DRAFT

ENVIRONMENTAL IMPACT REPORT

LION'S GATE RESERVE

Lead Agency: County of Santa Clara

File #4039-67-28-93
SCH #94043016

March 1996

VOLUME II: TECHNICAL APPENDICES B through E

VOLUME II

TABLE OF CONTENTS

APPENDIX B

Economic Analysis of Agricultural Operations

Prepared by

Dr. James A. Niles

February 1996

Economic Analysis of Agricultural Operations of Lion's Gate Reserve

James A. Niles
Ph. D.
Agricultural Economics

February 1996

Economic Analysis of
Agricultural Operations
of Lion's Gate Reserve

Economics of Agriculture in Santa Clara County

Economic forces have placed tremendous pressure on the viability of farming operations in Santa Clara County. Pressures from competing uses of land, which have bid up the price of land, revenue effects from shifting agricultural product supply and demand, and unfavorable (higher) cost structure have been great. Lert and Wood [1] foresaw these changes in 1972:

> Santa Clara County agriculture has undergone some drastic changes in the past few years, and it is expected that these changes will continue, perhaps at an even faster rate. Some of the changes have been brought about by population growth, industrialization, and urbanization of what was once an agricultural community. Equally important have been the changes in California agriculture which have seen drastic shifts in cropping patterns elsewhere in California and a statewide increase in land available for the production of the specialized tree and vegetable crops which have been the backbone of local farming.

These market driven changes have resulted in a significant downsizing of agricultural operations in Santa Clara County.

Increased land values have been omnipotent factors in causing the shift from agricultural uses to other uses. Production agriculture cannot compete with developmental interests on the urban periphery. Should a farmer desire to continue farming, it is financially beneficial to sell the small, marginally productive local farm and reinvest the proceeds in a larger, more productive farm in another part of the state.

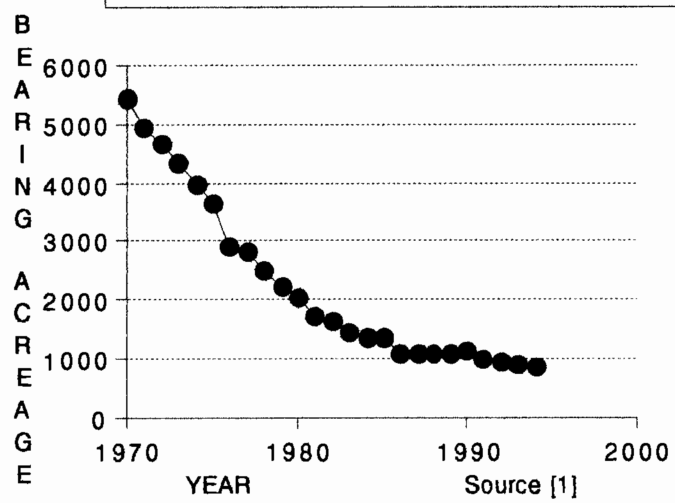
The consequences of these economic pressures can be seen by examining the historical production levels of Santa Clara County agriculture. The most drastic change is shown in the following figures on the acreage of trees and vines, at ten year intervals [2]:

1950	90,168 acres
1960	70,297 acres
1970	39,726 acres
1980	11,285 acres
1990	5,464 acres

Economic pressures have forced significant land use shifts in both the northern and southern portions of the country.

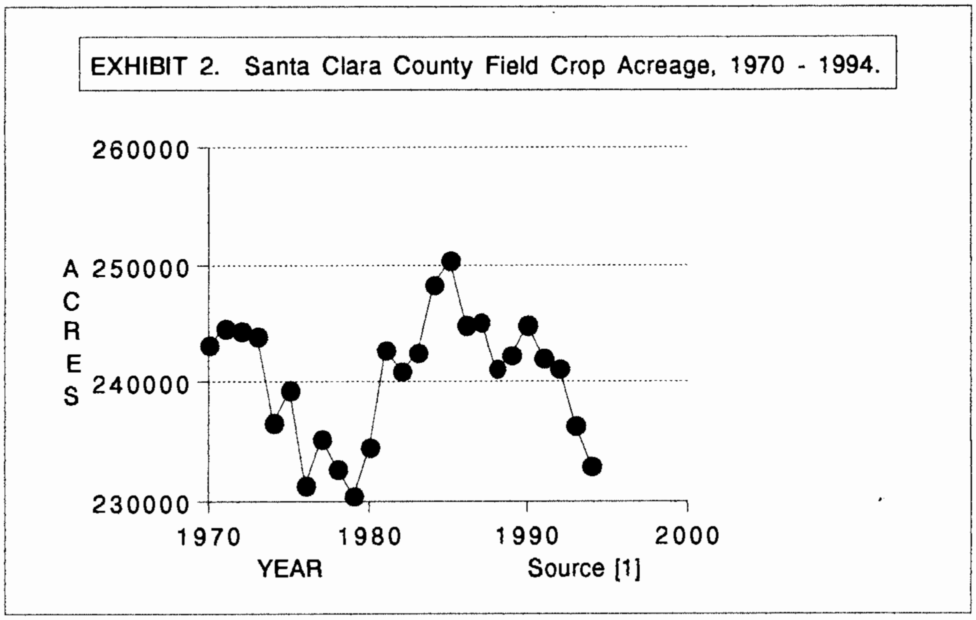
Changes in the walnut acreage in the county are of interest, since walnuts were grown on the subject property. Total acreage in the county was 9,619 in 1950, 5,498 in 1960, and fell to 875 in 1994. Exhibit 1 shows the annual bearing acreage figures for Santa Clara County over the period 1970-1994. A pronounced downward trend is very apparent.

Exhibit 1. Santa Clara Walnut Acreage, 1970 - 1994



However, statewide acreage of walnuts has been expanding. In 1970, the total California acreage was 146,520. In 1980, this figure increased to 179,900, and then to 181,000 acres in 1990. The decrease in the walnut acreage in Santa Clara County has come from multiple reasons in addition to high land values, higher costs because of smaller size planting and other inefficiencies. Santa Clara County is at a disadvantage to other walnut producing areas in California because of improved cultural practices, increased mechanization, higher density plantings, and the introduction of higher yielding varieties.

Examination of another important agricultural sector, the field crops sector, provides further perspective on economic pressures on the county's farmers. Acreage of field crops (wheat, dry beans, sugar beets, barley, oats, hay, and rangeland) for Santa Clara County over the period 1970-1994 is shown in Exhibit 2. After peaking with 250,469 acres in 1985, the acreage has been trending down with the 1994 acreage being 17,439 below the the 1985 figure, with continued declines expected.



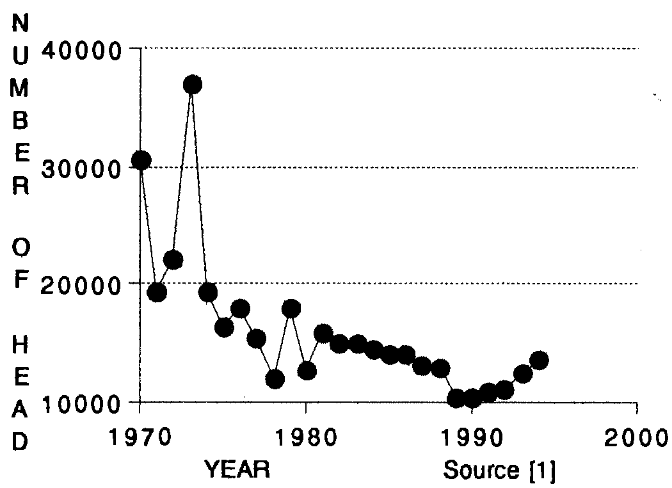
Santa Clara County farmers have been fighting a cost-price squeeze for many years. From the revenue side, Santa Clara farmers experience lower average crop yields than those in California's prime agricultural areas. The cost of production has a direct impact on the profitability of an operation. Considerations are the availability of resources, input costs, and the level of input. Santa Clara County farmers have an unfavorable cost structure due to location and other unique factors. As the agricultural importance of an area decreases, the agricultural infrastructure also declines. Operating costs for labor, farm services, supplies, and equipment tend to be higher than in the more competitive predominantly agricultural areas. This results in a cost disadvantage where more resources must be expended for a lower level of production, placing Santa Clara County farmers in a declining revenue, increased cost situation. Over an extended period, this will result in successively increasing number of farming operations going out of business,and declining agricultural production.

California farms have responded to their economic pressures by adopting new technology, substituting capital for labor and increasing size to achieve efficiency. New plantings of orchard crops in other areas enjoy comparative cost advantages. Economies of scale can be achieved by larger farms, where lower per unit fixed costs result because capital costs can be spread over a larger acreage. These benefits are not available to Santa Clara County farmers because the high value of the land restricts expansion.

The third agricultural sector that will be discussed is the livestock sector, specifically cow calf operations. This low intensive use of land involves pasturing cattle on rangeland and selling the output -- the calves at weaning time. The annual output of the sector measured in number of head is shown in Exhibit 3. After years of decline, this sector is experiencing an uptrend. Cattle can be run on marginal land and land further away from development, which has experienced less appreciation.

Cattle can also be run on an interim basis as landowners are awaiting development.

EXHIBIT 3. Number of Cattle and Calves, Santa Clara County, 1970 - 1994.



Subject Property

The subject property is located 3 miles south of Morgan Hill and east of San Martin, on the eastern side of Santa Teresa Boulevard. The property stretches up to Watsonville Road, varying in elevation from 270 to 1200 feet. The southern part of the property is approximately 2.5 miles north of Highway 152. The total acreage of the subject property is 1,676 acres and can be divided into three parcels for discussion purposes.

The majority of the property, Parcel A is 1500 acres of hilly terrain. It consists of a valley formed by the west branch of Llagas Creek flanked by hills. The major soil type of this portion is Keefers clay loam, (KeC2). The USDA soil survey [3] describes this soil series as "well drained clay loams that are underlain by alluvium from basic igneous rock". The vegetation where soils are not cultivated is "annual grasses, forbs, and scattered oak trees". With this slope, these soils types are appropriate for grazing of cattle [3], which is it's present use.

Parcel B of the subject property consists of approximately 144 acres that have been cleared and has been cultivated to field crops. At one time a dairy was operated on the property. There still exist two dairy barns in fair to poor condition and an outdated milking parlor. This area has a minor slope variation, with the major soil type being Los Robles clay loam (LrA). The Los Robles clay loams are "well drained clay loams that are underlain by stratified basic igneous rock alluvium". Los Robles soils have historically been used for row crops. orchards, dryland had and pasture[3]. The last time that this parcel was cropped was the 1994 season. Currently, the parcel is rented out with a cow calf operation being run on the property. There is one house on the property that is rented out.

Parcel C of the subject property is approximately 32 acres which have been cleared and leveled and were planted to walnuts and other fruit trees decades ago. This orchard is well past it's economic life, and has not been farmed for eight to 10 years. The northeast portion has no trees remaining. The orchard is beyond salvaging and the remaining trees need to be removed. Two soil types exist in this portion, the previously mentioned Los Robles clay loam (LrA) and Maxwell clay (McB). The Maxwell series consists of moderately well drained clays that are underlain by serpentine alluvium. The Maxwell clay soil type has "slow permeability with runoff being very slow to slow". This soil type has been used for irrigated prunes, dryland grain hay and pasture[3].

<u>Economic Evaluation</u>

The preceding discussion on the macro economic pressures outlined the market driven forces that are impacting Santa Clara County agriculture. These pressures have strong implications on the economic viability of the three parcels in the subject property.

Parcel C. Santa Clara County fruit and nut operations cannot effectively compete in today's marketplace, with a significant decrease in the county's acreage as a result of operations being forced out of business. This parcel has no current agricultural value. The state of the orchard can only be described as abandoned. In fact, this parcel has a negative agricultural value since remaining trees must be cut down and removed. The one house one the property is being rented for $325 per month for a total income of $3,900 per year. Taxes alone on this parcel are $7,923 per year.

Are there more favorable conditions so that this parcel would be able to generate positive economic returns? The hypothetical "family farm" will be analyzed.[1] This agricultural operation will have no existing long term debt, prior to commencing new farming activities. The first alternative to be budgeted is the planting of a walnut orchard on the 28 farmable acres in this parcel. The annual Gross Revenues are the product of 3000 pounds of walnuts per acre times 60 cents per pound times 28 acres, or $50,400. Direct cultural costs, harvesting and dehydrating costs would be $37,240 , leaving Net Revenues of $13,160 to cover Overhead Costs. The Overhead Cost would be $19,900 at the existing tax level of $7,900. Thus, the net return is negative $6,740. If the tax level could be reduced to $1160, then a break-even condition could be created.[2] This would provide no returns to cover living expenses.

The Williamson Act provides tax relief for continued commitment to agricultural uses. At the reduced level of assessed value, the annual tax levy for the parcel would be $1181 or approximately the break-even condition. Thus, it would only be of minuscule benefit.

Parcel B. As discussed, this parcel has had a variety of uses over the past 20 years, now being used for pasturing of cattle. Rent for the pasture and one house is currently $550 per month for a total income of $6,600 per year. This is a non-economic unit as the taxes are $29,740 per year.

For this parcel we will budget growing hay on 125 farmable acres again modeling our "family farm" without any existing long term debt. Net Revenues would be $7,655. At the existing tax level of $29,740, Overhead Costs would be $35,740, budgeting the annual costs of an office, accounting costs, insurance, and the interest cost on borrowed capital to be $6000. Taxes would have to drop to $1,655 to establish a break-even condition. This would provide for no return for risk taking or return on investment.

For this parcel, the calculated tax level under the Williamson Act provisions would be $5,314 which is below the break-even tax level.

Parcel A. This parcel has always been utilized as rangeland for cattle. Approximately 175 - 200 head of cattle are currently being run on this parcel. This parcel currently has a negative cash flow . The rent received is $20,000 per year with the taxes being $160,000 per year.

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1 The framework for this analysis was the development of cash flow budgets for various options. First, Gross Revenues were calculated by multiplying the output of the agricultural operation by the price per unit. Second, direct Production Costs are calculated . These costs will be the growing or cultural costs plus any harvesting or appropriate costs. Third, Net Revenues, Gross Revenues minus Production Costs are determined. Forth, Overhead Costs are calculated. These costs include annual costs such as maintaining an office, accounting costs, and insurance. Also included are the costs of borrowing capital as the start-up costs of trees, tractors and other equipment, and the cow herd will have to be financed. Property taxes,of special interest, are included here. Last, a Net Return is calculated, being Net Revenues minus Overhead Costs.

