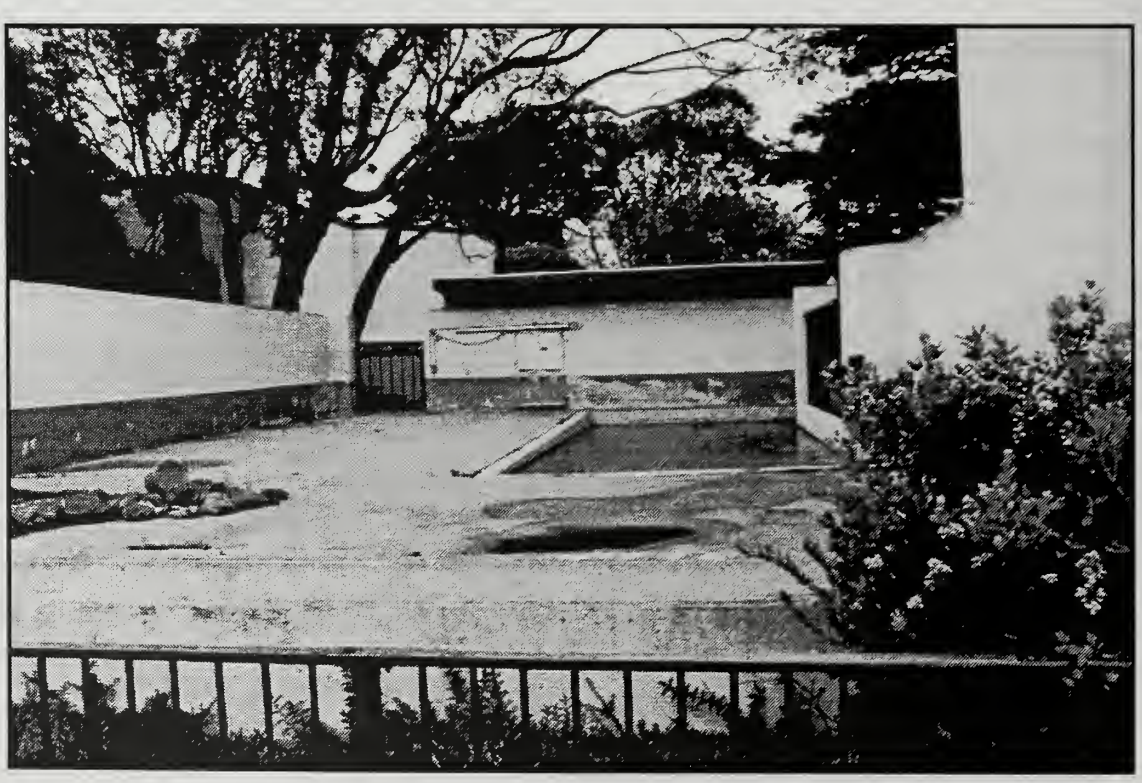


Figure 50 Pachyderm House - Public Entrance North Facade

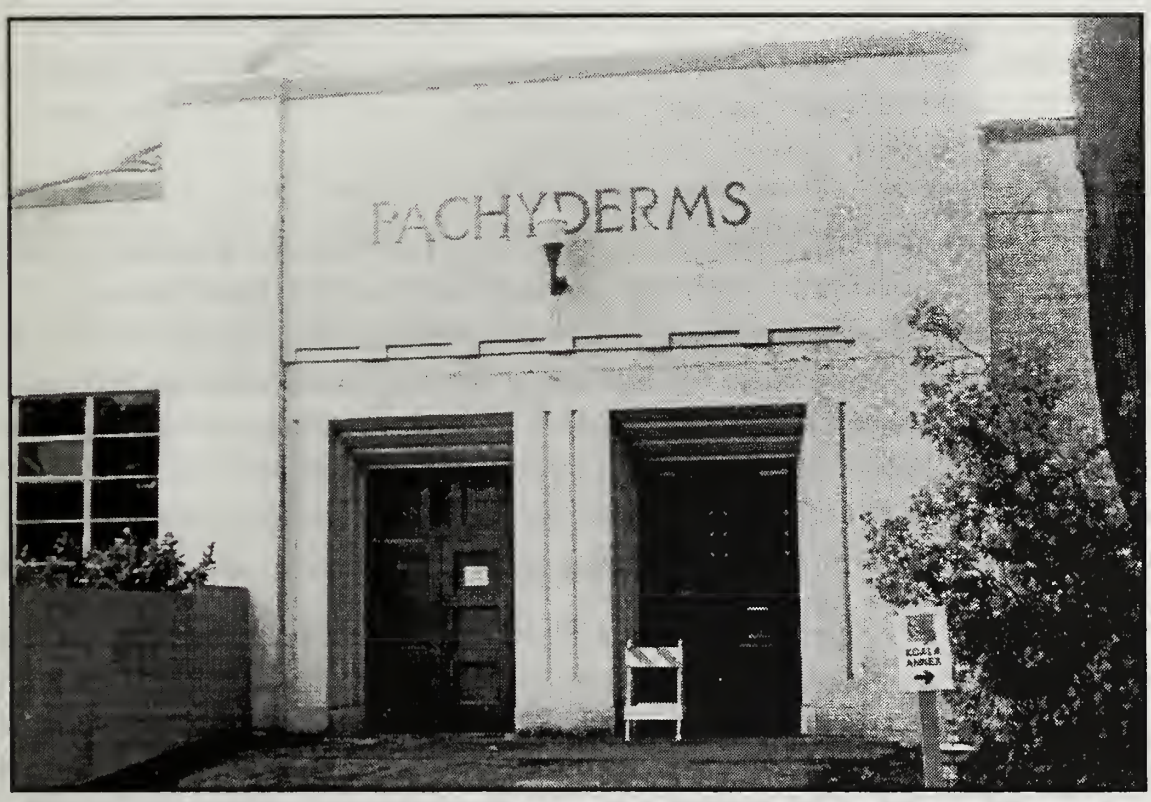
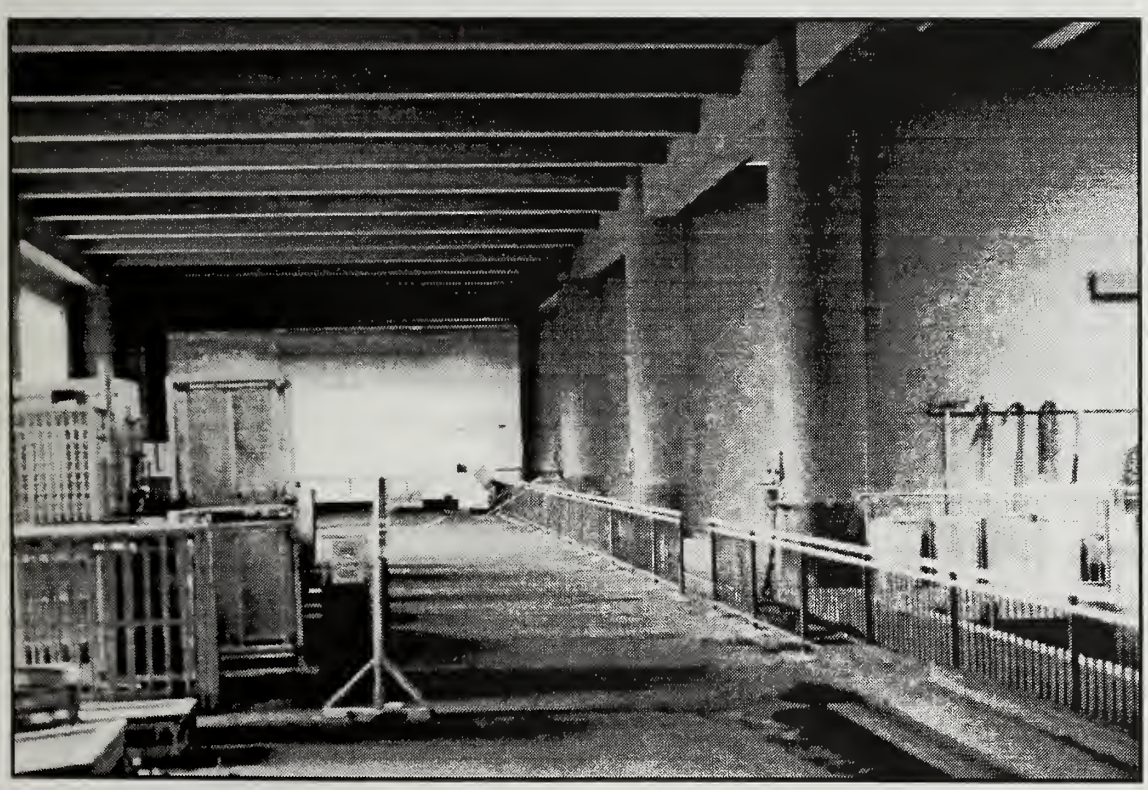


Figure 51 Pachyderm House - Interior Public Area



columns adjacent to the public area, and concrete walls separate the various stalls. The outdoor yard on the south opens into a service passage from which the animals enter the interior stalls. The yards on the east and west sides of the buildings open directly into interior stalls. In recent years, a steel restraining system for the elephants has been installed in two of the stalls.

The Third Zoo

The Third Zoo occupies the remainder of the Zoo's site, i.e. the area to the west of the Second Zoo, built primarily during the last 20 years (1975 - 1995). The area of the Third Zoo includes three support buildings dating from the period of the first Zoo: the Zoo Commissary, a public restroom and the Zoo Director's house. The animal exhibits in this area include the enclosures for large African animals - elephants, zebras, big birds, giraffes - and the large area for primates, including the 1985 Primate Discovery Center, Orangutan enclosure, and Gorilla World. Adjacent to the Gorilla World is a new enclosure for Musk Ox. The Children's Zoo north of the Musk Ox enclosure has been rebuilt in recent years, except for the carousel. A new Feline Conservation Center has recently opened east of the Zoo Director's residence.

Identified Historic Resources

The potential significance of the Zoo buildings and landscape features are evaluated using established cultural resources eligibility criteria for the California Register. The California Register Guidelines also consider the elements of historic integrity including location, design, setting, materials, workmanship, feeling and association. Integrity is defined as "the authenticity of a property's physical identity, as evidenced by the survival of characteristics that existed during the property's period of significance." This quality of authenticity enables a given property to convey its historic significance.

The only building at San Francisco Zoo already recognized under any formal historic resource designation is the Mothers Building which was listed on the National Register of Historic Places on December 31, 1979 [83]. The other buildings and landscape features at the San Francisco Zoo have not been previously evaluated, determined eligible or listed under any national, state or local historic resource designation, nor have they been included in an historic resources survey conducted according the guidelines of the State Office of Historic Preservation [84].

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83 The Mothers Building is listed on the National Register as the Delia Fleishhacker Memorial building (NR# 79000529). The building was considered to be significant under National Register criteria A and C.

84 None of the buildings or landscape features at the San Francisco Zoo have been designated as historical landmarks under San Francisco's Landmarks Ordinance (Article 10 of the San Francisco Planning Code: Preservation of Historical, Architectural and Aesthetic Landmarks).

Two of the Zoo buildings, the Aviary and the Lion House, retain good integrity and appear, individually, to be potentially eligible as historic resources under Criterion C. These Hobart buildings are particularly strong and unusual examples of the Moderne Style in the Bay Area. None of the other Zoo buildings appear to be individually eligible.

Based on the historic context presented in the technical background report prepared for the San Francisco Zoo, the Zoo also appears to be eligible as an historic district for the California Register under Criterion A at a local level as a significant social, educational and recreational institution in the history of San Francisco[85]. For almost 70 years, the Zoo has educated people throughout the region about wild animals while also providing the city with a park for family outings. The building of the "second" Zoo was one of the largest WPA projects in San Francisco providing a local source of employment during the depression. According to the background report, all the buildings and landscape features over 50 years old (i.e. the period the first and second zoos were developed between 1925 and 1940) would be considered contributory to a San Francisco Zoo Historic District.

Overall, the San Francisco Zoo retains a high level of integrity from its primary period of significance. If one excludes the cages, paddocks and adjacent paths no longer existing from the first Zoo, about ninety per cent of the major buildings and landscape design of the two zoos built between 1925 and 1940 survive today. The major buildings and the original landscape plan have received few alterations. The inclusion of naturalistic plantings and rocks in the outdoor grottos of the Pachyderm and Lion Houses are the only significant alterations to these major buildings. The only alteration to the Aviary is the installation of planters in the public area. The only major contributory features missing from the Zoo's primary period of significance are Monkey Island and its surrounding oval shaped path and landscaping (demolished in 1995). A minor feature irrevocably altered is the turtle pond at the western end of the central plaza.

Because of the alterations to Hobart's original plan (i.e. the destruction of the Monkey Island area), the Zoo does not appear to be eligible under Criterion C as a significant work of landscape design and planning. Although the Zoo's landscaping is aesthetically the most successful aspect of Hobart's design, there is no evidence that the Zoo plan was particularly significant in the history of landscape architecture.

The following are the contributing resources to the potential San Francisco Zoo Historic District:

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85 In presenting the following evaluation, the use of the phrase "appears potentially eligible or not eligible" is standard practice. Only the State Office of Historic Preservation can make an actual determination of eligibility for inclusion in the California Register.

First Zoo:

The Mothers Building and surrounding Landscaping
The Pump House
Two Public Restrooms
The Snack Building
The Carousel
The Commissary
The Zoo Director's House

Second Zoo:

The surviving elements of Hobart's 1936 Landscape Plan
(paths and plantings, lakes, bridges)
The Aviary
The Seal Pool
The Bear Dens
The Paddocks
The Terrace Restaurant
The Circular Fountain and Stairway
(with Lion Statues)
The Small Mammal Dens
The Lion House
The Pachyderm House

It should be noted that these features are contributing elements because they date from the potential historic district's period of significance, and because they seem to retain their integrity (i.e. they have not been greatly altered). Not all of the contributing elements have the same presence within the district, however, and city reviewers believe that structures like the restrooms and pump house are smaller and less important to the potential district than the larger buildings and landscape features.

Non-contributing features in the potential San Francisco Zoo Historic District are the various new enclosures including the ones for the Wallabys and the Wild Dogs, and the African animal enclosures south of the Lion House (Hippos, African Elephants, Zebras and Big Birds, Feline Conservation Center, and Giraffes). None of the buildings or other features in the third (modern) zoo are contributory to the potential historic district.

Archaeological Resources

There is no known archaeological site within the Zoological Gardens site area.[86] A literature survey and surface reconnaissance of the nearby Lake Merced area was conducted in 1979.[87] No evidence of prehistoric or historic sites was revealed in the search of pertinent cultural resource files, nor were discernible areas of archaeological or historical significance noted during the surface reconnaissance of the site.

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86 Southwest Water Pollution Control Plan Final EIR, File #EE 76.389, certified August 23, 1979, p. 83

IMPACTS

Historic Resources Impacts

The proposed Zoo Master Plan would retain The Mothers Building (listed on the National Register of Historic Places) and the following structures which are listed as contributing resources to the potentially eligible San Francisco Zoo Historic District: the Carousel and the Zoo Keeper's House from the First Zoo era and the Terrace Restaurant and the stone walls along Sloat Boulevard from the Second Zoo era.

The initial phase of the proposed Zoo Master Plan development would demolish the Pachyderm Building, circular fountain, snack building, public restroom, pump house, the commissary, and landscape elements which contribute to the potential historic district. The second phase of the proposed Zoo Master Plan (to be implemented after 2006) would remove the Aviary and the Lion House (the two buildings which appear to be potentially eligible as individual historic resources) and contributory features to the potential historic district including the paddocks, the Bear dens, and the Friendship Lagoon. While some changes within the potential historic district would be possible without affecting the district's overall significance, it is clear that implementation of the Zoo Master Plan as a whole, would result in a significant impact to the potential historic district.

Archeological Impacts

Based on a literature survey and surface reconnaissance, no archeological impacts would be expected from excavation, construction or operation of the Zoo Master Plan. Should buried archaeological materials exist under the large sand dunes at the southern portion of the site or within the excavation field at any other location, however, they would be subject to disturbance and damage in the excavation process. Construction stipulations would require the contractor to halt activities, notify the Environmental Review Officer (ERO) and contact a qualified archaeologist should suspect material or cultural or archaeological origin be uncovered.

While archeological impacts are not expected from excavation, construction, and operation of the Zoo Master Plan, measures are identified for implementation should the need arise.

MITIGATION MEASURES

- Should the remains of cultural or historic artifacts or features be found within the project site, a qualified archaeologist would supervise a program of on-site monitoring during site excavation. The archaeologist would record observations in a permanent log. Should cultural or historic artifacts be found following the start of excavation activities, the archeologist would assess the significance of the

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[87] Archaeological Consultants 1979; this document is on file and available for public review at the San Francisco Planning

find and immediately report to the ERO and the President of the Landmarks Preservation Advisory Board (LPAB). Upon receiving the advice of the consultants and the LPAB, the ERO would recommend specific mitigation measures, if necessary. The monitoring program, whether or not there were finds of significance, would result in a found following the start of excavation activities, the archaeologist would assess the significance of the find, and immediately report to the ERO and the President of the LPAB. Upon receiving the written report to be submitted first and directly to the ERO, with a copy to the project sponsor. If artifacts were found during construction, a program of archaeological testing would be developed and undertaken.

The program would be supervised by a qualified archaeologist using a series of mechanical, exploratory borings or other testing methods determined by the archaeologist to be appropriate. The archaeologist would supervise the testing at the site to determine the probability of finding cultural and historical remains. At the completion of the archaeological testing program, the archaeologist would submit a written report first and directly to the ERO, with a copy of the project sponsor, which would describe the findings, assess their significance and proposed appropriate recommendations for any additional procedures necessary to mitigate adverse impacts to cultural resources determined to be significant.

- Complete an Historic American Building Survey (HABS) using National Park Service format and guidelines to expand the information contained in the Historic Landscape and Architectural Survey Report. Additional descriptive information on the buildings would be included and large format photographs and landscape features that contribute to the Zoological Historic District would be donated to a local historic collection, e.g., San Francisco History Room at the Main Library.

- Develop a professional quality film or video to fully document the historic evolution of the San Francisco Zoological Gardens and its architectural and landscape features. This product could be distributed to local libraries and schools. An exhibit of the history of the Zoo could also be developed as an on-site educational resource in the proposed Children's Zoo Education Center Building.

- Consult with the Landmarks Preservation Advisory Board, San Francisco Heritage, or other interested groups prior to demolition of prominent structures, such as the Aviary, to coordinate potential salvage efforts.

Demolition of structures contributing to a potential Historic District would remain a significant adverse environmental impact of the proposed project, even with mitigation measures to record and document the resources to reduce the extent of loss.

Department, Office of Environmental Review, 1600 Mission Street.

III. OTHER TOPICS REQUIRED BY CEQA

A. SIGNIFICANT ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED IF THE PROPOSED PROJECT IS IMPLEMENTED

In accordance with Section 21082.2 of the Public Resources Code, California Environmental Quality Act (CEQA), and with Section 15126 of the State CEQA Guidelines, the purpose of this Section is to identify impacts that could not be eliminated or reduced to an insignificant level by mitigation measures included as part of the proposed project, or by other mitigation measures that could be implemented.

The findings of significant impacts are subject to final determination by the Planning Commission as part of its certification process for the EIR. This chapter in the Final EIR will be revised, if necessary, to reflect the Planning Commission's findings. If all mitigation measures are adopted, the following unavoidable significant effects would occur.

During preparation of this EIR, an Historic Landscape and Architectural survey was completed. The survey identified the San Francisco Zoo as a potentially eligible historic district for the California Register according to CEQA Section 21084.1 of the Public Resources Code. Within the Zoo, only two buildings, the Aviary and the Lion House, were identified as potentially eligible historic structures. For this reason, demolition of the Aviary, the Lion House, and other Zoo features contributing to a potential historic district would be an unavoidable, significant adverse effect of the Zoo Master Plan development.

B. SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES WHICH WOULD BE INVOLVED IF THE PROPOSED ACTION SHOULD BE IMPLEMENTED

This section of CEQA calls for a discussion of the uses of non-renewable resources during the initial and continued phases of the project that could be irreversible because of a commitment of resources that make removal or nonuse of the resource unlikely thereafter. Two potentially irreversible changes associated with development of the Zoo Master Plan have been discussed in Chapter II of this EIR: the first is the unavoidable adverse impact to the historic buildings and landscape of the Hobart design for the Zoo that dates back to the early 1900's. The historic Zoo, would be photo-documented, but would no longer exist to be experienced by future generations or by persons who remember childhood visits to the Zoo; and the second is that the proposed project would result in a less-than-significant irreversible commitment of natural resources through direct consumption of fossil fuels, and through use of materials, primarily during construction.

IV. ALTERNATIVES TO THE PROPOSED PROJECT

A. NO PROJECT

The No Project Alternative would mean that the Zoological Society would not make changes to the existing Zoo entry on Sloat Boulevard, or to visitor circulation internal and external to the Zoo, landscaping, animal exhibits, animal care facilities, educational facilities, or to existing visitor amenities. Under this alternative, routine maintenance and operations at the Zoological Gardens would continue, and piecemeal improvements to animal exhibits could be made, on an as-needed basis to meet health and safety needs of animals. The 55-year old animal facilities that are in disrepair and no longer meet the health and safety needs of animals and their keepers would continue to deteriorate. In particular, the deficiencies described in Chapter I, page 3, would continue to present unnecessary exposure to physical risk for both animals and animal keepers. The Zoo would continue to be subject to inspection violations from the USDA for cracks in concrete, poorly ventilated facilities, lack of soft surfaces in animal holding areas, and inadequate facilities for protective contact feeding.

Projects that have already received environmental review and approval (Zoo Infrastructure, South African Gateway) would proceed as planned, but would not be coordinated with future changes to other Zoo facilities. Forestry management would continue as conducted in the past, with selected tree trimming and new planting throughout the Zoo, primarily to protect Zoo visitors and animals from falling branches during storms and provide light and shade to animal areas.

The Zoo would not expand to the west to occupy the 30 acres of Park land designated as a joint-use area. This area would be used by the City for the Recycle Water Treatment Plant, but would not be accessible to the public for recreational use.

With continued use of the existing main entry on Sloat Boulevard by visitors and school groups, traffic and parking along Sloat Boulevard would continue to be congested during summer months and on weekends when visitor attendance is high, particularly on special event days, 'free days' and the Zoo Run.