2 For comparison purposes and to show the comparative disadvantage of Santa Clara County , I currently farm 40 acres of walnuts in the San Joaquin Valley where the tax level is $1600.

As an alternative, we will consider a “Family Ranching operation” free of any long term debt. Budgeted will be a cow herd of 250 cows, producing 215 calves at a 86 percent calf crop at weaning time. The calves will be sold at a weaning weight of 500 pounds at 65 cents per pound for Gross Revenues of $69,875. Net Revenues after production costs are calculated to be $44,875. Overhead costs at the existing tax level of $160,000 would be $182,000. The tax level would have to fall to $22,875 for a break-even condition to be realized. Again, this break-even situation provides for no economic incentive to pursue this option.

The Williamson Act tax relief would not be great enough to create a break-even condition for this parcel, as the calculated Williamson Act tax rate would be $36,900.

Conclusion

The agricultural operations of the subject property are not economically viable for a number of reasons. Underlying all activities are the severe economic pressures on Santa Clara County agriculture. These forces have created a property that can not compete because of lower productivity, higher costs, and the inability to take advantage of scale economies. Budgeting three alternatives for the “family farm”, revealed that in all three cases, minimal tax levels resulted only in break-even situations. These operations had the additional benefit of the assumption of being initially debt free. These break-even situations provide for no economic return for the risk taking, the return on investment, or the generation of any profits to live on. Thus, there is no economic incentive to undertake these operations, even under more favorable conditions. Besides the basic, underlying economics, the property is adversely affected by the level of taxation. At the existing tax levels, the subject property is a non-performing economic unit with all three parcels experiencing negative cash flow. Extreme financial burdens occur because of the high tax levels. This condition would still exist should this property be placed under the Williamson Act, with one parcel at the break-even tax level and two parcels below that level. Thus, there is no agricultural operation that could support any of these tax levels.

LITERATURE CITED

[1]. County of Santa Clara, Santa Clara County Agriculture Report, Various reports, 1971- 1994, Department of Agriculture.

[2]. Lert, Peter J. and W.W. Wood, Jr. , Santa Clara County Agriculture - A Look at Its Future, Agricultural Extension, University of California, Santa Clara County, June 1972.

[3]. Soil Conservation Service, Soil Survey of Eastern Santa Clara Area, California, USDA, September 1974.

APPENDIX C

Geologic Reports

Prepared by

1) Pacific Geotechnical Engineering

December 1995

2) ENGEO, Inc.

April 1993

3) Wahler Associates

April 1990

4) Kaldveer Associates

August 1989

5) Terratech, Inc.

January 1988

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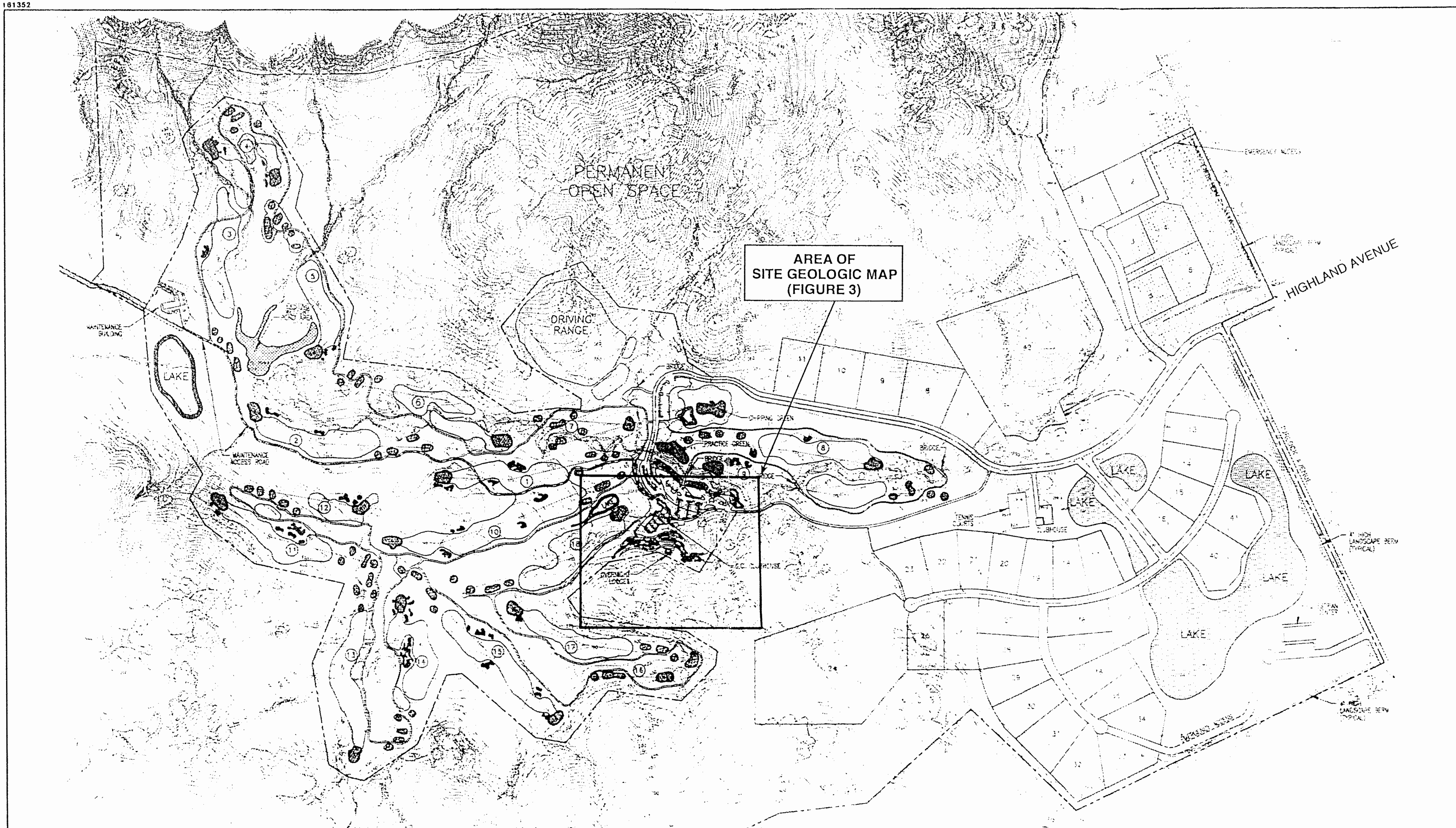

PACIFIC GEOTECHNICAL ENGINEERING	DATE DEC. 1995	DEVELOPMENT PLAN	FIGURE 2
	SCALE 1" = 600'	CLUBHOUSE AND OVERNIGHT LODGES THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	PROJECT 1385/5G

GEOLOGIC FEASIBILITY INVESTIGATION
CLUBHOUSE AND OVERNIGHT LODGES
THE LIONS GATE RESERVE
SAN MARTIN, CALIFORNIA

PROJECT 1385/5G

For

Mr. Tom Hix
Hayes Valley Development Partners
c/o Hix Rubenstein Companies
405 El Camino Real - Suite 127
Menlo Park, California 94025

By

PACIFIC GEOTECHNICAL ENGINEERING
16120 Caputo Drive, Suite D
Morgan Hill, California 95037
(408) 778-2818

December 1995

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

GEOLOGIC FEASIBILITY EVALUATION
CLUBHOUSE AND OVERNIGHT LODGES
THE LION'S GATE RESERVE
SAN MARTIN, CALIFORNIA

INTRODUCTION

This report presents the results of our Geologic Feasibility Evaluation of the site proposed for construction of a golf course clubhouse with overnight lodges as part of The Lion's Gate Reserve development. The primary elements of the overall development are a golf course with clubhouse and overnight lodges, and 41 executive homes. This study was directed at evaluating the geologic suitability of the area proposed for the clubhouse and overnight lodges. Other elements of the development plan were not a part of this study.

The property, locally known as the Hayes Valley, occupies 1676 acres. The proposed development will occupy about 400 acres, with the balance being dedicated to open space. The site is located about 2 miles southwest of the center of the rural community of San Martin. The site is about 5 miles south of the City of Morgan Hill. Hayes Valley extends from Watsonville Road on the west to Highland Avenue on the east. Access to the site will be by an extension of Highland Avenue. Location of the property is shown on our Geologic Index Map, Figure 1.

The overall development concept includes a golf course that will occupy much of the floor of Hayes Valley. The clubhouse will lie at the southern margin of the valley, with the overnight lodges on the hillside behind, elevated 30 to 50 feet above the valley floor. Five of the homesites will lie within Hayes Valley, but the remaining 36 will be situated east of the golf course entrance on the alluvial plain of Santa Clara Valley. Sewage treatment for the proposed clubhouse and overnight lodges will be by a specially designed treatment plant to be constructed onsite. The overall development concept can be seen on the Development Plan, Figure 2.

Several other development concepts have been proposed for the property during recent years. Feasibility and design-level studies conducted as part of project planning and evaluation of those concepts generated voluminous technical data (W.A. Wahler and Associates, 1973; Peter Kaldveer and Associates, 1977; Kaldveer and Associates, 1989; Wahler Associates, 1990; Engeo Incorporated, 1991, 1993). A list of all documents we reviewed as part of this study is presented in the *References* section of this report. For our work on this project, we were provided with a 24-page set of plans titled "The Lion's Gate Reserve" prepared by Forsgren Associates, Inc., dated November, 1995.

SCOPE OF SERVICES

In the completion of this project, we performed the following scope of services:

1. Review of regional and site-specific geologic literature.
2. Study of aerial photographs of the site and surroundings.
3. Geologic mapping of the area proposed for the clubhouse and overnight lodges.
4. Construction of two topographic profiles and two field-measured profiles in representative and critical areas of the proposed development, and construction of four geologic cross sections.
5. Excavation and logging of seven exploratory backhoe test pits.
6. Analysis of our findings and formulation of conclusions regarding the geologic suitability of the area for the proposed development.
7. Preparation of this Geologic Feasibility Evaluation report.

FINDINGS

Terrain

The physiographic setting of the property can be seen on our Geologic Index Map, Figure 1. Hayes Valley is an intermontane valley in the eastern foothills of the Santa Cruz Mountains. It lies along the lowest fringe of the mountain range, just 20 to 40 feet above the floor of Santa Clara Valley. The east-west trending valley is almost an embayment of the Santa Clara Valley, with two bedrock inselbergs protruding marginally above the valley floor.

Hayes Valley is flanked by moderately to steeply sloping hillside terrain. Hills north of the valley rise gradually to 785 feet above sea level, while hills south of the valley rise rather steeply to more than 1000 feet. The prominent mountain peak, termed "Lion's Peak" or "Lion's Head", rises directly behind the proposed clubhouse site to an elevation of 1117 feet above sea level.

The proposed development is to be sited within three different physiographic terrains: 1) flat *alluvial plain* of Hayes Valley, 2) moderately to steeply sloping *bedrock spur ridges*, and 3) moderately sloping *colluvial swales* that lie between the spur ridges. Although these specific terrain designations are not shown on our maps, their locations can be readily inferred by the presence of the respective earth materials: alluvium, bedrock, and colluvium.

The proposed clubhouse spans a large distance across all three terrain types. Slope gradients at the proposed clubhouse range from near zero on the alluvial plain to a maximum of about 14 degrees on the lower flanks of the bedrock ridge. The overnight lodges are to be spread out along the hillside, occupying both bedrock ridge terrain and colluvial swale terrain. Slope gradients at the overnight lodges range from a minimum of about 12 degrees in the flatest colluvial swale to a maximum of about 19 degrees on the steepest bedrock ridge.

There has been no previous grading at the site of the proposed improvements.

Drainage

Drainage of surface water on the property occurs by uncontrolled, overland sheet flow to the north towards the valley floor and a seasonal creek. That creek flows generally east-northeast and becomes tributary to the main creek draining Hayes Valley. The main creek flows east-southeast out of the valley and becomes tributary to Llagas Creek in Santa Clara Valley. At the time of our field work, there was no flow within either creek, but it was evident that flow occurred during the past winter and spring months.

Drainage off the hillsides above the clubhouse site flows into first-order drainage swales that flow directly north towards the valley. It is clear that flow in these swales occurs only during high intensity or long duration rain storms.

We did not observe evidence of springs or seeps within the proposed development area, although several springs are present in other hillside areas of the property. Soils observed within our hillside test pits contained relatively low moisture contents, and we estimate that the ground water table there is at significant depth. Exploratory excavations performed over the past years within the valley floor have revealed that ground water remains at relatively shallow depths there within the alluvium. Ground water could be expected to be within 10 to 15 feet of the ground surface beneath the clubhouse site during much of the year.

Regional Geologic Setting

Earth materials underlying the eastern foothills of the Santa Cruz Mountains are composed of rocks belonging to the Franciscan Complex of Jurassic to Cretaceous age. Bedrock types found within the Hayes Valley area include sandstone, shale, chert, limestone, greenstone, and low-grade metamorphic rocks. Many areas of the bedrock terrane include a mixture different rock types in a sheared matrix; this formational mixture is termed a melange. Serpentinite is also found within this assemblage of rocks.

The hills north of the valley are underlain by a mixture of different rock types, much of it within melange units. With one exception, the hills south of the valley are underlain by only greenstone. The exception to this generalization is the short (about 2000 feet long) east-west trending ridge underlying the clubhouse and overnight lodges. The rocks there are predominantly sandstone and shale, but include chert and metamorphic rocks, suggesting that they belong to the "family" of rocks found north of the valley. Therefore, we judge that there is a bedrock suture juxtaposing this "family" of rocks with the greenstone rocks south of the short ridge.

The regional trend of geologic structure in the Hayes Valley area is roughly east-west, somewhat acute to the overall geologic structure of N40W for the Santa Cruz Mountains as a whole. Physiographic features, bedrock contacts, and faults are all generally parallel to the this structural grain.

Earth Materials

We identified a variety of different geologic units underlying the area of proposed development. A brief description of the units is provided below; a more detailed description of the geologic units is presented on the Logs of Exploratory Test Pits, located in the *Appendix* of this report. For soil descriptions we have used the ASTM method of classification, and for pertinent properties of bedrock we have used the ASCE Manuals and Reports on Engineering Practice - No. 5 ; a summary of the soil and bedrock classification systems is also presented in the *Appendix*.

There are three major categories of earth materials at the project site: alluvium, colluvium and bedrock. A fourth geologic unit is landslide debris, found in two areas upslope from the proposed development area. Three units are considered surficial deposits (alluvium, colluvium, and landslide debris) because they lie at the ground surface, overlying the deeper bedrock materials. The areal extent of these geologic materials is shown on our Site Geologic Map, Figure 3, and the inferred subsurface relationships are shown on our Geologic Cross Sections A-A', B-B', C-C', and D-D', Figures 4 and 5.

The golf course clubhouse lies within terrains underlain by the three major earth material categories. Some of the overnight lodges are underlain by bedrock, and others are underlain by colluvium (Figures 3, 4, and 5).

Alluvium (Qal). Surficial alluvium at the clubhouse site is moderate yellowish brown (10YR4/2), dry, hard, fat clay with sand (CH). Within recent decades, physical characteristics of the subsurface alluvium throughout Hayes Valley were investigated by other geologic and geotechnical professionals, and recently by Pacific Geotechnical Engineering. We reviewed logs of 22 exploratory excavations in alluvium completed by others between 1973 and 1994, and we excavated 21 small-diameter borings within alluvium during the past year. Our interpretation of the 43 excavation logs suggests that the subsurface alluvial soils at the site are composed of fat clay with sand and/or gravel (CH). The alluvium is reported to be about 100 feet thick near the center of the valley (W.A. Wahler and Associates, 1973). Results of our profiling and cross section work suggests that it is about 25 to 30 feet thick in the area of the proposed clubhouse (see cross section A-A' on Figure 4).

Colluvium (Col). Colluvial soil and bedrock materials were investigated within the hillside areas during this study by means of seven exploratory backhoe test pits. Colluvium was found to be composed of materials ranging from gravelly silt with sand (MI) to fat clay with gravel (CH). Within the proposed development area, colluvium is interpreted to range in thickness between less than one foot in steep terrain to perhaps as much as 20 feet on the flattest, lowest parts of the slope.

Franciscan Complex (KJfs). All of the hillside test pits were excavated to depths sufficient to encounter bedrock. In every case, the bedrock was found to belong to the Franciscan Complex. We encountered either sandstone or shale or both. Although chert and metamorphic rocks (also belonging to the Franciscan Complex) were observed within soil, we judge that they do not underlie significant portions of the development area; we observed them in outcrop along the top of the ridge a few hundred feet upslope. The sandstone is mostly fine- to medium-grained and can be generally characterized as pale yellowish brown (10YR6/2) to grayish brown (5YR3/2), hard, cemented, moderately to closely fractured, and moderately to slightly weathered. Shale is generally a dusky brown (5YR2/2), soft to medium hard, moderately weathered, crushed and pervasively sheared.

Landslide Debris (Dls) Landslide debris is present within two colluvial swales upslope from the eastern end of the proposed overnight lodges. The easternmost landslide measures about 40 feet long and about 25 feet wide and is estimated to be about 5 feet thick. The western landslide is much larger (170 feet by 75 feet) and has significant impact on development. Consequently it was explored with a backhoe test pit (TP-6). It was found to be a maximum of about 9 or 10 feet thick and to be composed entirely of colluvial soil (see Geologic Cross Sections C-C' and D-D' on Figure 5). A strikingly planar, 1/4" thick seam of clay lies at the base of the landslide, which, when examined, was found to have a somewhat dull surface and could not be picked clean without significant effort; we infer that the landslide plane had "healed" somewhat in past decades and therefore does not reflect very recent movement. A healthy, twin oak tree containing two 2-foot diameter trunks is situated in the middle of the landslide, suggesting either that the landslide has not moved in many decades (a greater age for the landslide than for the tree), or that the landslide may have moved more recently but moved as a fairly intact mass so as to not disturb the tree. A more thorough discussion of the hazard of landsliding at the site is presented in subsequent sections of this report.

Geologic Processes

Active geologic hillside processes at the subject property have the potential to influence the proposed improvements. These processes can be very rapid (such as soil liquefaction) or very slow (such as soil creep).

Expansive Soil Seasonal wetting and drying causes plastic soils to expand and contract, in some cases with enough force to damage structures and pavement surfaces. The vast majority of soil on the site is moderately to highly expansive, so there is a high potential for distress due to this geologic process. However, the process is well understood and can be readily mitigated by proper geotechnical engineering, design and construction.

Soil Creep Where expansive soils are present on sloping ground, the seasonal expansion and contraction causes soils to move downslope, generally at a rate measured in millimeters per year. Whereas this rate is very slow, it has a progressive and degenerative effect on structures that are not designed to accommodate or resist the forces involved. The presence of chert fragments within soil at the site of the overnight lodges indicates the effect of creep, because those rock fragments had to have been carried by creeping soil from a bedrock outcrop source, which we suspect to be more than one hundred feet upslope. It appears that the rate of soil creep is more rapid than alluvial deposition near the project site: east of the proposed clubhouse opposite the mouth of the colluvial swale, the thalweg of the seasonal creek has been pushed about 50 feet north by creeping colluvium. (On Figure 3, refer to the curve in the creek channel in the area proposed for parking immediately east of the clubhouse.) The hazard of soil creep can be readily mitigated by proper geotechnical engineering, design and construction.

Shallow Ground Water It has been well documented by earlier field studies that ground water is present at shallow depths within the valley alluvium. While the depth to ground water varies seasonally and yearly, the potential effect on building foundations can be readily mitigated by proper geotechnical engineering, design and construction.

Flooding The proposed clubhouse spans the channel of a seasonal creek. Whereas flow in the creek channel is inferred to be infrequent and low, it is evident that this geologic process could impact the proposed structure and appurtenant facilities. This hazard can be readily mitigated by proper civil and hydraulic engineering, design and construction.

Soil Liquefaction During high intensity ground shaking, such as occurs during large magnitude earthquakes, loose, saturated, sandy alluvium can liquefy and cause displacement of the ground surface. The alluvial deposits of Hayes Valley would otherwise be susceptible to this processes except that all exploration logs we reviewed (a total of roughly 1100 linear feet of boring log) indicate too high a clay and/or gravel content of the deposits for liquefaction to occur.

Landsliding The presence of two landslide deposits within colluvial swales indicates the potential for instability of slopes at and above the proposed overnight lodges. Due to slope angle and slope position of the two landslide deposits, we judge them to be potentially unstable. Therefore, we have categorized them as "Dormant". If either of the existing Dormant Landslide deposits were to become re-activated, it is possible that they could flow downhill and impact the proposed overnight lodge area. Whereas we estimate that there is a high probability of some type of re-newed landslide activity, we are unable to estimate whether that re-newed activity could directly impact proposed structures. (Landsliding might involve only a small segment of the existing deposits, or landslide movement might extend only a few feet, therefore never reaching the lodges.) Nevertheless, the two landslide bodies will need to be addressed during future, design-level geologic and geotechnical studies. It appears that the landslide hazard in these two colluvial swales can be addressed and mitigated in conventional fashion without exorbitant cost. We envision that some type of a grading repair would be appropriate, possibly a simple removal of landslide debris and destruction of the basal plane(s) of failure.

The proposed development of overnight lodges crosses two other colluvial swales west of the ones containing landslide debris. Test pit observations in the two western swales indicate a thickness of colluvium similar to that in the eastern swales. Slope angles in the upper reaches of all swales range between 18 degrees and 20 degrees. Therefore, we judge that there is a significant potential for incipient landsliding within the two western swales. However, those swales have not "hollowed" as deeply as the eastern swales: as can be seen on the base map for Figure 3, inflection of the 450' contour line is 80 feet and 50 feet respectively for the eastern two swales, while it is only 20 feet and 10 feet for the western two swales. While it will be important to devise some method to increase stability of colluvium in the western swales, it appears that this also could be accomplished by conventional means.

Faulting

The site is located nearly equidistant between the two largest active faults in the south San Francisco Bay Region. The San Andreas fault crosses the western side of the Santa Cruz Mountains about 7.4 miles southwest of the site On the northeastern side of the Santa Clara Valley, the Calaveras fault crosses the base of the Diablo Range about 5.6 miles to the northeast. Other active faults in the region include the Hayward fault about 16 miles to the northwest and the Sargent-Berrocal fault, about 4.3 miles to the southwest. All of these faults can be considered capable of generating a large magnitude earthquake that could cause high intensity ground shaking at the site.

Several faults of unknown activity are located much closer to the project site. Regional geologic maps by Dibblee (1973) and Williams et al (1973) show the bedrock suture described earlier to be a fault, as well as several other bedrock contacts within melange terrane on the north side of Hayes Valley. Those faults can be seen on our Geologic Index Map, Figure 1. We find good justification for those mapped faults, and we judge that further detailed mapping could reveal others. However, the regional trend of these faults (30 to 50 degrees to the trend of active faults), and the type of formational materials they juxtapose (only Franciscan rocks) suggest that the faults are of a much earlier geologic period and are not active.

The property is not located within any of the State of California Earthquake Fault Zones (formerly Special Studies Zones), established to ensure that structures for human occupancy are not sited across the trace of an active or potentially active fault.

Seismicity

The property is in an area of high seismicity. The San Andreas fault and the Calaveras fault have each caused damaging earthquakes near the site within recent years. The Hayward fault caused at least two damaging earthquakes during the 1800's.

San Andreas Fault. The San Andreas fault generated the October 17, 1989 Loma Prieta earthquake that registered 7.1 on the Richter scale, causing 64 deaths, about 4000 injuries and causing about 6 billion dollars damage in the Bay Area. The epicenter of that earthquake was about 15 miles west of the site in the Santa Cruz Mountains. The San Andreas fault also generated the 1906 San Francisco earthquake that was estimated to have been 8.3 Richter magnitude; that earthquake killed thousands of people and caused so much damage that threw the economy of Northern California into disarray. The San Francisco earthquake released about 60 times the amount of energy released during the Loma Prieta earthquake.

Data from strong-motion seismograms suggest that peak ground accelerations in the San Martin area from the Loma Prieta earthquake were probably about 0.25g (about 25% the acceleration of gravity). However, evaluation of structural damage in the area suggests that local areas experienced significantly higher accelerations. Those areas appear to have unique topographic characteristics, such as along narrow bedrock ridges and on knolls.

The next major earthquake to have serious impact on the San Martin area may occur on the San Andreas fault along the segment north of the Loma Prieta area. In a 1990 publication, The Working Group on California Earthquake Probabilities estimated that there was a 37% probability of a Richter magnitude 6.5 or 7 earthquake occurring along that segment (the San Francisco Peninsula segment) of the fault by the year 2020. If that earthquake occurs, it could cause high intensity ground shaking at the site that would be equivalent or greater than that experienced there during the Loma Prieta earthquake.

Calaveras Fault. The Calaveras fault is one of the major branches of the San Andreas fault in the Bay Area. The damaging "Morgan Hill" earthquake of April 24, 1984, was epicentered on the Calaveras fault in the Halls Valley area about 19 miles north of the site. The magnitude of the earthquake was reported to be 6.2 on the Richter scale. The "Coyote Lake" earthquake of August 6, 1979 was epicentered on the Calaveras fault also, about 7 miles southeast the subject property. This earthquake had a Richter magnitude of 5.9, and peak ground accelerations (horizontal) were as high as 0.28g at Coyote Dam and 0.42g in Gilroy. Repeatable high ground accelerations (10 cycles or more) in the Morgan Hill area were in the range of 0.2 to 0.25g. No one was killed in either of these earthquakes, but damage reached several million dollars for each earthquake.

Hayward Fault. During historic time, the Hayward fault has generated two large magnitude earthquakes (in 1836 and 1868). Both of these earthquakes are estimated to have been roughly equivalent to a Richter magnitude 7. Both earthquakes were in Alameda County. It is anticipated that the Hayward fault will someday generate earthquakes of equivalent magnitude. The Working Group estimated in 1990 that the probability of a Richter magnitude 7 earthquake occurring by the year 2020 was 28% for the northern segment of the fault, and 23% for the southern segment.

Following more recent studies of earthquake recurrence periods, the Working Group may be raising their estimated probability of a major earthquake occurring within the Bay Area in the next 25 years from 67% to possibly as much as 90% (David Schwartz, the Working Group, personal communication).

Due to the proximity of these active faults it is very likely that the site will experience severe ground shaking during the lifetime of the proposed improvements.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the information we have studied, it is our opinion that the proposed development sites are geologically suitable for construction of a golf course clubhouse and overnight lodges. There are several geologic constraints to the proposed development, but it appears that they can all be addressed during future, design-level studies, and appropriate solutions or mitigation methods can be established.

The probability of ground rupture caused by active surface faulting at the site is very low because there are no active faults known to cross the site. The geologic processes associated with expansive soils and soil creep can be addressed and mitigated by conventional geotechnical engineering, design and construction. The potential for stream flooding can be quantified through hydraulic analyses, and hazard mitigation solutions can be developed accordingly. Any potential adverse impact of shallow ground water can be analyzed during future geotechnical studies; it is important, however, to recognize this condition when planning for underground structures and utilities in alluvial terrane. Based on our regional studies, we presently consider the probability of soil liquefaction and lateral spreading to be very low; this conclusion could be further evaluated during future studies. The hazards of seiche and tsunami do not exist in Hayes Valley.

Landsliding

The hazard of landsliding within the colluvial swales has a significant potential to impact the proposed development. There is a high probability that the Dormant Landslides could become re-activated, although it is not currently known whether re-newed landslide movement could reach the site of the proposed overnight lodges. The high clay content of the colluvial material we observed suggests that landslide failure would probably not generate a high velocity debris flow that could travel far down slope.

Our subsurface exploration within one Dormant Landslide indicates that the depth of current as well as future landsliding will probably not be greater than about 10 feet. This significant finding indicates a high probability that the current landslides can be stabilized (or removed) using conventional grading techniques. Future geologic and geotechnical studies of the landslide hazard could reveal other, more cost-effective methods or other, more aesthetically pleasing methods of adequately mitigating the hazard.

Subsurface exploration within the two western colluvial swales revealed a similar depth of colluvial soil, indicating that the maximum depth of potential instability there is similar to that at the current landslide areas. Future geologic and geotechnical studies should address stability of the colluvium in these two swales and, if necessary, develop means to decrease the potential for incipient landsliding there.

Seismicity

Due to the close proximity of the San Andreas, Hayward and Calaveras faults, as well as other active and potentially active faults, it is reasonable to assume that the site will experience high intensity ground shaking at least once within the design life of the proposed improvements. It is possible that a future large-magnitude earthquake could generate ground shaking intensities at the site that could equal or exceed those experienced there during the Loma Prieta earthquake. We currently suggest that the "design earthquake" for the project site be a magnitude 7.0 event with an epicenter near the southern end of the San Francisco Peninsula segment of the San Andreas fault, or a similar earthquake at the southern end of the southern segment of the Hayward fault. Those hypothetical epicenters are each about 16 miles from the site; those earthquakes have the capability to generate peak horizontal ground accelerations at the site of 0.3g and repeatable high ground accelerations (10 cycles or more) of 0.2g. Ground motions of this character could result in shaking intensities in the range of Modified Mercalli Intensity VII-VIII, similar to that experienced during the Loma Prieta earthquake. The occurrence probability of these design earthquakes is somewhere between 67% and 90% over the next 25 years.