The Zoological Society objectives to improve educational opportunities, and opportunities for conservation, for breeding, for species survival, and for preservation of wildlife would not be met. Exhibits would continue to represent a 'postage stamp' view of fragmented animal groups rather than the planned interconnected web of integrated animal groups in a habitat reflective of a natural setting and exhibits, programs and personnel supportive of the biodiversity philosophy.

B. PRESERVATION ALTERNATIVE

The Preservation Alternative would retain the following historic structures (which are also retained in the *SF Zoo Master Plan*) and integrate them into the renovated Zoo Plan: the Mothers Building, the Carousel, the Terrace Restaurant, the Zoo Keeper's residence, and the stone walls along Sloat Boulevard, flanking the existing main entrance gate. In addition to these features, the Preservation Alternative would preserve the most prominent structures and physical elements from the 1920's that are identified as contributing to a potentially eligible San Francisco Zoo Historic District (using Criterion C of the California Register of Historic Resources). The Preservation Alternative would modify the proposed Zoo Master Plan by preserving, to the extent feasible, a majority of the structures and landscape elements of the original Hobart design. See Figure 52 showing the Preservation Alternative overlay on the proposed Zoo Master Plan.

- The Aviary, a classic Moderne Style architectural design is located along the northeastern edge of the Zoo, where the Australian Biogeographic region is planned, would remain. This building could potentially be converted to use as a Zoo History Museum or Educational Center. The location of the Aviary, in the northeast corner of the Zoo, places it the farthest away from the visitor entry of other sites for educational facilities. The existing ventilation system and seismic condition of the 1939 building would need substantial retrofit, and ADA accessible restrooms would need to be added to the facility for public use. The building is south facing with limited interior natural light. Reuse of the building could require removal of surrounding trees to open the facility to light.

- The Lion House, another Moderne Style of architectural design located in the central part of the Zoo, adjacent to the proposed visitor spine and future Insectarium, would be preserved and potentially rehabilitated for another type of animal exhibit. This 7,224 square foot building is a visually dominant structure in the central part of the Zoo. Seismic retrofit, and plumbing, electrical and heating retrofit would be necessary for public use of the building (it is currently closed to public use). The undersized exterior paddocks, dens and outdated moats would need to be redesigned and expanded for continued animal use.

- The Pachyderm House is another visually dominant feature in the central part of the Zoo. With the Lion House, it flanks the original Hobart designed Central Plaza of the Zoo (which has since been modified). The Pachyderm House is located where the South American and Australian Gateways are planned. As with the Lion House, seismic, plumbing, electrical, and heating retrofit would be necessary for public use of the building. Potential re-use of this building has not been defined.

- The existing stucco and tile roof Snack Building, located adjacent to the existing picnic area, Mother's Building and Zoo entry area off Sloat Boulevard, would be preserved and relocated to the new Visitor

Figure 52 Preservation Alternative Overlay on Proposed Master Pan

Source: The Portico Group, December 1996

Plaza at the west end of the Zoo. Use of the 459 square foot building would be limited to storage of maintenance materials or perhaps strollers. The feasibility of physically moving the concrete structure without damage to its integrity is uncertain, and would need to be explored. The doorways are not ADA accessible and would need to be widened to meet code.

- The circular fountain and stairway near the Lion House and the original Hobart landscape plan with a north-south axial focus on the circular fountain and the oval features at each end would be preserved as part of the 1936 landscape plan for the Zoo. This fountain is in the area proposed as part of the visitor spine and the future Asian Montane Biogeographic Region.

This alternative would be similar to the proposed project in some respects, since it would include the new entry and parking area, and would involve construction activities with their attendant (non-significant or mitigable) impacts. By preserving, rehabilitating, and re-using prominent features of the potentially eligible historic district (discussed in Section II.K), this alternative would also reduce or eliminate the project's significant impact on historical resources. Substantial and costly changes to the historical and contributing buildings would still be required to achieve animal or visitor re-use objectives and to meet seismic, safety and ADA requirements.

The Zoological Society and its planning consultants considered renovation and re-use of existing buildings in the early phases of conceptual planning for the Zoo Master Plan. It was determined that the dominant scale of the buildings and renovation that would be required to meet present standards for animal health and safety would not meet the sponsors objectives for the new Zoo biogeographic themes, would affect their ability to continue the species survival program, and would make the plan infeasible financially.

According to the project sponsors, the preservation of the Lion House and the Aviary for potential use by the public or by animals would continue to expose animals and their keepers to risk-prone animal care situations. Preservation of these buildings would also add substantial cost to the project if seismic and Americans with Disabilities Act (ADA) requirements are met and if US Department of Agriculture standards and criteria for the safe and healthy care of animals are met. The Zoological Society's goals for creating zoogeographic regions with animal habitat conducive to wildlife preservation, animal social group interaction, breeding and releasing threatened species to their natural habitats, and interactive education for visitors would not be met. The Feline Conservation Center and the Avian Conservation Center are examples of the types of geographic habitats and programs that would not be possible if the Lion House and central fountain are preserved. These historic features would impact the planned Asian Montane Biogeographic Region for the snow leopard, red panda, golden monkey, Siberian tiger and Himalayan black bear.

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Karen Kubick, PM for Zoo Infrastructure
Mickey Heo, Groundwater Plan

San Francisco Municipal Railway
MUNI Planning Division
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San Francisco, CA 94115
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Jack & Vicki Schneider
431 Quintara St.
San Francisco, Ca. 94116

2513/ 024
Carl & Ruth Friend
1867 43rd Ave.
San Francisco, Ca. 94122

2513/ 025
Yennie & Edward Soohoo
1489 17th Ave.
San Francisco, Ca. 94122

2512/ 023
Cheng Puck Kim & Yuet Ying
2534 32nd Ave.
San Francisco, Ca. 94116

2513/ 002
Patel Amratabhai
1400 Fashion Island Bl. # 304
San Mateo, Ca. 94404

2513/ 004a
Pasquale Ussorio
1785 Fulton St.
San Francisco, Ca. 94117

2513/ 004b
Mitchell & Ethel Davies &
Beatrice Tentes
c/o Helen Christopher
2989 21st Ave.
San Francisco, Ca. 94132

2510/ 014
Au Yuk Chong & Cecilia Chan
c/o Paul Tan
1422 22nd Ave.
San Francisco, Ca. 94122

2515/ 001
Sang Yol Sim
22 Seacliff Ave.
San Francisco, Ca. 94121

2512/ 017
The Roth Family
19 Sheldon St.
San Francisco, Ca. 94122

7278/ 027
Occupant
257 Lakeshore Dr.
San Francisco, Ca. 94132

2518/ 030
Occupant
2857 Yorba St.
San Francisco, Ca. 94116

2514/ 002a
Occupant
2750 Sloat Blvd.
San Francisco, Ca. 94116

7278/ 017
Occupant
100 Country Club Dr.
San Francisco, Ca. 94132

2518/ 032
Occupant
2845 Yorba St.
San Francisco, Ca. 94116

2514/ 005
Occupant
3427 Wawona St.
San Francisco, Ca. 94116

7278/ 020
Occupant
215 Lakeshore Dr.
San Francisco, Ca. 94132

2518/ 013
Occupant
2168 Sloat Blvd.
San Francisco, Ca. 94116

2513/ 022
Occupant
3301 Wawona St.
San Francisco, Ca. 94116

7278/ 010
Occupant
142 Country Club Dr.
San Francisco, Ca. 94132

2518/ 010
Occupant
2150 Sloat Blvd.
San Francisco, Ca. 94116

2513/ 023
Occupant
2707 44th Ave.
San Francisco, Ca. 94116

7278/ 003
Occupant
184 Country Club Dr.
San Francisco, Ca. 94132

2518/ 011
Occupant
2156 Sloat Blvd.
San Francisco, Ca. 94116

2613/ 024
Occupant
2713 44th Ave.
San Francisco, Ca. 94116

7273/ 028
Occupant
339 Lakeshore Dr.
San Francisco, Ca. 94132

2518/ 002a
Occupant
2821 59th Ave.
San Francisco, Ca. 94116

2513/ 025
Occupant
2719 44th Ave.
San Francisco, Ca. 94116

7273/ 023
Occupant
319 Lakeshore Dr.
San Francisco, Ca. 94132

2518/ 003
Occupant
2827 39th Ave.
San Francisco, Ca. 94116

2512/ 023
Occupant
3219 Wawona St.
San Francisco, Ca. 94116

2518/ 035
Occupant
2827 Yorba St.
San Francisco, Ca. 94116

2514/ 006
Occupant
2710 Sloat Blvd.
San Francisco, Ca. 94116

2513/ 002
Occupant
2600 Sloat Blvd.
San Francisco, Ca. 94116

2519/ 014
Occupant
1912 Sloat Blvd.
San Francisco, Ca. 94116

2515/ 001
Occupant
2800 Sloat Blvd.
San Francisco, Ca. 94116

2513/ 004a
Occupant
2640 Sloat Blvd.
San Francisco, Ca. 94116

2518/ 029
Occupant
2863 Yorba St.
San Francisco, Ca. 94116

2518/ 001
Occupant
2801 39th Ave.
San Francisco, Ca. 94116

2513/ 004b
Occupant
2650 Sloat Blvd.
San Francisco, Ca. 94116

7278/ 034
Eugene & Margaret McMahon
45 Berkshire Way
San Francisco, Ca. 94132

7278/ 026
Charles Barca
251 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 007
Richard Arnold
160 Country Club Dr.
San Francisco, Ca.

7276/128
Alfred & Gertrud Laufer
263 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 018
Ken & Yoshiaki Tanase
201 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 008
Judson & Winnie Leong
154 Country Club Dr.
San Francisco, Ca. 94132

7278/ 029
Victoria W. Andre
269 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 019
Gertrude Chappell
209 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 009
Frank Leong
148 Country Club Dr.
San Francisco, Ca. 94132

7278/ 030
Romeo C. Agloro
275 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 021
Vernice Shikles
221 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 011
John & Mary Kelleher
136 Country Club Dr.
San Francisco, Ca. 94132

7278/ 031
Robert & Jeanne Vitali
281 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 022
James & Colleen Omeara
227 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 001
Charles & Annette Maguire
7 Berkshire Way
San Francisco, Ca. 94132

7278/ 032
Mary Moore
287 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 012
San & Oy-Mui Chen
130 Country Club Dr.
San Francisco, Ca. 94132

7278/ 002
Henry & Rose Thomas
190 Country Club Dr.
San Francisco, Ca. 94132

7278/033
Joseph & Annie Ng
293 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 013
Ernest Stark
124 Country Club Dr.
San Francisco, Ca. 94132

7278/ 004
Eugene Su & Bonnie Wong
178 Country Club Dr.
San Francisco, Ca. 94132

7278/ 023
Maria Karkazis
233 Lakeshore Dr.
San Francisco, Ca. 94132

7278/ 014
David & Katherine Longacre
118 Country Club Dr.
San Francisco, Ca. 94132

7278/ 005
Frank Brady
172 Country Club Dr.
San Francisco, Ca. 94132

7278/ 024
Pick Chee & Susie W. Chang
239 Lakeshore Dr.
San Francisco, Ca. 94132

7278/015
Meyer & Frances Segal
112 Country Club Dr.
San Francisco, Ca. 94132

7278/ 006
Herbert & Leticia Dietzler
166 Country Club Dr.
San Francisco, Ca. 94132

7278/ 025
John L. & Barbara R. Kay
245 Lakeshore Dr.
San Franmcisco, Ca. 94132

7278/ 016
Edgar & Alice Lahl
106 Country Club Dr.
San Francisco, Ca. 04132

7273/ 134
Jonathan & Elaine Chow
1867 26th Ave.
San Francisco, Ca. 94122

2512/ 010
Sheila & Ivy Shea
1252a 21st Ave.
San Francisco, Ca. 94122

2501/ 043
Ritchee So
15 26th Ave.
San Francisco, Ca. 94109

2510/ 008
Robert & Alice Ringel
700 Santiago St.
San Francisco, Ca. 94116

2512/ 005
Gerald & Giti Knopoff
47 Sotelo Ave.
San Francisco, Ca. 94116

2510/ 044
Suh Choon Hee
c/o Falcon Realty
735a Taraval St.
San Francisco, Ca. 94116

2510/ 009
Bartholomew Meier
86 Fair Oaks
San Francisco, Ca. 94110

2511/ 021
Susan & Joseph Hsu
2371 32nd Ave.
San Francisco, Ca. 94116

2510/ 045
Roman & Nadja Stroganoff
499 Blackstone Dr.
San Rafael, Ca. 94903

2510/ 001b
Leo & Regina Deutsch
2254 41st Ave.
San Francisco, Ca. 94116

2511/ 025
Cathy Ng
Flat H 16/F Blk. 3 Avon Park
Fanling, N T
HONG KONG

2510/ 035
Don & May Jue Qwan
2533 Ortega St.
San Francisco, Ca. 94122

2510/ 005
Amelia Abell
2722 42nd Ave.
San Francisco, Ca. 94116

2511/ 015
Virgilio & Gloria Guevara
77 Canterbury DR.
Vallejo, Ca. 94591

2510/ 039
Winnie & David Chia
620 10th Ave.
San Francisco, Ca. 94118

2509/ 055
Susan & April Fong, c/o Daniel Fong
PO Box 170144
San Francisco, Ca. 94117

2511/ 018
Gertrud Ehrlich
2126 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 029
Douglas Jackson
101 Bonita Ave.
Redwood City, Ca. 94061

2510/ 001a
Egon Stein
2445 Rivera St.
San Francisco, Ca. 94116

2511/ 009
Hanna & Josef Hochfeld
1450 Post St., Apt.# 416
San Francisco, Ca. 94109

2510/ 034
Charles & Helen Chung
99 Montrose Ave.
Daly City, Ca. 94015

2509/ 048
Lorraine Jensen, L & H
Properties
74 Del Monte St.
San Francisco, Ca. 94122

2511/ 003
Robert Romeyn
32 Calafia Ct.
San Rafael, Ca. 94903

2510/ 020
Donald & Dorothy Stewart
17220 Tamara Ln.
Watsonville, Ca. 95076

2509/ 044
Jian Yong Chen & Lisa Yee
630 19th Ave., #2
San Francisco, Ca. 94121

2511/ 001
Chan Leung Kwai Fong & Yiu
Chung
1058 Washington St.
San Francisco, Ca. 94108

2510/ 021
Arthur & Claire Holl
2763 40th Ave.
San Francisco, Ca. 94116

2509/ 046a
Violet & Soo Khoo
2119 42nd Ave.
San Francisco, Ca. 94116

2511/ 001b
Angele Goyenche
2363 35th Ave.
San Francisco, Ca. 94116

2510/ 007
The Hesky Family Trust
4553 Latimer Ave.
San Jose, Ca. 95130

2509/ 001
Lee Kae- Hwan & Kukji Jo
1022 Skyline Dr.
Daly City, Ca.. 94015

2513/ 005
Occupant
2750 45th Ave.
San Francisco, Ca. 94116

2511/ 001b
Occupant
2711 42nd Ave.
San Francisco, Ca. 94116

2510/ 007
Occupant
2739 41st Ave.
San Francisco, Ca. 94116

2712/ 017
Occupant
2712 44th Ave.
San Francisco, Ca. 94116

2510/ 043
Occupant
2710 42nd Ave.
San Francisco, Ca. 94116

2510/ 008
Occupant
2743 41st Ave.
San Francisco, Ca. 94116

2512/ 005
Occupant
2550 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 044
Occupant
2706 42nd Ave.
San Francisco, Ca. 94116

2510/ 009
Occupant
2747 41st Ave.
San Francisco, Ca. 94116

2511/ 021
Occupant
2754 43rd Ave.
San Francisco, Ca. 94116

2510/ 045
Occupant
2700 42nd Ave.
San Francisco, Ca. 94116

2510/ 001b
Occupant
2711 41st Ave.
San Francisco, Ca. 94116

2511/ 025
Occupant
2730 43rd Ave.
San Francisco, Ca. 94116

2510/ 035
Occupant
2744 42nd Ave.
San Francisco, Ca. 94116

2510/ 005
Occupant
2731 41st Ave.
San Francisco, Ca. 94116

2511/ 015
Occupant
2418 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 039
Occupant
2726 42nd Ave.
San Francisco, Ca. 94116

2509/ 055
Occupant
2912 Yorba St.
San Francisco, Ca. 94116

2511/ 018
Occupant
2780 43rd Ave.
San Francisco, Ca. 94116

2510/ 029
Occupant
2780 42nd Ave
San Francisco, Ca. 94116

2510/ 001a
Occupant
2707 41st Ave.
San Francisco, Ca. 94116

2511/ 009
Occupant
2751 42nd Ave.
San Francisco, Ca. 94116

2510/ 034
Occupant
2750 42nd Ave.
San Francisco, Ca. 94116

2509/ 048
Occupant
2939 Wawona St.
San Francisco, Ca. 94116

2511/ 003
Occupant
2723 42nd Ave.
San Francisco, Ca. 94116

2510/ 020
Occupant
2719 41st Ave.
San Francisco, Ca. 94116

2509/ 044
Occupant
2716 41st Ave.
San Francisco, Ca. 94116

2511/ 001
Occupant
2701 42nd Ave.
San Francisco, Ca. 94116

2510/ 021
Occupant
2791 41st Ave.
San Francisco, Ca. 94116

2509/ 046a
Occupant
2704 41st Ave.
San Francisco, Ca. 94116

7273/ 035
Robert Moore
367 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 024
Frances Goodrich
323 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 011
Dennis Carey
242 Country Club Dr.
San Francisco, Ca. 94132

7273/ 036
Michael & Maureen Horan
371 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 025
William Lai Yuen Fai & Kwoon Lai Yeun
327 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 012
Jeanne Shimmon
236 Country Club Dr.
San Francisco, Ca. 94132

7273/ 037
Charlie Kaw & Yu Aye Aye
375 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 026
Ralph & Gladys Gough
331 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 014
Kathleen Beaulieu
224 Country Club Dr.
San Francisco, Ca. 94132

7273/ 038
James & Mary Spanos
379 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 027
Irene Behrend
335 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 015
Mary Gallagher
218 Country Club Dr.
San Francisco, Ca. 94132

7273/ 039
Shizu & Mary Kobayshi
383 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 016
Crystal Kreuter
212 Country Club Dr.
San Francisco, Ca. 94132

7273/ 005
Benjamin & Susan Lau
278 Country Club Dr.
San Francisco, Ca. 94132

7273/ 029
Richard & Suzanne O'Toole
343 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 017
Catherine Delany & Mary Murphy
206 Country Club Dr.
San Francisco, Ca. 94132

7273/ 006
Joanne Ho
272 Country Club Dr.
San Francisco, Ca. 94132

7273/ 030
Chiu Yu Pui & Ying Kuk
347 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 018
Anna Yukm
2 Berkshire Way
San Francisco, Ca. 94132

7273/ 007
Larry Mazzola
266 Country Club Dr.
San Francisco, Ca. 94132

7273/ 032
Luella Johnson
355 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 019
Robert Gutterman
50 Berkshire Way
San Francisco, Ca. 94132

7273/ 008
James & Anne Chin
260 Country Club Dr.
San Francisco, Ca. 94132

7273/ 033
Emile & Jane Lemeteyer
359 Lakeshore Dr.
San Francisco, Ca. 94132

7273/020
Lawrence & Henrietta Dietzen
307 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 009
Matthew & Elizabeth Faliano
254 Country Club Dr.
San Francisco, Ca. 94132

7273/ 022
George & Melinda Aherns
315 Lakeshore Dr.
San Francisco, Ca. 94132

7273/021
Lothar & Ruth Bossing
311 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 010
Sung & Lynda Kwong
248 Country Club Dr.
San Francisco, Ca. 94132

2449/ 042
Mildred Salvotti
2534 Great Highway
San Francisco, Ca. 94116

2449/ 025
Coda Enterprises
PO Box 420693
San Francisco, Ca. 94142

2512/ 010
Occupant
2757 43rd Ave.
San Francisco, Ca. 94116

2449/ 044
Terence & Susan Quinlan
145 San Benito Ave.
San Francisco, Ca. 94127

2449/ 020
Chi Hang & Sui King Lau
123 12th Ave., # 3
San Francisco, Ca. 94118

2449/ 020
Occupant
2679 47th Ave.
San Francisco, Ca. 94116

2449/ 045
Virginia Lister & Arce Daylin
451 Fernwood Drive
San Bruno, Ca. 94066

2449/ 022
Yee King & Amy Ng
2611 38th Ave.
San Francisco, Ca. 94116

2449/ 022
Occupant
2687 47th Ave.
San Francisco, Ca. 94116

2449/ 046
John & Carole Sullivan
1209 Elmwood Dr.
Walnut Creek, Ca. 94596

2449/ 037
Gertrude Coleman
519 47th Ave.
San Francisco, Ca. 94121

2449/ 039
Ludmila & Baron Zalaman
441 30th Ave.
San Francisco, Ca. 94121

2449/ 040
Patricia & David Land
101 Greenbrook Ct.
Danville, Ca. 94526

2449/ 041
James & Yvonne Gavros
2652 Garfield St.
San Mateo, Ca. 94403

2449/ 042
American General Finance Inc.
c/o Ralph Uribarre
8331 Utica, # 130
Rancho Cucamonga, Ca.
91730

2449/ 035
Linda & Chung Kwong Chan
1666B 48th Ave.
San Francisco, Ca. 94122

2509/ 001
Occupant
2701 40th Ave.
San Francisco, Ca. 94116

2449/ 043
Occupant
2626 Great Highway
San Francisco, Ca. 94116

2449/ 012
James & Electra Gavros
2652 Garfield St.
San Mateo, Ca. 94403

2449/ 014
Thomas & Lisa Fung
1045 Sycamore Dr.
Millbrae, Ca. 94030

2449/ 015
Christina & Robert Wu
1743 35th Ave.
San Francisco, Ca. 94122

2449/ 008
Richard & Cecilia Deleon
1649 Albemarle Way
Burlingame, Ca. 94010

2449/ 010
Wong Hoy & Wai Heung
Howard Wong
279 12th Ave.
San Francisco, Ca. 94118