For our estimation peak ground accelerations anticipated from a "design earthquake", we have chosen a maximum *probable* event. Engeo (1993) previously calculated peak ground accelerations greater than 0.4g for maximum *credible* earthquakes on the San Andreas fault, Calaveras fault, and Hayward fault. We judge that their deterministic calculations using maximum credible earthquakes may be better applied to the design critical structures (such as hospitals); our probabilistic prediction of earthquake ground motions uses maximum probable earthquakes and includes an excedence probability of something in the range of 10% to 20% over an assumed design life of 50 years for proposed structures.

The Loma Prieta earthquake caused a variety of ground deformation features that had not been anticipated by geologists prior to that time. It is certain that future earthquakes will teach us more about the impact of permanent ground deformation on hillside development. It must be understood that it is not possible to predict exactly how the subject property will respond to future large-magnitude earthquakes.

Once the development concept is confirmed, we recommend that a geotechnical engineering investigation be included along with the other anticipated design-level studies.

Access to the proposed development area from Highland Avenue is geologically feasible. Emergency access or egress from Watsonville Road is geologically feasible.

LIMITATIONS

The recommendations contained in this report are based, in part, on certain information and data that have been provided to us. In the event that any changes in the general grading concept, building location, or general type of structure are required, our conclusions and recommendations shall not be considered valid unless we are commissioned to review such changes and to make any necessary additions or changes to our recommendations.

Subsurface exploration is necessarily confined to selected locations and conditions may, and often do, vary between these locations. Should conditions different from those assumed in this report be encountered during future studies or project development, additional exploration, testing and analysis may be required.

Any person concerned with this project, observing features or conditions at the site or surrounding area which are different from those described in this report, should report them immediately to this office for evaluation.

In preparing the findings and professional opinions presented in this report, we have endeavored to follow all generally accepted principles and practices of the geotechnical engineering professions. This warranty is in lieu of all other warranties, express or implied.

It is the responsibility of the client to ensure that the recommendations given in this report are made known to all design professionals involved with the project. A copy of this report should be provided to new owners if the property is conveyed.

Report prepared by,

PACIFIC GEOTECHNICAL ENGINEERING

Peter C. Anderson
RG 3833
CEG 1189

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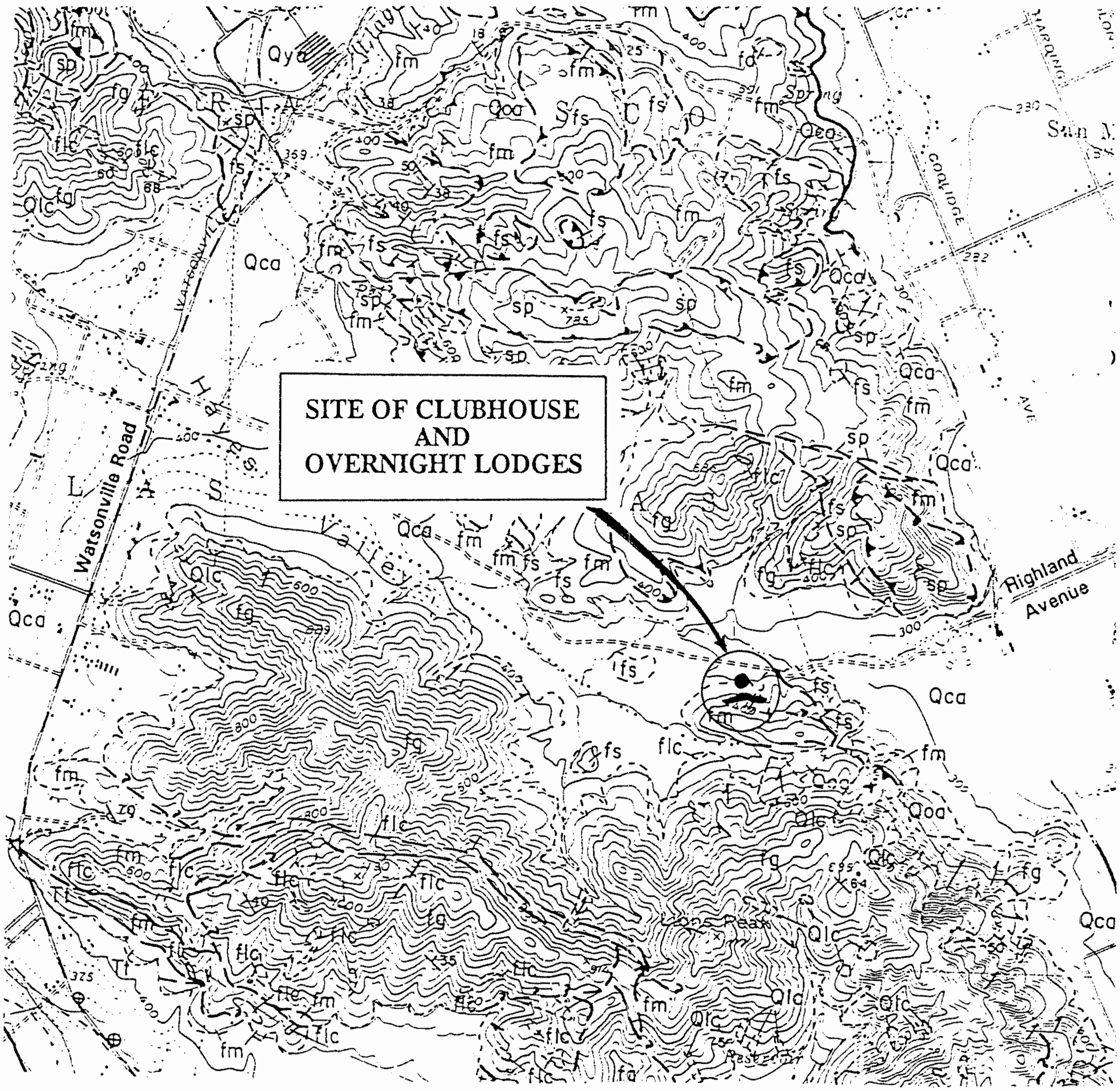
02/28/93, Aerial Photomapping Services, black & white, Series APS 93607, Frame #7, 8, 9, 12, 13, 14, Scale 1"=750'.

03/02/93, Aerial Photomapping Services, black & white, Series APS 93607, Frame #16C, 18C, scale 1"=1800'.

FIGURES

161352



Base Map: Areal Geology, South County Study Area, 1973, by Williams and others, CDMG PR-18, 1" = 2000'

- N -

EXPLANATION

Qca	Alluvium and thick colluvium
fm	Franciscan Complex melange
fg	Franciscan Complex greenstone
flc	Franciscan Complex limestone & chert
fs	Franciscan Complex sandstone
sp	Serpentinite
	Landslide

PACIFIC GEOTECHNICAL ENGINEERING

DATE	GEOLOGIC INDEX MAP	FIGURE
DEC 1995	CLUBHOUSE AND OVERNIGHT LODGES THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	1
SCALE		PROJECT
1" = 2000'		1385/5G

LOGS OF EXPLORATORY TEST PITS

KEY TO SOIL CLASSIFICATION - FINE GRAINED SOILS[1]

FINE GRAINED SOILS

MORE THAN 50% PASSING THE NO. 200 SIEVE

MAJOR DIVISIONS				GROUP NAMES
ML/CL	SILTS AND CLAYS LIQUID LIMIT < 35	SILTS AND CLAYS WITH LESS THAN 30% COARSE GRAINED MATERIAL	< 15% COARSE GRAINED	LEAN SILTS/CLAYS
			15 TO 29% COARSE GRAINED	LEAN SILTS/CLAYS WITH GRAVEL OR SAND
		SILTS AND CLAYS WITH GREATER THAN 30% COARSE GRAINED MATERIAL	% SAND > % GRAVEL	SANDY LEAN SILTS/CLAYS WITH OR WITHOUT GRAVEL
			% GRAVEL > % SAND	GRAVELLY LEAN SILTS/CLAYS WITH OR WITHOUT SAND
MI/CI	SILTS AND CLAYS LIQUID LIMIT 35 TO 50	SILTS AND CLAYS WITH LESS THAN 30% COARSE GRAINED MATERIAL	< 15% COARSE GRAINED	SILTS/CLAYS
			15 TO 29% COARSE GRAINED	SILTS/CLAYS WITH GRAVEL OR SAND
		SILTS AND CLAYS WITH GREATER THAN 30% COARSE GRAINED MATERIAL	% SAND > % GRAVEL	SANDY SILTS/CLAYS WITH OR WITHOUT GRAVEL
			% GRAVEL > % SAND	GRAVELLY SILTS/CLAYS WITH OR WITHOUT SAND
MH/CH	SILTS AND CLAYS LIQUID LIMIT > 50	SILTS AND CLAYS WITH LESS THAN 30% COARSE GRAINED MATERIAL	< 15% COARSE GRAINED	SILTS/FAT CLAYS
			15 TO 29% COARSE GRAINED	SILTS/FAT CLAYS WITH GRAVEL OR SAND
		SILTS AND CLAYS WITH GREATER THAN 30% COARSE GRAINED MATERIAL	% SAND > % GRAVEL	SANDY SILTS/FAT CLAYS WITH OR WITHOUT GRAVEL
			% GRAVEL > % SAND	GRAVELLY SILTS/FAT CLAYS WITH OR WITHOUT SAND

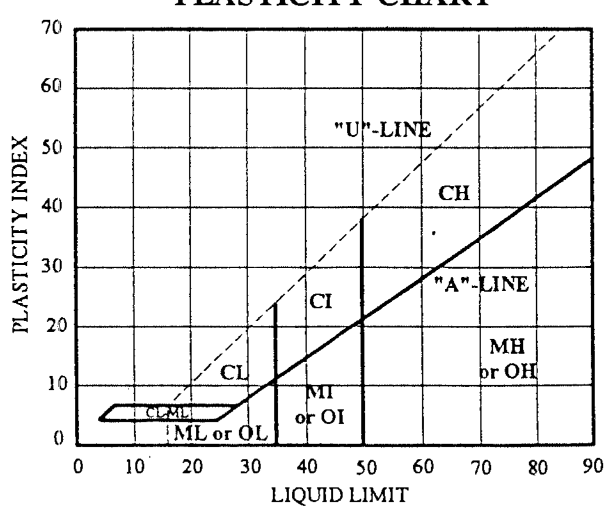
1. BASED ON A MODIFICATION OF ASTM D2487-85.

SOIL CONSISTENCY[2]

CONSISTENCY (SILTS AND CLAYS)	UNCONFINED SHEAR STRENGTH (KSF)	STANDARD PENETRATION[3] (BLOWS/FT)
VERY SOFT	< 0.25	< 2
SOFT	0.25 - 0.50	2 - 4
FIRM	0.50 - 1.00	4 - 8
STIFF	1.00 - 2.00	8 - 15
VERY STIFF	2.00 - 4.00	15 - 30
HARD	> 4.0	> 30

2. BASED ON TERZAGHI AND PECK.
3. FOR PRELIMINARY APPROXIMATION ONLY.

PLASTICITY CHART



COLOR

(FOR FINE AND COARSE GRAINED SOILS)

GENERALLY BASED ON THE MUNSELL SOIL COLOR CHARTS

KEY TO SOIL CLASSIFICATION - COARSE GRAINED SOILS[1]

COARSE GRAINED SOILS

LESS THAN 50% PASSING THE NO. 200 SIEVE

MAJOR DIVISIONS					GROUP NAMES
GRAVELS LESS THAN 50% PASSING THE NO. 4 SIEVE	< 5% FINE GRAINED MATERIAL	WELL GRADED	GW	< 15% SAND	GRAVEL
		POORLY GRADED	GP	≥ 15% SAND	GRAVEL WITH SAND
	5% TO 12% FINE GRAINED MATERIAL	WELL GRADED	GW	< 15% SAND	GRAVEL WITH SILT OR CLAY
		POORLY GRADED	GP	≥ 15% SAND	GRAVEL WITH SILT OR CLAY AND SAND
	> 12% FINE GRAINED MATERIAL	SILTY FINES	GM	< 15% SAND	SILTY GRAVEL
				≥ 15% SAND	SILTY GRAVEL WITH SAND
		CLAYEY FINES	GC	< 15% SAND	CLAYEY GRAVEL
				≥ 15% SAND	CLAYEY GRAVEL WITH SAND
SANDS MORE THAN 50% PASSING THE NO. 4 SIEVE	< 5% FINE GRAINED MATERIAL	WELL GRADED	SW	< 15% GRAVEL	SAND
		POORLY GRADED	SP	≥ 15% GRAVEL	SAND WITH GRAVEL
	5% TO 12% FINE GRAINED MATERIAL	WELL GRADED	SW	< 15% GRAVEL	SAND WITH SILT OR CLAY
		POORLY GRADED	SP	≥ 15% GRAVEL	SAND WITH SILT OR CLAY AND GRAVEL
	> 12% FINE GRAINED MATERIAL	SILTY FINES	SM	< 15% GRAVEL	SILTY SAND
				≥ 15% GRAVEL	SILTY SAND WITH GRAVEL
		CLAYEY FINES	SP	< 15% GRAVEL	CLAYEY SAND
				≥ 15% GRAVEL	CLAYEY SAND WITH GRAVEL

1. BASED ON A MODIFICATION OF ASTM D2487-85.

SOIL DENSITY[2]

RELATIVE DENSITY (SANDS AND GRAVELS)	STANDARD PENETRATION (BLOWS/FT)
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	> 50

2. BASED ON TERZAGHI AND PECK.

SOIL MOISTURE

(FOR FINE AND COARSE GRAINED SOILS)