2449/ 001
Andrew, Alfred & Allan Chiu
1826 Cabrillo St.
San Francisco, Ca. 94121

2449/ 002
Jennie Kwok & Stan Kwong
PO Box 330008
San Francisco, Ca. 94133

2449/ 039
Occupant
2648 Great Highway
San Francisco, Ca. 94116

2449/ 040
Occupant
2640 Great Highway
San Francisco, Ca. 94116

2449/ 012
Occupant
2643 47th Ave.
San Francisco, Ca. 94116

2449/ 014
Occupant
9 Cutler Ave.
San Francisco, Ca. 94116

2449/ 015
Occupant
15 Cutler Ave.
San Francisco, Ca. 94116

2449/ 008
Occupant
22 Cutler Ave
San Francisco, Ca. 94116

2449/ 010
Occupant
2635 47th Ave.
San Francisco, Ca. 94116

2449/ 011
Occupant
2639 47th Ave.
San Francisco, Ca. 94116

2449/ 001
Occupant
2601 47th Ave.
San Francisco, Ca. 94116

2449/ 002
Occupant
2611 47th Ave.
San Francisco, Ca. 94116

2518/ 020
Choy Siu Kin & Calvin Pong
2242 Sloat Blvd.
San Francisco, Ca. 94116

2449/ 043
Occupant
2628 Great Highway
San Francisco, Ca. 94116

2449/040
Occupant
2642 Great Highway
San Francisco, Ca. 94116

2518/021
Gloria & Robert Law
2230 Sloat Blvd.
San Francisco, Ca. 94116

2449/ 044
Occupant
3655 Vicente St.
San Francisco, Ca. 94116

2449/ 041
Occupant
2634 Great Highway
San Francisco, Ca. 94116

2518/ 014
Wai Lin Leung & Kam Lee Pui
2200 Sloat Blvd.
San Francisco, Ca. 94116

2449/ 045
Occupant
3629 Vicente St.
San Francisco, Ca. 94116

2449/ 041
Occupant
2636 Great Highway
San Francisco, Ca. 94116

2518/ 015
Albert Hoffman
2206 Sloat Blvd.
San Francisco, Ca. 94116

2449/ 045
Occupant
3631 Vicente St.
San Francisco, Ca. 94116

2449/ 042
Occupant
2630 Great Highway
San Francisco, Ca. 94116

2518/ 015a
Margaret Cunningham
2212 Sloat Blvd.
San Francisco, Ca. 94116

2449/ 046
Occupant
3623 Vicente St.
San Francisco, Ca. 94116

2449/ 042
Occupant
2632 Great Highway
San Francisco, Ca. 94116

2518/ 015b
William Jones
2220 Sloat Blvd.
San Francisco, Ca. 94116

2449/ 046
Occupant
3625 Vicente St.
San Francisco, Ca. 94116

2449/ 035
Occupant
33 Cutler Ave.
San Francisco, Ca. 94116

2518/ 016
Samuel & Robert Gordon
2270 Sloat Blvd.
San Francisco, Ca. 94116

2449/ 037
Occupant
50 Cutler Ave.
San Francisco, Ca. 94116

2449/ 025
Occupant
3620 Wawona St.
San Francisco, Ca. 94116

2518/ 009
Janice & Waynard Lowe
2144 Sloat Blvd.
San Francisco, Ca. 94116

2449/ 039
Occupant
2646 Great Highway
San Francisco, Ca. 94116

2449/ 026
Occupant
2690 Great Highway
San Francisco, Ca. 94116

2518/ 012
Liu Chun Yuk & Hang Lin
2162 Sloat Blvd.
San Francisco, Ca. 94116

7272/ 048
Dunn Wei Pong & Yu Teng
300 Country Club Dr.
San Francisco, Ca. 94132

2518/ 022
William Collins
2933 Yorba St.
San Francisco, Ca. 94116

2518/ 005
Hu Wan Tang & Foon Jee Chow
2120 Sloat Blvd.
San Francisco, Ca. 94116

7273/ 001
Maria & Gregory Spencer
387 Lakeshore Dr.
San Francisco, Ca. 94132

7273/ 002
Bruce & Yong Fehling
296 Country Club Dr.
San Francisco, Ca. 94132

7273/003
Marguerite & Alois Hofman
290 Country Club Dr.
San Francisco, Ca. 94132

7273/ 004
Anne Bushkin
284 Country Club Dr.
San Francisco, Ca. 94132

2518/ 036
Yoshiye & Benjamin Tada
2821 Yorba St.
San Francisco, Ca. 94116

2519/ 013
Ida & Anna Murphy
1906 Sloat Blvd.
San Francisco, Ca. 94116

2519/ 015
King Yip Woo & Hang-Yim
1918 Sloat Blvd.
San Francisco, Ca. 94116

2518/ 033
Nathan Pan
2839 Yorba St.
San Francisco, Ca. 94116

2518/ 034
Sheila Robbins
2833 Yorba St.
San Francisco, Ca. 94116

2518/ 023
Yat Sun Cheung
2927 Yorba St.
San Francisco, Ca. 94116

2518/ 024
Hilda Ellerbeck
2921 Yorba St.
San Francisco, Ca. 94116

2518/ 025
Forrest Nutting
2915 Yorba St.
San Francisco, Ca. 94116

2518/ 026
Lonnie & Elanor Myers
2909 Yorba St.
San Francisco, Ca. 94116

2518/ 027
Chau Wing Kwong & Chau
Chan Shun Ching
2901 Yorba St.
San Francisco, Ca. 94116

2518/ 028
Pansy & Albert Wong
2869 Yorba St.
San Francisco, Ca. 94116

2518/ 017
Magdi & Nagah Ebeid
2260 Sloat Blvd.
San Francisco, Ca. 94116

2518/ 018
Lynda & Lawrence Mackenzie
2254 Sloat Blvd.
San Francisco, Ca. 94116

2518/019
Martha & Lorenoz Mezzera
2248 Sloat Blvd.
San Francisco, Ca. 94116

2512/ 006
John Weybrew & Melody
Gaines-Weybrew
2736 44th Ave.
San Francisco, Ca. 94116

2512/ 006a
Dorothy Hourican
2730 44th Ave.
San Francisco, Ca. 94116

2511/ 033
Kaoru Noda
3125 Wawona St.
San Francisco, Ca. 94116

2512/ 001
Bernice & Manuel Kapkin
2701 43rd Ave.
San Francisco, Ca. 94116

2512/ 001a
Stanley & Betty Cohn
2709 43rd Ave.
San Francisco, Ca. 94116

2512/ 001b
Elsie Boyd
2715 43rd Ave.
San Francisco, Ca. 94116

2512/ 001c
Amalie Suessmann
2721 43rd Ave.
San Francisco, Ca. 94116

2512/ 002
Dorothy & Edward Chaput
2727 43rd Ave.
San Francisco, Ca. 94116

2511/ 028
Katy & Tony Kuan
2712 43rd Ave.
San Francisco, Ca. 94116

2518/006
Gertrud Friedmann Ehrlich &
Stephen Ehrlich
2126 Sloat Blvd.
San Francisco, Ca. 94116

2518/ 007
Blanche & Correa Quinton
2132 Sloat Blvd.
San Francisco, Ca. 94116

2518/ 008
Andy & Voula Pappas
2138 Sloat Blvd.
San Francisco, Ca. 94116

2518/ 002
Vera Alexander
2815 39th Ave.
San Francisco, Ca. 94116

2518/ 004
Elizabeth & Leonard Tong
2839 39th Ave.
San Francisco, Ca. 94116

2518/ 003a
Leonie Tse
2833 39th Ave.
San Francisco, Ca. 94116

2518/ 004a
Kathleen Gargano
2845 39th Ave.
San Francisco, Ca. 94116

2518/ 001a
Maria & Melissa Journey
2809 39th Ave.
San Francisco, Ca. 94116

2513/ 026
United Irish Cultural Center
2700 45th Ave.
San Francisco, Ca. 94116

2512/ 022
Shirley & Donald Lee
3225 Wawona St.
San Francisco, Ca. 94116

2512/ 012
Wong Chuk Keung & Siu Ping
2524 Wawona St.
San Francisco, Ca. 94116

2512/ 019
Gilbert Estrada
2700 44th Ave.
San Francisco, Ca. 94116

2512/ 020
Vuong Tai Binh & Phuong Lee
3237 Wawona St.
San Francisco, Ca. 94116

2512/ 007
Monzer & Marwa Elshawa
2724 44th Ave.
San Francisco, Ca. 94116

2512/ 008
Ton Phuong Quan
2745 43rd Ave.
San Francisco, Ca. 94116

2512/ 009
Dorothy Kurosaki
2751 43rd Ave.
San Francisco, Ca. 94116

2512/ 011
Luis & Petronella Vanvelzen
2518 Sloat Blvd.
San Francisco, Ca. 94116

2512/ 003
Maria & Michael Hovorka
2733 43rd Ave.
San Francisco, Ca. 94116

2511/ 029
Henry & Henriette Gordon
2706 43rd Ave.
San Francisco, Ca. 94116

2511/ 007
Mario & Rina Carrera
2739 42nd Ave.
San Francisco, Ca. 94116

2511/ 008
Mildred McCormick
2745 42nd Ave.
San Francisco, Ca. 94116

2510/ 048
Clifford & Ilse Wichmann
3025 Wawona St.
San Francisco, Ca. 94116

2510/ 049
Irene Shegoleff
3019 Wawona St.
San Francisco, Ca. 94116

2511/ 001a
Mary Parkinson
2707 42nd Ave.
San Francisco, Ca. 94116

2511/ 001c
June Maliano
2715 42nd Ave.
San Francisco, Ca. 94116

2511/ 002
Liu Jian Ming & Ai Ting Liu Jun
2719 42nd Ave.
San Francisco, Ca. 94116

2510/ 046
James & Rosemarie Horan
3037 Wawona St.
San Francisco, Ca. 94116

2512/ 021
Susan L. Webb
3231 Wawona St.
San Francisco, Ca. 94116

Grace & Calvin Wong
2739 43rd Ave.
San Francisco, Ca. 94116

2510/ 047
Ngai Kwok Hing & Mo Kit
3031 Wawona St.
San Francisco, Ca. 94116

2511/ 030
Anna Haakonsen
2700 43rd Ave.
San Francisco, Ca. 94116

2511/ 019
Gloria & Gonzalo Daza
2764 43rd Ave.
San Francisco, Ca. 94116

2510/ 040
Amelia Abell
2722 42nd Ave
San Francisco, Ca. 94116

2511/ 031
Peter Kardassakis
3137 Wawona St.
San Francisco, Ca. 94116

2511/ 020
George & Sophie Goultas
2760 43rd Ave.
San Francisco, Ca. 94116

2510/ 011
Josephine Manzano
2755 41st Ave.
San Francisco, Ca. 94116

2511/ 032
Carmelo Vernale
3131 Wawona St.
San Francisco, Ca. 94116

2511/ 010
Richard , Raymond & Janet Chow
2757 42nd Ave.
San Francisco, Ca. 94116

2510/ 001c
Dorothy Henry
2715 41st Ave.
San Francisco, Ca. 94116

2511/ 022
Mable Ballard
2748 43rd Ave.
San Francisco, Ca. 94116

2511/ 011
Judy & Jonathan Song
2763 42nd Ave.
San Francisco, Ca. 94116

2510/ 002
Craig & Remedios Chapman
2719 41st Ave.
San Francisco, Ca. 94116

2511/ 023
Eugene & Jlia Ahern
2742 43rd Ave.
San Francisco, Ca. 94116

2511/ 012
Anne Montgomery
2400 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 003
Chiu Foo Chan
2723 41st Ave.
San Francisco, Ca. 94116

2511/ 024
Huang Xiao Rong & Tan Jing
2736 43rd Ave.
San Francisco, Ca. 94116

2511/ 013
James & Sandra Kwan
2406 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 004
Stanley & Elizabeth Lowe
2727 41st Ave.
San Francisco, Ca. 94116

2511/ 026
June Dunagan
2724 43rd Ave.
San Francisco, Ca. 94116

2511/ 014
Peter & Anthony Chow
2412 Sloat Blvd.
San Francisco, Ca. 94116

2509/ 056
Alice Eng Eubank
2920 Yorba St.
San Francisco, Ca. 94116

2511/ 027
Paul & Ashen Tchakalian
2718 43rd Ave.
San Francisco, Ca. 94116

2511/ 004
Nagura Yasuko & Archibald Wong
2727 42nd Ave.
San Francisco, Ca. 94116

2509/ 057
James Chan & Fan Yun Wah
2928 Yorba St.
San Francisco, Ca. 94116

2511/ 016
Francisco & Corazon Bautista
2424 Sloat Blvd.
San Francisco, Ca. 94116

2511/ 017
Janet & Joseph MacCormack
2430 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 041
Mary & Carlos Balibrera
2718 42nd Ave.
San Francisco, Ca. 94116

2510/ 042
Morris Shein
2714 42nd Ave.
San Francisco, Ca. 94116

2510/ 036
Tang Hong Duc & Wu Yu Mei
2738 42nd Ave.
San Francisco, Ca. 94116

2510/ 037
Marvin Claudio
2734 42nd Ave.
San Francisco, Ca. 94116

2510/ 038
Mariam & Dikran Sarkisian
2730 42nd Ave.
San Francisco, Ca. 94116

2510/ 030
Mary & Ellen Prager
2774 42nd Ave.
San Francisco, Ca. 94116

2510/ 031
Eduardo & Erlinda Babaran
2768 42nd Ave.
San Francisco, Ca. 94116

2511/ 005
Anita Yung
2731 42nd Ave.
San Francisco, Ca. 94116

2511/ 005a
Ellen & William Johnson
2735 42nd Ave.
San Francisco, Ca. 94116

2510/ 025
Alex & Natalie Dudoroff
2336 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 026
La Truong Van & Kim Mai
2350 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 027
Jim & Tony Leung & Wong
Hung Lin
2792 42nd Ave.
San Francisco, Ca. 94116

2510/ 028
Jean & George Wang Bow
2786 42nd Ave.
San Francisco, Ca. 94116

2510/ 018
Joan, Sean & Joseph Sisser
2783 41st Ave.
San Francisco, Ca. 94116

2510/ 019
Gloria Siegloch
2787 41st Ave.
San Francisco, Ca. 94116

2510/ 022
Luis & Elvira Bruschi
2300 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 001
Joseph & Lina Messina
2701 41st Ave.
San Francisco, Ca. 94116

2509/ 049
Naomi & lloyd Hiura
2933 Wawona
San Francisco, Ca. 94116

2509/ 050
Elroy Joyce
2927 Wawona St.
San Francisco, Ca. 94116

2509/ 025
Frieda Bohme
2792 41st Ave.
San Francisco, Ca. 94116

2509/ 026
Clarita & Rolando Valle
2788 41st Ave.
San Francisco, Ca. 94116

2509/ 027
Yu Jaly
2784 41st Ave.
San Francisco, Ca. 94116

2509/ 028
Naomi Tate
2780 41st Ave.
San Francisco, Ca. 94116

2509/ 029
Baker
2776 41st Ave.
San Francisco, Ca. 94116

2509/ 030
Ralph & Charlotte Brown
2772 41st Ave.
San Francisco, Ca. 94116

2510/ 032
Kelvin, Xing, & Lisa Zeng
2762 42nd Ave.
San Francisco, Ca. 94116

2510/ 023
Mercedes Chofre
2324 Sloat Blvd.
San Francisco, Ca. 94116

2509/ 009
Vivian Burg
2759 40th Ave.
San Francisco, Ca. 94116

2510/ 033
Eduard & Betty Bolin
2756 42nd Ave.
San Francisco, Ca. 94116

2510/ 006
Frank Loskay
2735 41st Ave.
San Francisco, Ca. 94116

2509/ 009a
Claire & Arthur Holl
2763 40th Ave.
San Francisco, Ca. 94116

2510/ 024
Clara Stein
2330 Sloat Blvd.
San Francisco, Ca. 94116

2510/ 010
Santiago Berasategui
2751 41st Ave.
San Francisco, Ca. 94116

2509/ 011
George & Penny Ugawa
2775 40th Ave.
San Francisco, Ca. 94116

2509/ 051
Barbara Baumann & Josephine Schweizer
2921 Wawona St.
San Francisco, Ca. 94116

2509/ 039
Mary & Kathleen Luhman
2736 41st Ave.
San Francisco, Ca. 94116

2509/ 012
Vivian Kite
2900 Yorba St.
San Francisco, Ca. 94116

2509/ 052
Ewald Tilker
2767 40th Ave.
San Francisco, Ca. 94116

2509/ 040
Frank & Ivy Jou
2732 41st Ave.
San Francisco, Ca. 94116

2449/ 024
Simplicio Pedragosa
2695 47th Ave.
San Francisco, Ca. 94116

2509/ 053
John & Irene Altany
2771 40th Ave.
San Francisco, Ca. 94116

2509/ 041
Erwin Levy
2728 41st Ave.
San Francisco, Ca. 94116

2449/ 028
Gin Ying & Siu Ching Y Yee
2686 Great Highway
San Francisco, Ca. 94116

2509/ 054
Virginia & Bill Louie
2906 Yorba St.
San Francisco, Ca. 94116

2509/ 042
David & Yuk-Ling Yee
2724 41st Ave.
San Francisco, Ca. 94116

2449/ 029
Werner & Gertrude Luedloff
2680 Great Highway
San Francisco, Ca. 94116

2509/ 043
William Au & Jesus Carrillo
2720 41st Ave.
San Francisco, Ca. 94116

2509/ 031
Kimon & Lila Kaddas
2768 41st Ave.
San Francisco, Ca. 94116

2449/ 030
Diana & Makroohi Ignatius
2676 Great Highway
San Francisco, Ca. 94116

2509/ 045
Simone Jarry
2712 41st Ave.
San Francisco, Ca. 94116

2509/ 032
Louie Ching Yee
2764 41st Ave.
San Francisco, Ca. 94116

2449/ 018
Robert Sy & Ana Tan
2671 47th Ave.
San Francisco, Ca. 94116

2509/ 046
Lam Tung Kwan & Siu Yuet Li
2708 41st Ave.
San Francisco, Ca. 94116

2509/ 033
Covadonga Alexander
2760 41st Ave.
San Francisco, Ca. 94116

2449/ 019
Teresa & Kun Lam Sun
2675 47th Ave.
San Francisco, Ca. 94116

2509/ 047
Thomas Hull
2700 41st Ave.
San Francisco, Ca. 94116

2509/ 034
Meda Hacopian
2756 41st Ave.
San Francisco, Ca. 94116

2449/ 021
Bernice Dumont
2683 47th Ave.
San Francisco, Ca. 94116

2509/ 037
Betty & Arthur Susnowitz
2744 41st Ave.
San Francisco, Ca. 94116

2509/ 035
Sindy & Joseph Wong
2752 41st Ave.
San Francisco, Ca. 94116

2449/ 023
Maria Garcia
2691 47th Ave.
San Francisco, Ca. 94116

2509/ 038
James Kenny
2740 41st Ave.
San Francisco, Ca. 94116

2509/ 036
Kristen & Jogn Fineran
2748 41st Ave.
San Francisco, Ca. 94116

2449/ 013
Liou Li-Hwa & Lan Lee
1 Cutler Ave.
San Francisco, Ca. 94116

2509/ 015a
Jim & Shan Shan Hom
2930 Yorba St.
San Francisco, Ca. 94116

2509/ 001b
Leo & Mildred McAllister
2711 40th Ave.
San Francisco, Ca. 94116

2449/ 016
Elena Rivera
21 Cutler Ave.
San Francisco, Ca. 94116

2509/ 024
Farida & Serugi Daoud
2796 41st Ave.
San Francisco, Ca. 94116

2509/ 001c
Galina Debruun
2715 40th Ave.
San Francisco, Ca. 94116

2509/ 005
Frances Shoop
2731 40th Ave.
San Francisco, Ca. 94116

2509/ 002
Irma Erman
2719 40th Ave.
San Francisco, Ca. 94116

2509/ 006
Virginia Fetter
2735 40th Ave.
San Francisco, Ca. 94116

2509/ 003
Jose Chen Pang & Grace Lui
2723 40th Ave.
San Francisco, Ca. 94116

2509/ 007
Alice & Darwin Clay
2739 40th Ave.
San Francisco, Ca. 94116

2509/ 004
Mildred & John Elb
2727 40th Ave.
San Francisco, Ca. 94116

2449/ 009
Lisa Truong & Can Hoa Lee
16 Cutler Ave.
San Francisco, Ca. 94116

2509/ 007a
Paul Fan
2743 40th Ave.
San Francisco, Ca. 94116

2509/ 007b
John Ward
2747 40th Ave.
San Francisco, Ca. 94116

2509/ 008
Roy Omi
2751 40th Ave.
San Francisco, Ca. 94116

2509/ 008a
Kathleen Lenihan
2755 40th Ave.
San Francisco, Ca. 94116

2509/ 001a
Catherine Censi
2707 40th Ave.
San Francisco, Ca. 94116

2449/ 017
Indrathan Pillay & Mary Seery
2667 47th Ave.
San Francisco, Ca. 94116

2449/ 006
Margaret Harrison
2627 47th Ave.
San Francisco, Ca. 94116

2449/ 007
Edmund & Omega Lucia
2631 47th Ave.
San Francisco, Ca. 94116

2449/ 031
Yolanda & Henry Khalil
2672 Great Highway
San Francisco, Ca. 94116

2449/ 032
Paul Arias & Nakata Haughee
2668 Great Highway
San Francisco, Ca. 94116

2449/ 033
Kathlyn Free
2664 Great Highway
San Francisco, Ca. 94116

2449/ 034
George Mayer
2660 Great Highway
San Francisco, Ca. 94116

2449/ 036
Phyllis & Kenneth Fletcher
27 Cutler Ave.
San Francisco, Ca. 94116

7273/ 013
Irene Chicos
230 Country Club Dr.
San Francisco, Ca. 94132

2518/ 031
Ruth George
2851 Yorba St.
San Francisco, Ca. 94116

2511/ 034
Kam Sin Chan
3119 Wawona St.
San Francisco, Ca. 94116

2449/ 003
Coszette Eneix
2615 47th Ave.
San Francisco, Ca. 94116

2449/ 004
Jae Woo & Jung Ja Kim
2619 47th Ave.
San Francisco, Ca. 94116

2449/ 005
Lana Troyan
2623 47th Ave.
San Francisco, Ca. 94116

7273/ 031
Edgar Blankenship
351 Lakeshore Dr.
San Francisco, Ca. 94132

2512/ 016
Jane & Yukio Ide
2718 44th Ave.
San Francisco, Ca. 94116

2512/ 018
John Nihill
2706 44th Ave.
San Francisco, Ca 94116

APPENDICES

APPENDIX A. EIR REQUIREMENT

APPENDIX B. NOISE DESCRIPTORS

APPENDIX C. BIOLOGICAL RESOURCES

APPENDIX D. EIR AUTHORS, CONSULTANTS

APPENDIX A. EIR REQUIREMENTS

PLANNING DEPARTMENT

City and County of San Francisco 1660 Mission Street San Francisco, CA 94103-2414

(415) 558-6378 PLANNING COMMISSION FAX: 558-6409 ADMINISTRATION FAX: 558-6426 CURRENT PLANNING/ZONING FAX: 558-6409 LONG RANGE PLANNING FAX: 558-6426

NOTICE THAT AN ENVIRONMENTAL IMPACT REPORT IS DETERMINED TO BE REQUIRED

Date of this Notice: April 4, 1997

Lead Agency: Planning Department, City and County of San Francisco
1660 Mission Street Street - 5th Floor, San Francisco, CA 94103-2414

Agency Contact Person: Irene Nishimura **Telephone:** (415) 558-6358

Project Title: 95.469E: San Francisco Zoological Gardens Master Plan
Project Sponsor: San Francisco Zoological Society
Project Contact Person: Marla Jurosek, Assistant Director of Operations and Capital Development, (415) 753-7080

Project Address: San Francisco Zoological Gardens, 2701 Sloat Boulevard
Assessor's Block(s) and Lot(s): 7281/6 &7
City and County: San Francisco

Project Description: The San Francisco Zoological Gardens Master Plan is a long-range (1997 - 2010), physical development plan for the S.F. Zoo that proposes expansion into an adjoining Recreation and Park property already designated for Zoo uses above-ground, reconfiguration and construction of a new visitor entrance area, and new construction, demolition, and renovation projects in order to improve and update visitor areas and services; wildlife exhibits; animal housing, veterinarian, conservation, and breeding areas and buildings; a new Children's Zoo; Zoo service and support areas and buildings; and new visitor parking. The Master Plan includes a Zoo Forestation Management Plan that proposes replanting, new planting and maintenance of the Zoo's trees and shrubs.