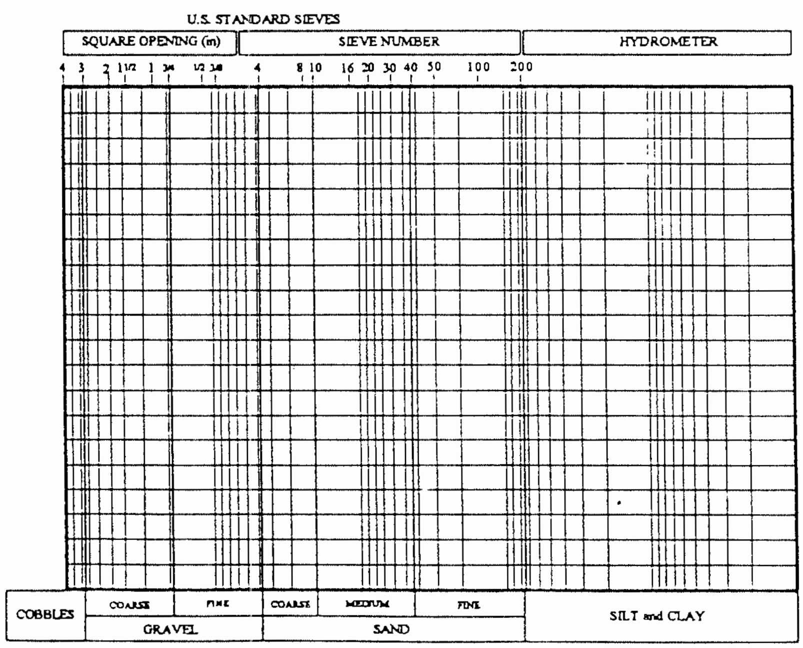
DRY - DUSTY, ABSENCE OF ANY MOISTURE

DAMP - SLIGHT MOISTURE BUT WELL BELOW OPTIMUM WATER CONTENT

MOIST - NEAR OPTIMUM WATER CONTENT

WET - VISUAL FREE WATER, USUALLY SOIL IS BELOW WATER TABLE

GRAIN SIZE CLASSIFICATION



ROCK QUALITY DESCRIPTIONS

HARDNESS**

Very Hard	Cannot be scratched with knife or sharp pick. Breaking of hand specimens requires several hard blows of the geologist's pick.
Hard	Can be scratched with knife or pick only with difficulty. Hard blow with hammer required to break sample.
Moderately Hard	Can be scratched with knife or pick. Gouges or grooves to 1/4 inch can be excavated by hard blow of point of a geologist's pick. Hand specimens broken with moderate blow.
Medium	Can be grooved or gouged 1/16 inch deep by firm pressure on knife or pick point. Can be excavated in small chips about one inch maximum in dimension by hard blows of the point of a geologist's pick.
Soft	Can be gouged or grooved readily with knife or pick point. Can be excavated in chips to pieces several inches in size by moderate blows of a pick point. Small pieces can be broken by finger pressure.
Very Soft	Can be carved with knife. Can be excavated readily with point of pick. Pieces one inch or more thickness can be broken with finger pressure. Can be scratched readily by fingernail.

FRACTURE DIMENTIONS*

Fractrure	Block Size (or spacing[1])
Crushed	-5 microns to 0.1 ft
Intensely	0.05 to 0.1 ft
Closely	0.1 to 0.5 ft
Moderately	0.5 to 1.0 ft
Slightly	1.0 to 3.0 ft
Massive	3.0 and larger

1 Average distance between adjacent fractures

* Source of data unknown

** Source of data: "Subsurface Investigation for Design and Construction of Foundation Buildings", (1976) American Society of Civil Engineers, Manuals and Reports on Engineering Practice - No. 5

WEATHERING **

Fresh or unweathered	Rock fresh, crystals bright, few joints and fractures may show slight staining. Rock rings under hammer if crystalline.
Very slight	Rock generally fresh, fractures and joints stained, some joints may shown thin clay coatings, crystals in broken face show bright. Rock rings under hammer if crystalline.
Slight	Rock generally fresh, joints and fractures stained, and discoloration extends into rock up to one inch. Joints may contain clay. In granitic rock some occasional feldspar crystals are dull and discolored. Crystalline rocks ring under hammer.
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rock, most feldspars are dull and discolored; some show clay. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.
Moderately	All rock except quartz severe discolored of stained. In granitoid rock, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick. Rock goes "clunk" when struck.
Severe	All rock except quartz discolored or stained. Rock "fabric" clear and evident, but reduced in strength to strong soil. In granitoid rock, all feldspars kaolinized to some extent. Some fragments of strong rock usually left.
Very severe	All rock except quartz discolored or stained. Rock "fabric" discernible, but mass effectively reduced to "soil" with only fragments of strong rock remaining.
Complete	Rock reduced to "soil". Rock "fabric" not discernible or discernible only in small scattered locations. Quartz my be present as dikes or stringers.

TEST PIT LOG

NO. T-1			
PROJECT: Lion's Gate Overnight Lodges	**PROJECT NO.:** 1385/5G	**DATE:** 11/30/95	
EXCAVATED BY: Case 580E Backhoe	**ELEVATION:** --	**LOGGER:** PV	
WATER DEPTH: **Initial** -- **Final** --	**WALL LOGGED:** Southwest		

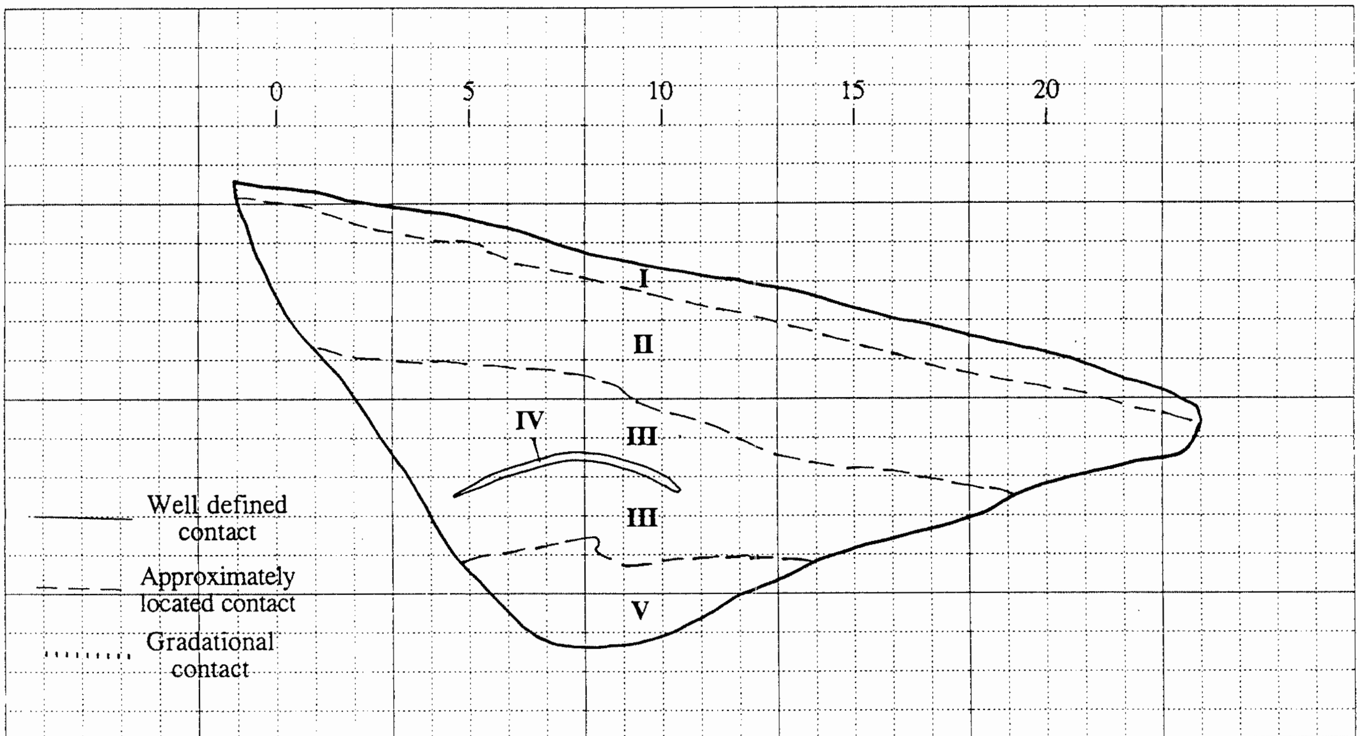
MATERIAL DESCRIPTIONS:

COLLUVIUM

I GRAVELLY SILT w/SAND (MI); Brown (10YR 5/3), dry, soft; 30-40% gravel, moderately subangular blocky structure, lower contact approximate over 1-2".

II GRAVELLY CLAY w/SAND (CI); Brown to dark brown (10YR 4/3-5/3), dry, firm to stiff; 30% fine gravel, moderately subangular blocky structure, lower contact approximate over 2-3".

III SILTY SAND w/GRAVEL (SC); Yellow (2.5Y 7/6), dry to damp, medium dense; gravel - mostly fractured clasts to 3" diameter, locally has moderately thick clay films near upper contact, lower contact approximate over 1-3".



SCALE: 1" = 5'

MATERIAL DESCRIPTIONS CONT.:

IV FAT CLAY (CH); Light olive brown (2.5Y 5/4) damp to moist, stiff; breaks out in angular blocky peds, highly plastic, occasional gypsum crystals, lower contact sharp over < .5".

BEDROCK

V SANDSTONE; Light olive brown (2.5Y 5/4), damp, hard; closely to intensely fractured, slightly to moderately severely weathered, siliceous.

REMARKS:

PACIFIC GEOTECHNICAL ENGINEERING

TEST PIT LOG

PROJECT: Lion's Gate Overnight Lodges		**PROJECT NO.:** 1385/5G	**NO.** T-2 / **DATE:** 11/30/95
EXCAVATED BY: Case 580E Backhoe		**ELEVATION:** --	**LOGGER:** PV
WATER DEPTH: **Initial** --	**Final** --	**WALL LOGGED:** West	

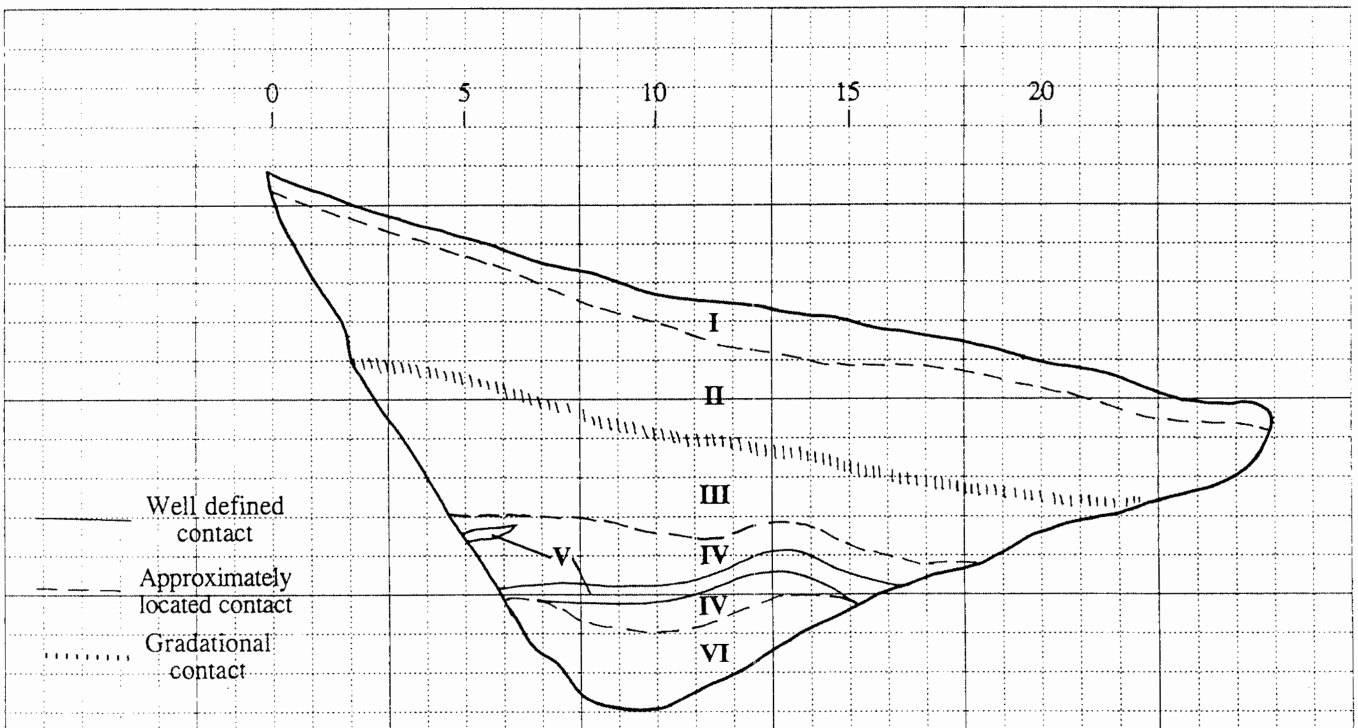
MATERIAL DESCRIPTIONS:

COLLUVIUM

I GRAVELLY SILT w/SAND (MI); Brown (10YR 5/3), dry, soft; 30% gravels, angular and <1" diameter, weak to moderately fine subangular blocky structure, contact approximate over 1-2".

II GRAVELLY FAT CLAY w/SAND (CH); Dark brown to brown (10YR 4/3), dry, firm to stiff; 30% fine gravel, moderately to strongly subangular to angular blocky structure, many thick clay films, lower contact gradational over 3".

III GRAVELLY FAT CLAY w/SAND (CH); Dark brown to brown (10YR 4/3), dry to damp, stiff to very stiff; few thick clay films, moderately subangular to angular blocky structure, lower contact approximate over 1-2".



SCALE: 1" = 5'

MATERIAL DESCRIPTIONS CONT.:

IV SANDY SILT w/CLAY (MI); Mottled gray and yellow (2.5Y 7/6), damp to moist, firm to stiff; rare clast of siliceous sandstone that are subparellel to contacts, lower contact is sharp ovre <.5", less gravel than I and III.

FAT CLAY (CH); Grayish brown (2.5Y 5/2), moist, soft; trace fine gravel, common gypsum crystals, lower contact is sharp over <.5".

V **BEDROCK**

SANDSTONE; Light olive brown (2.5Y 5/4), moist , hard; moderately weathered, closely fractured, silicous.

REMARKS:

TEST PIT LOG

NO. T-3

PROJECT:	Lion's Gate Overnight Lodges	**PROJECT NO.:** 1385/5G	**DATE:** 11/30/95
EXCAVATED BY:	Case 580E Backhoe	**ELEVATION:** --	**LOGGER:** PCA
WATER DEPTH:	**Initial** -- **Final** --	**WALL LOGGED:** West	

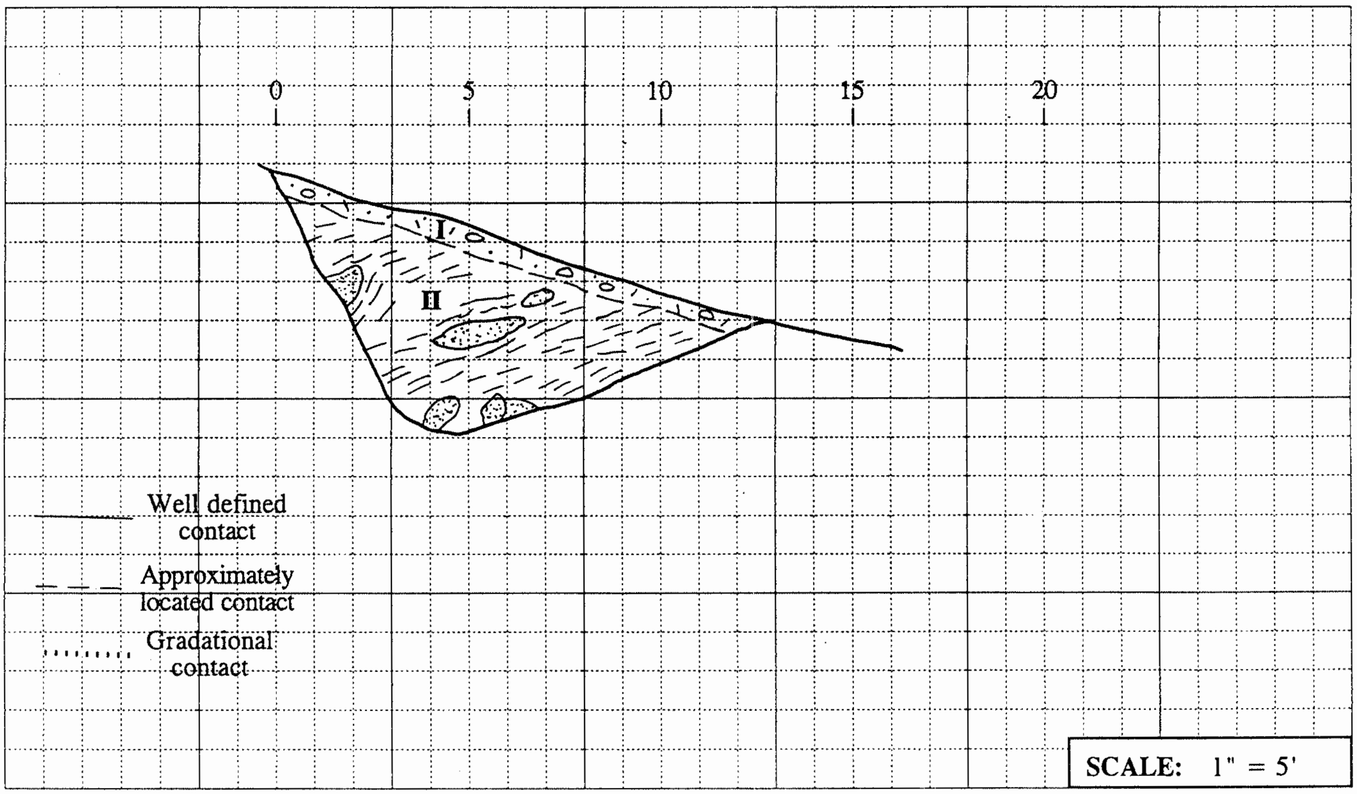
MATERIAL DESCRIPTIONS:

COLLUVIUM

I GRAVELLY FAT CLAY (CH); Pale yellowish brown (10YR 6/2), dry, hard; 50-60% fines, 10-20% sand, 20-30% gravels up to 12" of angular sandstone and smaller fragments of shale.

BEDROCK

II SHALE; Dusky brown to pale orange (5YR 2/2 to 10YR 7/4), damp, medium hard to soft; slightly to moderately weathered, pervasively sheared (unsheared pieces are .25"); ellyptical fragments of grayish olive (10Y 4/2) cemented sandstone up to 2' long.



MATERIAL DESCRIPTIONS CONT.:

REMARKS:

TEST PIT LOG

NO. T-4

PROJECT: Lion's Gate Overnight Lodges		**PROJECT NO.:** 1385/5G	**DATE:** 11/30/95
EXCAVATED BY: Case 580E Backhoe		**ELEVATION:** --	**LOGGER:** PCA
WATER DEPTH: **Initial** --	**Final** --	**WALL LOGGED:** West	

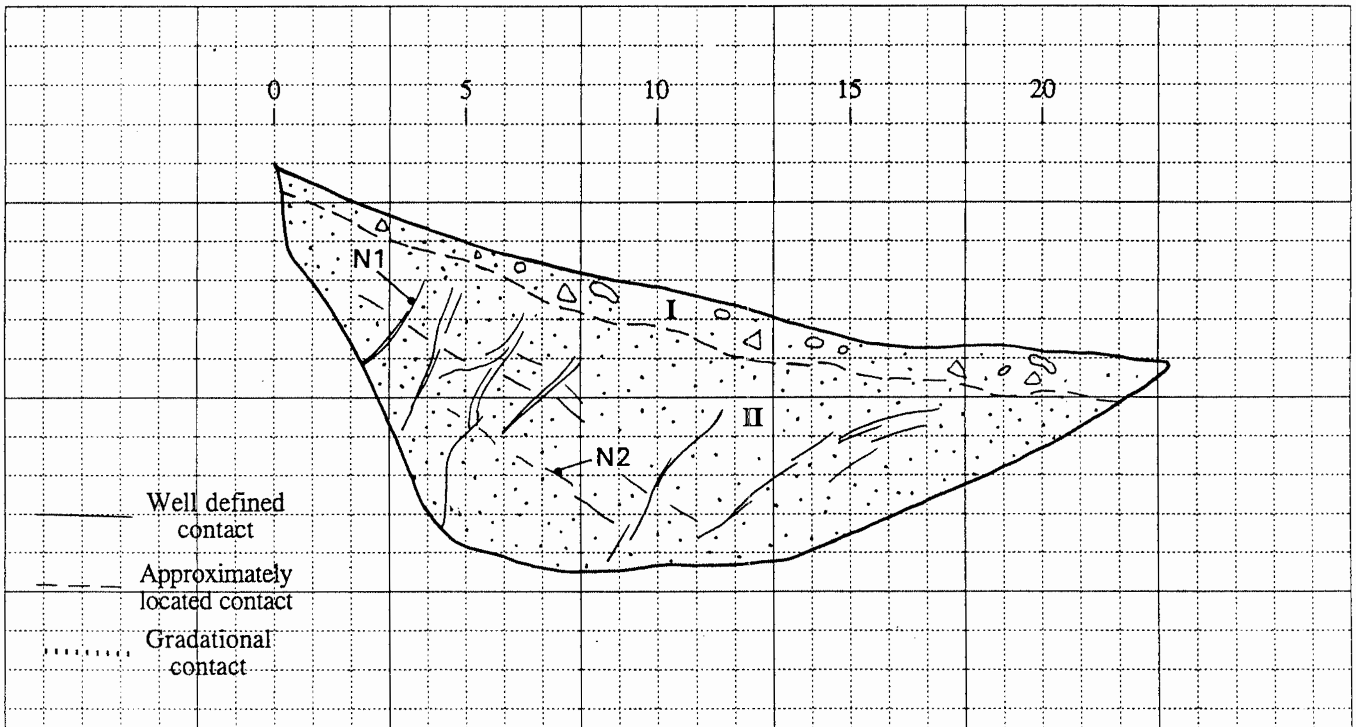
MATERIAL DESCRIPTIONS:

COLLUVIUM

I CLAYEY SAND w/GRAVEL (SC); Pale yellowish brown (10YR 6/2), dry, loose to medium dense; 25-35% fines, 15-25% gravels of angular sandstone up to 8".

BEDROCK

II SANDSTONE; Moderate yellowish brown (10YR 5/4), dry, hard; cemented, slightly weathered, fracture spacing 1-8", prominent near-vertical joints have clay films and in places have up to 1/8" illuviated clay (joints shown diagramatically).



SCALE: 1" = 5'

MATERIAL DESCRIPTIONS CONT.:

REMARKS: N1, N65W; 74 on prominent joint set; N2, N40W; 28 on prominent joint set.

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TEST PIT LOG

PROJECT: Lion's Gate Overnight Lodges	**PROJECT NO.:** 1385/5G	**DATE:** 11/30/95	**NO.** T-5
EXCAVATED BY: Case 580E Backhoe	**ELEVATION:** --	**LOGGER:** PV	
WATER DEPTH: **Initial** -- **Final** --	**WALL LOGGED:** Northwest		

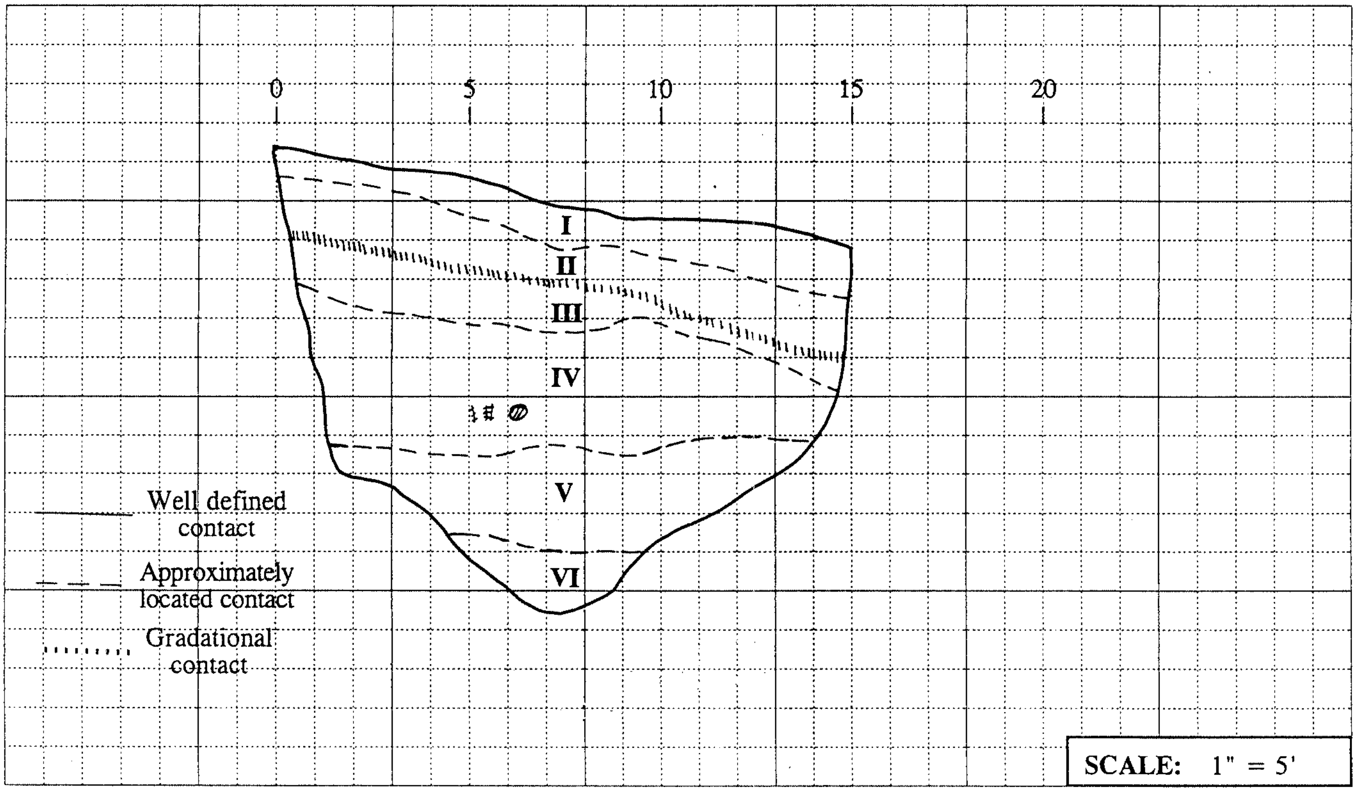
MATERIAL DESCRIPTIONS:

COLLUVIUM

I GRAVELLY SILT w/SAND (MI); Brown (10YR 5/3), dry, soft; 30-40% fine gravels, angular and <1" diameter, weak to fine subangular blocky structure, lower contact approximate over 1-2".

II GRAVELLY FAT CLAY w/SAND (CH); Dark grayish brown (10YR 4/2), dry, firm; 30-40% fine angular gravel, moderately subangular blocky structure, many thick clay films, lower contact gradational over 3".

III GRAVELLY CLAY w/SAND (CI); Dark grayish brown to grayish brown (10YR 4/2-5/2), dry, stiff; 30-40% fine angular gravel, weak to moderately subangular structure, common thick clay films, lower contact approximate over 1-3".



MATERIAL DESCRIPTIONS CONT.:

IV SANDY SILT w/GRAVEL (MI); Brown (10YR 5/3), dry, stiff; few thick clay films, lower contact is approximate over 1-2" and is locally defined by stone line.

V GRAVELLY FAT CLAY (CH); Dark yellowish brown to light yellowish brown (10YR 4/4-6/4), dry, very stiff; trace sand, 30% fine angular gravel, moderately subangular blocky structure, many thick, very stiff to hard clay films, lower contact is sharp over 1".

BEDROCK

VI SANDSTONE; Very dark gray and dark yellowish brown (10YR 3/1 & 3/4), dry, locally damp, hard; slightly to moderately severely weathered, closely fractured, siliceous.

REMARKS: Refusal at bottom of trench.