THIS PROJECT MAY HAVE A SIGNIFICANT EFFECT ON THE ENVIRONMENT AND AN ENVIRONMENTAL IMPACT REPORT IS REQUIRED. This determination is based upon the criteria of the Guidelines of the State Secretary for Resources, Section 15063 (Initial Study), 15064 (Determining Significant Effect), and 15065 (Mandatory Findings of Significance), and the following reasons, as documented in the Environmental Evaluation (Initial Study) for the project, which is attached.

Deadline for Filing of an Appeal to the City Planning Commission of this Determination that an EIR is required: April 28, 1997. An appeal requires: 1) a letter specifying the grounds for the appeal, and; 2) a $209.00 filing fee.

for Hillary E. Gitelman
Environmental Review Officer

PLANNING DEPARTMENT

City and County of San Francisco 1660 Mission Street San Francisco, CA 94103-2414

(415) 558-6378 PLANNING COMMISSION FAX: 558-6409 ADMINISTRATION FAX: 558-6426 CURRENT PLANNING/ZONING FAX: 558-6409 LONG RANGE PLANNING FAX: 558-6426

April 4, 1997

RE: 95.469E: San Francisco Zoological Gardens Master Plan
Environmental Impact Report Requirement

To Interested Parties:

A Notice that an Environmental Impact Report (EIR) is determined to be required for the above-referenced project is being sent to you because you have expressed an interest in the proposed project or the project area, or because you have been identified by the Planning Department as potentially having an interest in the project. Notice of publication of this document will be printed in a newspaper of general circulation on the day following the day that this has been mailed to you.

As stated in the Notice, the Planning Department has determined that an EIR must be prepared for the project prior to any final decision regarding whether to approve the project. The purpose of the EIR is to provide information about potential significant physical environmental effects of the proposed project, to identify possible ways to minimize the significant effects, and to describe and analyze possible alternatives to the proposed project.

This Notice is being sent to you to inform you about the status of this project, and to solicit comments you may have regarding what information should be included in the EIR. The Notice includes a summary of the information that the Department already intends to include in the EIR. If you believe that additional information should be included, please send those comments in writing to **Irene Nishimura**, at the Planning Department, 1660 Mission Street, 5th Floor, San Francisco, CA 94103, or call her at (415) 558-6358, by **April 28, 1997**.

Please note that preparation of an EIR does not indicate a decision by the City/County to approve or to disapprove the proposed project. However, prior to making any such decision, the City decision makers must review and consider the information contained in the EIR.

If you have any questions concerning the attached materials or this process, please contact Irene Nishimura at the address or telephone number noted above.

Sincerely,

for Hillary E. Gitelman
Environmental Review Officer

95.469E: SAN FRANCISCO ZOOLOGICAL GARDENS MASTER PLAN

SUMMARY OF POTENTIAL ENVIRONMENTAL EFFECTS

The proposed project, as described in the attached Notice, is the San Francisco Zoological Gardens Master Plan, a long-range physical development plan for the period from 1997 to 2015, which proposes new construction and major alteration and renovation of the main visitor entrance, visitor parking, the main visitor pathway, the wildlife exhibits, animal housing and feeding areas, and Zoo service areas, and the re-planting and maintenance of the Zoo's trees, plants and shrubs. The proposed project would entail demolition of most existing Zoo exhibits and buildings with the exception of the Mothers Building. The new Zoo entrance and new parking area would be accessed from the Great Highway, south of Sloat Boulevard.

Pursuant to the California Environmental Quality Act Guidelines Section 15060, the Planning Department has determined that an Environmental Impact Report (EIR) will be required for the proposed project, and will begin preparation of said EIR.

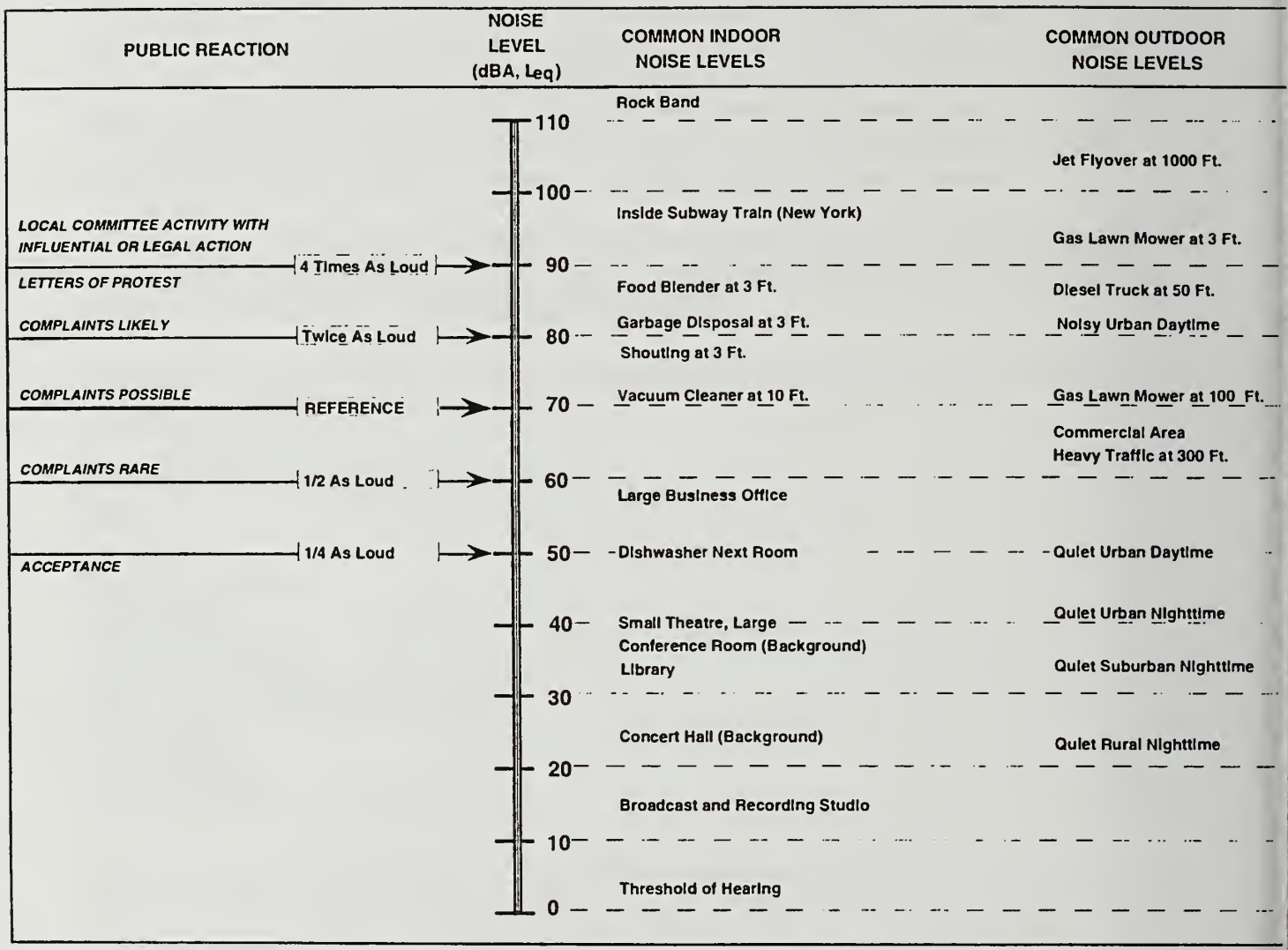
Potential environmental effects related to the following environmental features and issues will be considered in the EIR:

cultural and historic architectural resources
noise
air quality
biological resources
transportation
hazardous materials
geology, topography and groundwater
public services, utilities and water use
visual quality
land use/zoning
population and growth inducement

Construction-related, or temporary effects, will be considered as well as operational and permanent effects. Improvement and mitigation measures for identified potential impacts will be discussed, as appropriate. Possible Alternative projects will also be discussed and analyzed in the EIR.

APPENDIX B. NOISE DESCRIPTORS

APPENDIX B. NOISE DESCRIPTORS



SOURCE: Caltrans Transportation Laboratory Noise Manual, 1982; and Modification by Environmental Science Associates, Inc.