PACIFIC GEOTECHNICAL ENGINEERING

TEST PIT LOG

NO.	T-6

PROJECT: Lion's Gate Overnight Lodges		PROJECT NO.: 1385/5G	DATE: 11/30/95
EXCAVATED BY: Case 580E Backhoe		ELEVATION: --	LOGGER: PCA
WATER DEPTH: Initial --	Final --	WALL LOGGED: West	

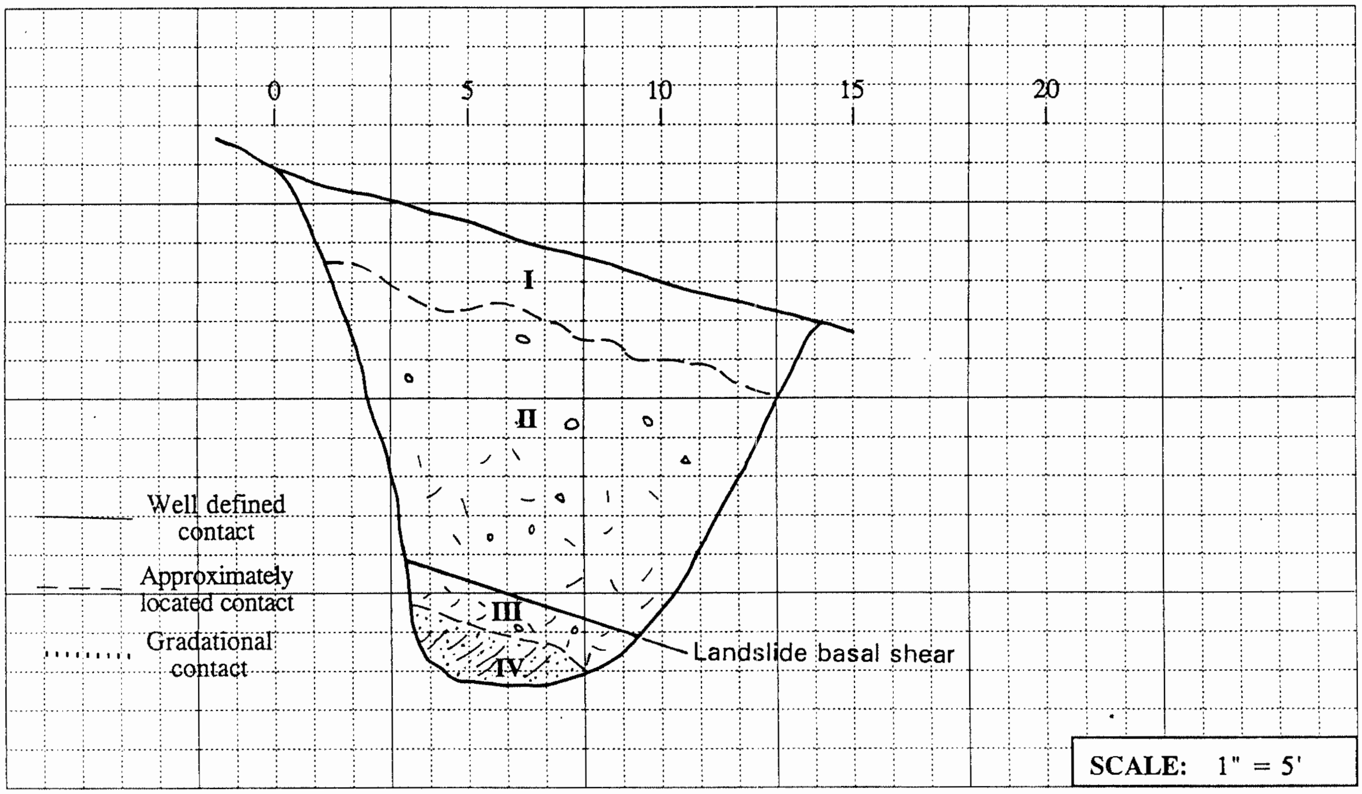
MATERIAL DESCRIPTIONS:

LANDSLIDE DEBRIS

I FAT CLAY w/GRAVEL (CH); Dark brownish gray, dry, hard; 10-20% angular gravel fragments to 1", abundant roots.

II FAT CLAY w/GRAVEL (CH); Dark yellowish brown, slightly damp, hard; 80-90% fines, 10-20% angular sandstone gravel up to 1/2".

III FAT CLAY (CH); Dark yellowish brown (more yellow than unit II), damp, very stiff; blocky fabric, trace angular sandstone fragments to 1".



MATERIAL DESCRIPTIONS CONT.:

LANDSLIDE SHEAR PLANE

FAT CLAY (CH); Dark brown to dusky brown, damp stiff; 1/4" to 1/2" thick grooved, striated, very planar, not shiny, very minor undulations; root concentration at and above plane.

BEDROCK

IV SANDSTONE; Moderate yellowish brown to olive gray, damp on parting surfaces, medium hard to hard, moderately bedded, medium to fine grained, moderately to sightly weathered, variably cemented, fracture spacing 1/2" - 2"

REMARKS: N75E, 30 SE on sandstone bedding; N70W, 20 NE on landslide basal shear.

TEST PIT LOG

NO. T-7		
PROJECT: Lion's Gate Overnight Lodges	**PROJECT NO.:** 1385/5G	**DATE:** 11/30/95
EXCAVATED BY: Case 580E Backhoe	**ELEVATION:** --	**LOGGER:** PCA
WATER DEPTH: **Initial** -- **Final** --	**WALL LOGGED:** West	

MATERIAL DESCRIPTIONS:

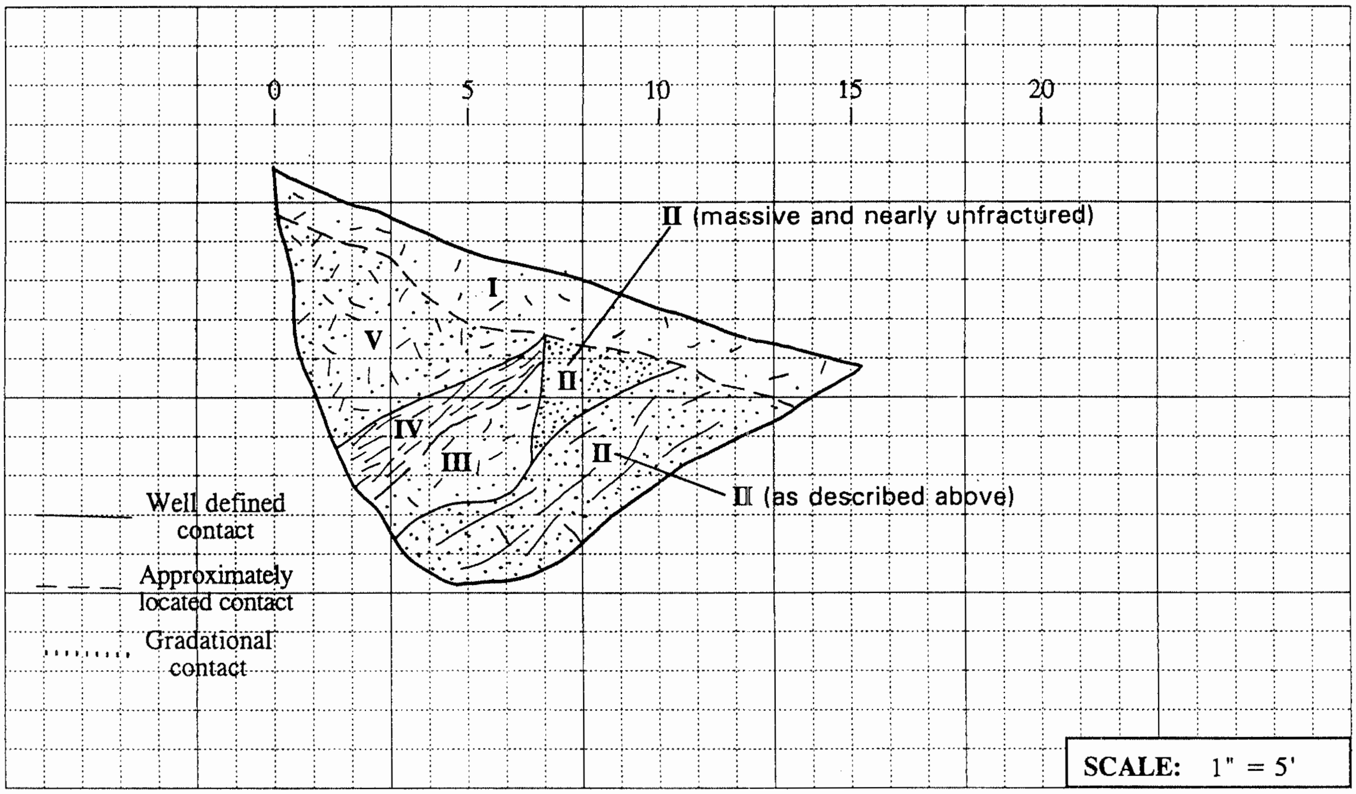
COLLUVIUM

I FAT CLAY w/SAND (CH); Moderate brown (5YR 4/4), damp to dry, very stiff to hard; 20% sand, trace angular gravel, blocky orthogonal cracks to base of unit.

BEDROCK

II SANDSTONE; Pale yellowish brown to grayish brown (10YR 6/2 - 5Y 3/2), dry, hard; cemented, slightly weathered, medium to fine grained, fracture spacing up to 2" but mostly < 1/2"; bedding (or fabric) faintly discernible.

WEATHERED SANDSTONE; Pale yellowish orange (10YR 8/6), dry, soft to medium hard; severly weathered,



MATERIAL DESCRIPTIONS CONT.:

caliche deposits throughout, friable, rock fabric essentially absent.

III WEATHERED CLAYSTONE; Dark yellowish brown to moderate olive brown (10YR 4/2 - 5Y 4/4), damp, medium hard; rock fabric discernible in only 1/2" to 1/4" long segments, severely weathered.

IV SANDSTONE; Dark olive gray (5Y 3/2) on fresh surfaces, moderate yellowish brown (10YR 5/4) on weathered surfaces, dry, medium hard to hard; cemented, medium to mostly fine grained, joint spacing uniformly about 1/2".

REMARKS:

PRELIMINARY GEOLOGIC FEASIBILITY EVALUATION
HOMESITES ON PARCELS #24, 25 AND 26
THE LION'S GATE RESERVE
SAN MARTIN, CALIFORNIA

PROJECT 1385/5G

For

Mr. Tom Hix
Hayes Valley Development Partners
c/o Hix Rubenstein Companies
405 El Camino Real - Suite 127
Menlo Park, California 94025

By

PACIFIC GEOTECHNICAL ENGINEERING
16120 Caputo Drive, Suite D
Morgan Hill, California 95037
(408) 778-2818

December 1995

PRELIMINARY GEOLOGIC FEASIBILITY EVALUATION
HOMESITES ON PARCELS #24, 25 AND 26
THE LION'S GATE RESERVE
SAN MARTIN, CALIFORNIA

INTRODUCTION

This Geologic Letter Report presents the results of our Preliminary Geologic Feasibility Evaluation of three parcels in a proposed residential subdivision, which are part of The Lion's Gate Reserve development. The primary elements of the proposed Lion's Gate Reserve development are a golf course with clubhouse and overnight lodges, and 41 executive homes. This study was directed at evaluating the geologic suitability of the area proposed for three of the 41 homesites. These three parcels are located near the base of a steep hillside where there is the potential for debris flow landsliding.

The property is situated within Hayes Valley and occupies 1676 acres. The proposed development will occupy about 400 acres, with the balance being dedicated to open space. The site is located about 2 miles southwest of the center of the rural community of San Martin. The site is about 5 miles south of the City of Morgan Hill. Hayes Valley extends from Watsonville Road on the west to Highland Avenue on the east. Location of the property is shown on our Geologic Index Map, Figure 1.

The overall development concept includes a golf course that will occupy much of the floor of Hayes Valley. The clubhouse and other facilities will lie at the southern margin of the valley. Five of the homesites will lie within Hayes Valley, with the remaining 36 homesites situated east of the golf course entrance on the alluvial plain of Santa Clara Valley. Access to the site will be by an extension of Highland Avenue. The overall development concept can be seen on the Development Plan, shown on Figure 2.

The three contiguous parcels are identified as Parcels #24, #25, and #26 on the subdivision plan. They lie at the eastern end of the grouping of 36 parcels near the golf course entrance. Parcels #25 and #26 lie at the very margin of the alluvial plain, and each occupies about 3 acres. Parcel #24 occupies about 18 acres mostly on steep hillside terrain. Access will be from a proposed cul-de-sac road connecting to Highland Avenue. Sewage treatment will be by on-site septic tank and leach field. The sites of the proposed leach fields were investigated and informally approved on May 17, 1995, by Mr. Matthew Smith of the County Department of Environmental Health. For that work, we coordinated subsurface exploration and logged exploratory excavations, but we did not analyze data or prepare any written documents.

For our work on this project, we were provided with a 24-page set of plans titled "The Lion's Gate Reserve" prepared by Forsgren Associates, Inc., dated November, 1995. During this Preliminary Geologic Feasibility Evaluation, we reviewed pertinent technical literature (including data from previous leach field suitability testing), studied aerial photographs in stereo pairs, performed a geologic reconnaissance of the site, and prepared this Geologic Letter Report.

FINDINGS

Terrain

The physiographic setting of the property can be seen on our Geologic Index Map, Figure 1. Hayes Valley is an intermontane valley in the eastern foothills of the Santa Cruz Mountains. It lies along the lowest fringe of the mountains, just 20 to 30 feet above the floor of Santa Clara Valley. The east-west trending valley is almost an embayment of the Santa Clara Valley, with a few bedrock inselbergs protruding marginally above the valley floor.

Hayes Valley is flanked by moderately to steeply sloping hillside terrain. Hills north of the valley rise gradually to 785 feet above sea level, while hills south of the valley rise rather directly to more than 1000 feet. The prominent mountain peak, termed "Lion's Peak" or "Lion's Head", rises immediately south of the valley.

The three subject residential parcels lie at the margin of Santa Clara Valley. Elevations on parcel #26 range between about 310 and 380 feet above sea level. Elevations on parcel #25 range between about 320 and 420 feet. Elevations on parcel #24 range between about 330 and about 700 feet.

Most of the area underlying parcels #25 and #26 can be generally characterized as alluvial plain terrain. The remainder of the area on these two parcels, and nearly all of the area on parcel #24, can be generally characterized as moderately sloping to steeply sloping hillside terrain.

The slope of natural ground on the alluvial plain terrain on these parcels ranges between about 3 degrees and 6 degrees. Hillside terrain was measured to slope up to 28 degrees.

Recent debris flow ("mudflow") landsliding at the mouth of a hillisde drainage swale has created an alluvial fan that extends several hundred feet out from the base of the hillside onto the alluvial plain of Santa Clara Valley. This alluvial fan is centered about in the middle of parcel 25. Ground slopes on the alluvial fan range between 9 degrees and 20 degrees.

There has been no grading on the parcels except for on unimproved ranch road.

Drainage

Drainage of surface water at the site occurs by uncontrolled, overland sheet flow to the northeast. Drainage on parcel #24 flows into one of two drainage swales, both of which discharge onto the alluvial plain. One discharges at the point of the proposed cul-de-sac, and the other discharges onto the alluvial fan of parcel #25. It also appears that most of the flow reaching the alluvial plain infiltrates the ground and does not travel overland to the creek. Ultimately, flow from these parcels enters the primary drainage of Hayes Valley and flows to the east into Llagas Creek near the middle of Santa Clara Valley. At the time of our field work on December 12, 1995, immediately following a high intensity rain storm, there was marginal flow within that creek. It appears that flow occurs only during and after major rain storms.