Common Indoor and Outdoor Noise L

APPENDIX C. BIOLOGICAL RESOURCES

C1. PLANT SPECIES OBSERVED AT THE SAN FRANCISCO ZOO

Common Name	Scientific Name
Tree Species	
Black acacia	Acacia melanoxylon
Bushy yate	Eucalyptus lehmannii
California buckeye	Aesculus californica
Eucalyptus	Eucalyptus globulosus, E. spp.
Monterey pine	Pinus radiata
Monterey cypress	Cupressus macrocarpa
New Zealand Christmas Tree	Metrosideros excelsea
Pittosporum	Pittosporum sp.
Toyon	Heteromeles arbutifolia
Weeping willow	Salix babylonica
Shrub Species	
Australian tea tree	Leptosporum spp.
Bottlebrush	Melaleuca sp.
Brewer's saltbush	Atriplex lentiformis
California lilac	Ceanothus spp.
Golden wattle	Acacia longifolia

Common Name	Scientific Name
Shrub Species, continued	
Himalaya blackberry	Rubus discolor
Lavender cotton	Santolina chamaecyparissus
Lemonberry	Rhus integrifolia
Myoporum	Myoporum sp.
Oregon grape	Mahonia aquifolium
Rockrose	Cistus purpureus
Rosemary	Rosemarinus officianalis
Spanish bayonette	Yucca shidigera
Strawberry tree	Arbutus unedo
Tree lupine	Lupinus arboreus
Herbaceous Forb Species	
African daisy	Arctotis stoechadifolia
Burr clover	Medicago polymorpha
California poppy	Eschscholzia californica
Cheeseweed	Malva parviflora
Chickweed	Stellaria media
English ivy	Hedera helix
English lawn daisy	Bellis perennis

Common Name	Scientific Name
Herbaceous Forb Species (continued)	
German ivy	Senecio macounii
Honeysuckle	Tecomaria capensis
Iceplant	Carpobrotus chilensis
Miner's lettuce	Claytonia perfoliata
Sonchus	Sonchus oleraceous
Storksbill	Erodium sp.
Vinca	Vinca major
Wild geranium	Geranium molle
Wild lettuce	Lactuca serriola
Wild mustard	Brassica sp.
Wild radish	Raphanus sativa
Wood mint	Stachys ajugoides (ssp. rigida)
Yarrow	Achillea millefolium
Grass Species	
Bermuda grass	Cynodon dactylon
Bluegrass	Poa annua
Brome grass	Bromus carinatus

Common Name	Scientific Name
Grass Species , continued	
California fescue	Festuca californica
Mediterranean barley	Hordeum marinum ssp. gypsophylla
Pampas grass	Cortaderia jubata
Red fescue	Festuca rubra
Ripgut brome	Bromus diandrus
Soft chess	Bromus hordeaceous
Emergent Aquatic Species	
Baltic rush	Juncus balticus
Carex	Carex spp.
Common sedge	Cyperus eragrostis
Duckweed	Lemna minor
Iris-leaved rush	Juncus xiphioides
Water smartweed	Polygonum amphibium
Watercress	Rorripa nasturtium-aquaticum
Yellow water iris	Iris pseudacorus

APPENDIX C. BIOLOGICAL RESOURCES

C2. WILDLIFE SPECIES KNOWN OR SUSPECTED WITHIN THE SAN FRANCISCO ZOO

Common Name	Scientific Name
Amphibians	
Bullfrog	Rana catesbeiana
Pacific tree frog	Hyla regilla
Western toad	Bufo boreas
Reptiles	
Garter snake	Thamnophis sirtalis
Slider	Pseudemys scripta
Smooth softshell turtle	Trionyx muticus
Western fence lizard	Sceloporus occidentalis
Raptors	
American kestrel	Falco sparverius
Barn owl	Tyto alba
Cooper's hawk	Accipiter cooperii
Great-horned owl	Bubo virginianus
Merlin	Falco columbarius
Northern harrier	Circus cyaneus
Peregrine falcon	Falco peregrinus

Common Name	Scientific Name
Raptors, continued	
Red-shouldered hawk	Buteo lineatus
Red-tailed hawk	Buteo jamaicensis
Turkey vulture	Cathartes aura
Other Birds	
Acorn woodpecker	Melanerpes formicivorus
Allen's hummingbird	Selasphorus sasin
American robin	Turdus migratorius
American coot	Fulica americana
American crow	Corvus brachyrhynchos
Anna's hummingbird	Calypte anna
Barn swallow	Hirundo rustica
Black-headed grosbeak	Pheucticus melanocephalus
Black-throated gray warbler	Dendroica nigrescens
Black phoebe	Sayornis nigricans
Bonaparte's gull	Larus philadelphia
Brown creeper	Certhia americana
Brown towhee	Pipilo fuscus
Bushtit	Psaltriparus minimus

Common Name	Scientific Name
Other Birds, continued	
California gull	Larus californicus
California quail	Callipepla californica
Cedar waxwing	Bombycilla cedrorum
Chestnut-backed chickadee	Parus rufescens
Common goldeneye	Bucephala elangula
Common saltmarsh	
yellowthroat (nesting)	Geothlypis trichas sinuosa
Common snipe	Gallinago gallinago
Common yellowthroat	Geothlypis trichas
Cinnamon teal	Anas cyanoptera
Dark-eyed junco	Junco hyemalis
European starling	Sturnus vulgaris
Golden-crowned sparrow	Zonotrichia atricapilla
Great blue heron	Ardea herodias
Hooded oriole	Icterus cucullatus
House finch	Carpodacus mexicanus
House sparrow	Passer domesticus
House wren	Troglodytes aedon

Common Name	Scientific Name
Other Birds (continued)	
Killdeer	Charadrius vociferus
Lesser goldfinch	Carduelis psaltria
Mallard	Anas platyrhynchos
Mourning dove	Zenaida macroura
Northern flicker	Colaptes auratus
Northern oriole	Icterus galbula
Purple finch	Carpodacus purpureus
Pygmy nuthatch	Sitta pygmaea
Red-breasted nuthatch	Sitta canadensis
Red-winged blackbird	Agelaius phoeniceus
Rufous-sided towhee	Pipilo crissalis
Scrub jay	Aphelocoma coerulescens
Snowy egret	Egretta thula
Stellar's jay	Cyanocitta stelleri
Swainson's thrush	Catharus ustulatus
Tennesee warbler	Vermivora peregrina
Townsend's warbler	Dendroica townsendi
Virginia rail	Rallus limicola

Common Name	Scientific Name
Other Birds (continued)	
Warbling vireo	Vireo gilvus
Western gull	Larus occidentalis
White-crowned sparrow	Zonotrichia leucophrys
White-throated sparrow	Zonotrichia albicollis
White-throated swift	Aeronautes saxatalis
Wilson's warbler	Wilsonia pusilla
Winter wren	Troglodytes troglodytes
Yellow-rumped warbler	Dendroica coronata

Common Name	Scientific Name
Mammals	
Black rat	Rattus rattus
California ground squirrel	Spermophilus beecheyi
California myotis bat	Myotis californicus
California vole	Microtus californicus
Deer mouse	Peromyscus maniculatus
House mouse	Mus musculus
Little brown myotis bat	Myotis lucifugus
Long-tailed weasel	Mustela frenata
Norway rat	Rattus norvegicus
Opossum	Didelphis virginiana
Racoon	Procyon lotor
Red fox	Vulpes fulva
Shrew	Neurotrichus gibbsii
Striped skunk	Mephitis mephitis
Western gray squirrel	Sciurus griseus
Western harvest mouse	Reithrodontomys megalotis

Table 1. Sensitive Plant and Wildlife Species with Potential to Occur at the San Francisco Zoo					
Common and Scientific Name	**Legal Status* Federal/State/Other**	**Distribution**	**Habitat Association**	**Identification Period**	**Comments**
WILDLIFE SPECIES					
California red-legged frog *(Rana aurora draytoni)*	E / SSC / -	Northern California south to northern Baja California	Permanent aquatic habitats, such as creeks and ponds with emergent and submergent vegetation; may aestivate in upland burrow during dry periods.	November to August	Considered but rejected: No occurrence records and no suitable habitat present.
California black rail *(Laterallus jamaicensis coturniculus)*	C / ST/ -	Pacific Coast, from Marin County south to San Diego County. Breeds inSan Francisco Bay, Suisun Bay, and in the Sacramento-San Joaquin Delta.	Freshwater marshes and coastal salt marshes. Wades in shallow lakes.	December to January	Considered but rejected: No suitable freshwater marsh or saltmarsh habitat present.
Bank swallow *(Riparia riparia)*	- / ST/ -	From Alaska south to California. In Bay Area, breeding areas include the banks of the Sacramento River, from Shasta County south to Contra Costa County.	Nests on cliffs, bluffs, and banks of rivers.	April to September	Considered but rejected. No suitable nesting habitats present. Closest occurrence is Ft. Funston.
Peregrine falcon *(Falco peregrinus)*	E / SE / -	Throughout California coastal areas from Del Norte County south to San Diego County.	Nests in cliffs, on ridges, and in rocky areas located next to open areas such as grasslands and lakes.	September to May	Considered but rejected. No suitable nesting habitat at Zoo. Species is occasional winter migrant across Zoo property.
Saltmarsh common yellowthroat *(Geothlypis trichas sinuosa)*	C/ SSC/ -	Coastal areas, San Francisco and Bay region.	Requires thick, continuous cover next to water surface for foraging; tules and willow patches for nesting.	April to June	Occasionally nests at Zoo. Reported from Friendship Lagoon, bear Exhibit, lion/tiger grottos
Tidewater goby *(Eucycloglobis newberryi)*	E / SSC / -	From mouth of Smith River, Trinity County south to Agua Hediona Lagoon, San Diego County	Requires still, stagnant waters with a high oxygen content. Found in shallow lagoons and lower reaches of streams.	Year-round	Considered but rejected. Zoo lacks suitable habitat (waterways connected to the ocean)
Tomales isopod (Carcidotea tomalensis)	C / - / -	From several Bay Area counties	Found in freshwater ponds among cattails	Year-round	Considered but rejected. Zoo lacks suitable ponds with cattails

Pacific sand bear=Scarab beetle *(Lichnanthe ursina)*	C / - / -	Sonoma County south to San Mateo County	Coastal sand dunes, usually close to sand surface at crest of the dune	Year-round	Considered but rejected. Zoo lacks suitable sand dune or ruderal sandy habitats.
PLANT SPECIES	**Legal Status* Federal/State/Other**	**Distribution**	**Habitat Association**	**Identification Period**	**Comments**
Marsh sandwort *(Arenaria palludicola)*	E / SE / 1B	Known from only one extant population in San Luis Obispo County. Historically reported from Los Angeles, San Bernardino, Santa Cruz, and San Francisco Counties.	Associated with coastal bogs and freshwater marsh habitats up to 300 meters above sea level, Washington to southern California.	May to August	Considered but rejected. Zoo lacks ruderal sandy habitats.Species is considered extirpated from SF by NDDB.
Presidio clarkia *(Clarkia franciscana)*	PE / SE / 1B	Known from fewer than five occurrences in Alameda and San Francisco Counties.	Associated with grasslands and coastal scrub communities on serpentine soils.	May to July	Considered but rejected. Zoo lacks serpentine outcrops and serpentine soils.
San Francisco gumplant *(Grindelia hirsuta* var. *maritima)*	C / - / 1B	Known from Monterey, Marin, Santa Cruz, San Francisco, San Luis Obispo, and San Mateo Counties.	Associated with sandy or serpentine slopes and sea bluffs up to 400 meters above sea level.	August to September	Considered but rejected. Zoo lacks sandy or serpentine coastal bluffs, ruderal sandy habitats.
San Francisco lessingia *(Lessingia germanorum)*	PE / SE / 1B	Known from only four occurrences at the Presidio of San Francisco, and one at San Bruno Mountain in San Mateo County.	Coastal scrub communities and remnant dunes.	August to November	Considered but rejected. Zoo lacks sandy dunes, coastal scrub, and ruderal sandy habitats.
San Francisco owl's clover (Tryphisaria floribunda)	C / - / 1B	Marin, San Francisco, and San Mateo Counties	Coastal prairie and valley foothill grasslands on serpentine substrates.	April to May	Considered but rejected. Zoo lacks serpentine substrates.
San Francisco popcorn flower *(Plagiobothrys diffusus)*	C / SE / 1B	Known from only six occurrences in Santa Cruz County. Presumed extirpated in San Francisco County.	Associated with coastal prairies and grasslands, edges of coastal forests.	April to June	Considered but rejected. Zoo lacks coastal prairie and ruderal sandy habitats. Species considered extirpated in SF.

* Federal Status	State Status	California Native Plant Society Ranking
- = No status	- = No status	- = No status
E= Federally listed as endangered	SE= State listed as endangered	1B=rare, threatened, or endangered in California and elsewhere
T= Federally listed as threatened	ST= State Listed as threatened	
C= Federal candidate under consideration for listing as threatened or endangered.	SSC= State species of special-concern	
PE= Proposed for status as federally endangered		

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