We did not observe evidence of springs or seeps within the proposed development area, although several springs are present in other hillside areas of the property. Exploratory excavations performed over the years within the valley floor have revealed that ground water is generally found at relatively shallow depths within the alluvium (W.A. Wahler and Associates, 1973; Peter Kaldveer and Associates, 1977; Kaldveer and Associates, 1989; Wahler Associates, 1990; Engeo Incorporated, 1991, 1993). However, exploratory test pits excavated May 17, 1995, on parcels #25 and #26 for evaluation of leach field suitability did not encounter ground water. The test pit on parcel #25 reached a total depth of 17 feet, and the test pit on parcel #26 reached a total depth of 14.5 feet.

Regional Geologic Setting

Earth materials underlying the eastern foothills of the Santa Cruz Mountains are composed of rocks belonging to the Franciscan Complex of Jurassic to Cretaceous age. Bedrock types found within the Hayes Valley area include sandstone, shale, chert, limestone, greenstone, and low-grade metamorphic rocks. Many areas of the bedrock terrane include a mixture of different rock types in a sheared matrix; this formational mixture is termed a melange. The regional trend of geologic structure in the Hayes Valley area is roughly east-west, somewhat acute to the overall geologic structure of N40W for the Santa Cruz Mountains as a whole. Bedrock contacts as well as faults are generally parallel to the this structural grain.

Earth Materials Surficial soils observed on alluvial plain terrain of parcels #25 and #26 are clays of intermediate to high plasticity (CI-CH) with variable amounts of gravel. Hillside soils observed at the area evaluated for a leach field on parcel #24 were recorded during our subsurface exploration to be very similar. A variety of rock types were observed on hillside terrain during our reconnaissance, so we infer that bedrock there is Franciscan Complex melange.

Debris Flow Landsliding

The alluvial fan centered on parcel #25 has been built over recent geologic time from sediment transported off of hillside terrain through the drainage swale. Most of that sediment transport appears to have occurred by flowing water during high-intensity or long-duration rain storms. However, it is possible that some transport could have occurred by rapidly flowing debris flows and/or earth flows (commonly termed "mudflow"). We investigated this potential geologic hazard by inspection of aerial photographs dating from 1939, and by a field reconnaissance of the alluvial fan and drainage swale above.

It appears that colluvial debris has been transported through the drainage swale by stream flow and debris flow processes, and then deposited at the mouth of the swale. The swale is about 1000 feet long. The axial gradient along the lower 600 feet ranges between 12 degrees and 16 degrees. The axial gradient along the upper 400 feet increases from 16 degrees to a maximum of 22 degrees near the top of the swale.

Hillsides adjacent to the axis of the drainage swale slope up to 28 degrees. The slopes are uniformly steep, generally planar and relatively smooth, suggesting that landsliding does not frequently occur there. We infer that colluvial soil developed on those side-slopes creeps into the axis of the swale, where it is periodically transported towards the alluvial fan below by flowing water or debris flow processes. There does not currently appear to be any significant accumulation of colluvial debris in the swale, so there does not appear to be any specific source area that might generate a future large debris flow from within the swale. The relatively low gradient of the swale (12 degrees to 16 degrees) suggests that debris flows would not travel with great speed and therefore would have difficulty reaching the alluvial fan and building sites below.

Slump-flow Landsliding

Study of aerial photographs revealed that relatively shallow landsliding has been occurring on the alluvial fan since at least 1939. Our field reconnaissance revealed that these landslides have generally been soil slumps and flows. They have occurred on slopes ranging between 16 degrees and 20 degrees. Subsequent flow has carried soil debris farther out onto the fan onto slopes as low as 9 degrees. We did not identify landslide bodies on slopes flatter than 9 degrees.

There is a large accumulation of colluvial debris at the very mouth of the swale, where the confined channel emerges from the hills. It appears that sediment has been brought to the mouth of the swale more frequently or at a faster rate than it has moved away from the mouth toward the fan. The downhill face of that accumulation of debris slopes up to a maximum of 20 degrees, significantly steeper than the axial gradient of the swale. It is clear that the large deposit of colluvial debris is potentially unstable, because landsliding has been occurring on that 20-degree slope for at least 56 years. The landsliding there has been relatively shallow (between about 10 and 15 feet thick), slow-moving, and of the slump-flow type.

Faulting

The site is located nearly equidistant between the two largest active faults in the south Bay Region. The San Andreas fault crosses western side of the Santa Cruz Mountains about 7.4 miles southwest of the site. On the northeastern side of the Santa Clara Valley, the Calaveras fault crosses the base of the Diablo Range about 5.6 miles to the northeast. Other active faults in the region include the Hayward fault, located about 16 miles to the northwest, and the Sargent-Berrocal fault, located about 4 miles to the southwest. All of these faults can be considered capable of generating a large magnitude earthquake that could cause high intensity ground shaking at the site.

Several faults of unknown activity are located much closer to the project site. Regional geologic maps by Dibblee (1973) and Williams et al (1973) show bedrock faults on both sides of the valley and one fault crossing the alluvium near the maintenance building. The regional trend of these faults (30 to 50 degrees to the trend of the regional active faults), and the type of formational materials they juxtapose (Franciscan rocks only) suggest that the faults are of a much earlier geologic period and are not active.

The site is not located within any of the State of California Earthquake Fault Zones (formerly Special Studies Zones), established to ensure that structures for human occupancy are not sited across the trace of an active or potentially active fault.

Seismicity

The property is in an area of high seismicity. The San Andreas fault and the Calaveras fault have each caused damaging earthquakes near the site within recent years. The Hayward fault caused at least two damaging earthquakes during the 1800's. The San Andreas fault generated the October 17, 1989 Loma Prieta earthquake that registered 7.1 on the Richter scale, causing 64 deaths, about 4000 injuries and causing about 6 billion dollars damage in the Bay Area. The epicenter of that earthquake was about 15 miles west of the site in the Santa Cruz Mountains. The San Andreas fault also generated the 1906 San Francisco earthquake that was estimated to have been 8.3 Richter magnitude; that earthquake killed thousands of people and caused so much damage that threw the economy of Northern California into disarray. The San Francisco earthquake released about 60 times the amount of energy released during the Loma Prieta earthquake.

The next major earthquake to have serious impact on the San Martin area may occur on the San Andreas fault along the segment north of the Loma Prieta area. In a 1990 publication, The Working Group on California Earthquake Probabilities estimated that there was a 37% probability of a Richter magnitude 6.5 or 7 earthquake occurring along that segment (the San Francisco Peninsula segment) of the fault by the year 2020. If that earthquake occurs, it could cause high intensity ground shaking at the site that would be equivalent or greater than that experienced there during the Loma Prieta earthquake.

The Calaveras fault is one of the major branches of the San Andreas fault in the Bay Area. The damaging "Morgan Hill" earthquake of April 24, 1984, was epicentered on the Calaveras fault in the Halls Valley area about 19 miles north of the site. The magnitude of the earthquake was reported to be 6.2 on the Richter scale. The "Coyote Lake" earthquake of August 6, 1979 was epicentered on the Calaveras fault also, about 7 miles southeast the subject property. This earthquake had a Richter magnitude of 5.9, and peak ground accelerations (horizontal) were as high as 0.28g at Coyote Dam and 0.42g in Gilroy. Repeatable high ground accelerations (10 cycles or more) in the Morgan Hill area were in the range of 0.2 to 0.25g. There were no deaths in either of these earthquakes, but damage reached several million dollars for each earthquake.

During historic time, the Hayward fault has generated two large magnitude earthquakes (in 1836 and 1868). Both of these earthquakes are estimated to have been roughly equivalent to a Richter magnitude 7. Both earthquakes were in Alameda County. It is anticipated that the Hayward fault will someday generate earthquakes of equivalent magnitude. The Working Group estimated in 1990 that the probability of a Richter magnitude 7 earthquake occurring by the year 2020 was 28% for the northern segment of the fault, and 23% for the southern segment.

Following more recent studies of earthquake recurrence periods, the Working Group may be raising their estimated probability of a major earthquake occurring within the Bay Area in the next 25 years from 67% to possibly as much as 90% (David Schwartz, the Working Group, personal communication).

Due to the proximity of these active faults it is very likely that the site will experience severe ground shaking during the lifetime of the proposed improvements.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the information we have studied, it is our opinion that development of the three proposed parcels is constrained by potential debris flow and landslide activity. However, it is possible to avoid theses hazards by siting proposed structures a suitable distance from the area of high landslide potential. If desired, structures could be sited closer to the area of potential landsliding if some type of mitigation method is designed and constructed in that area.

Debris-Flow Landsliding. The drainage swale upslope of parcel #25 was explored for possible areas that could generate a debris flow. Flat, planar sideslopes along the drainage swale suggest there is not a large accumulation of colluvium in an area upslope that could initiate such a flow. The relatively low gradient of the drainage swale (at least along the lower 600 feet - 12 degrees to 16 degrees) indicates that a large volume of colluvial debris could not move rapidly through to the alluvial fan. We conclude that a debris flow of significant volume is not likely to be initiated in the drainage swale. Additionally, even if such a flow were to be initiated, it would probably not accelerate to a very high velocity and therefore would probably not travel very far down the swale. Nevertheless, the existence of the broad alluvial fan at the mouth of the swale suggests that occasional, rare, fast-moving debris flow events may reach the mouth of the swale.

This debris-flow hazard impacts development of the property, particularly on parcel #25. We have delineated an area that we judge to be far enough away from the mouth of the swale to be safe for residential construction. Structures should be sited within this area (See Figure 3). If a developer, builder or homeowner wishes to build higher on the alluvial fan, then some type of debris flow mitigation should be employed. It is our preliminary opinion that a deflection wall, deflection berm, detention basin, etc., or possibly an energy-dissipation fence, could be designed and constructed at the site to adequately mitigate the hazard of debris flow landsliding on parcel #25. However, residential construction should not occur southwest of the delineated area without also considering the hazard of slump-flow landsliding.

Sump-Flow Landsliding. There is a high potential for slump-flow, slow-moving landsliding to occur on the relatively steep (20 degrees) face of the colluvium accumulated at the mouth of the drainage swale. It would be most prudent to avoid this hazard by observing the landslide set-back recommendations established above for debris-flow landsliding. If a developer, builder, or homeowner wishes to build higher on the alluvial fan, then some type of slump-flow mitigation should be employed. It is our preliminary opinion that this hazard could be satisfactorily mitigated by re-grading the slope on the face of the alluvial fan to a lower angle, excavating and recompacting landslide debris, and establishing drainage control. If such a mitigation scheme is considered, site-specific geotechnical recommendations should be developed.

There are essentially no other geologic constraints to the proposed development that could not be mitigated by proper engineering, design and construction. It appears that routine, design-level studies should be able to adequately address any potentially adverse soil condition and that any mitigation measures deemed necessary can be constructed using conventional methods.

The geologic processes associated with expansive soils and soil creep can be addressed and mitigated by conventional geotechnical engineering, design and construction. Any potential adverse impact of possible shallow ground water can be analyzed during future geotechnical studies. Based on the backhoe test pits we observed, we presently consider the probability of soil liquefaction and lateral spreading to be very low.

Due to the close proximity of the San Andreas, Hayward and Calaveras faults, as well as other active and potentially active faults, it is reasonable to assume that the site will experience high intensity ground shaking at least once within the design life of the proposed improvements. It is possible that a future large-magnitude earthquake could generate ground shaking intensities at the site that could equal or exceed those experienced during the Loma Prieta earthquake. We currently suggest that the "design earthquake" for the project site be a magnitude 7.0 earthquake with an epicenter near the southern end of the San Francisco Peninsula segment of the San Andreas fault, or a similar earthquake at the southern end of the southern segment of the Hayward fault. Those hypothetical epicenters are each about 16 miles from the site; those earthquakes have the capability to generate peak horizontal ground accelerations at the site of 0.3g and repeatable high ground accelerations (10 cycles or more) of 0.2g. Ground motions of this character could result in shaking intensities in the range of Modified Mercalli Intensity VII-VIII, similar to that experienced during the Loma Prieta earthquake. The occurrence probability of these design earthquakes is somewhere between 67% and 90% over the next 25 years.

The Loma Prieta earthquake caused a variety of ground deformation features that had not been anticipated by geologists prior to that time. It is certain that future earthquakes will teach us more about the impact of permanent ground deformation associated with earthquake ground shaking. It must be understood that it is not possible to predict exactly how the subject property will respond to future large-magnitude earthquakes.

Once the development concept is confirmed, we recommend that landslide avoidance and/or landslide mitigation measures be tailored to fit the specific development plans. A geotechnical engineering investigation should be included along with the other anticipated design-level studies for the proposed development.

The areas investigated and approved by the County Health Department on May 17, 1995, are geologically suitable for construction of septic leach fields. Access to the proposed development area from Highland Avenue is geologically feasible.

LIMITATIONS

The recommendations contained in this report are based, in part, on certain information and data that have been provided to us. In the event that site development plans change, our conclusions and recommendations shall not be considered valid unless we are commissioned to review such changes and to make any necessary additions or changes to our recommendations. This Geologic Letter Report should be considered preliminary; when a specific subdivision plan is confirmed, a detailed geologic investigation of landslide hazards may need to be completed if the hazard avoidance procedures recommended herein are not followed.

Subsurface exploration is necessarily confined to selected locations and conditions may, and often do, vary between these locations. Should conditions different from those assumed in this report be encountered during future studies or project development, additional exploration, testing and analysis may be required.

Any person concerned with this project, observing features or conditions at the site or surrounding area which are different from those described in this report, should report them immediately to this office for evaluation.

In preparing the findings and professional opinions presented in this report, we have endeavored to follow all generally accepted principles and practices of the engineering geology profession. This warranty is in lieu of all other warranties, express or implied.

It is the responsibility of the client to ensure that the recommendations given in this report are made known to all design professionals involved with the project. A copy of this report should be provided to new owners if the property is conveyed.

Report prepared by,

PACIFIC GEOTECHNICAL ENGINEERING

Peter C. Anderson
RG 3833
CEG 1189

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Aerial Photographs

10/20/39, National Archives, black & white, Series CIV, Roll 293, Frames #39, 40, Scale 1:20,000.

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02/28/93, Aerial Photomapping Services, black & white, Series APS 93607, Frame #7, 8, 9, 12, 13, 14, Scale 1"=750'.

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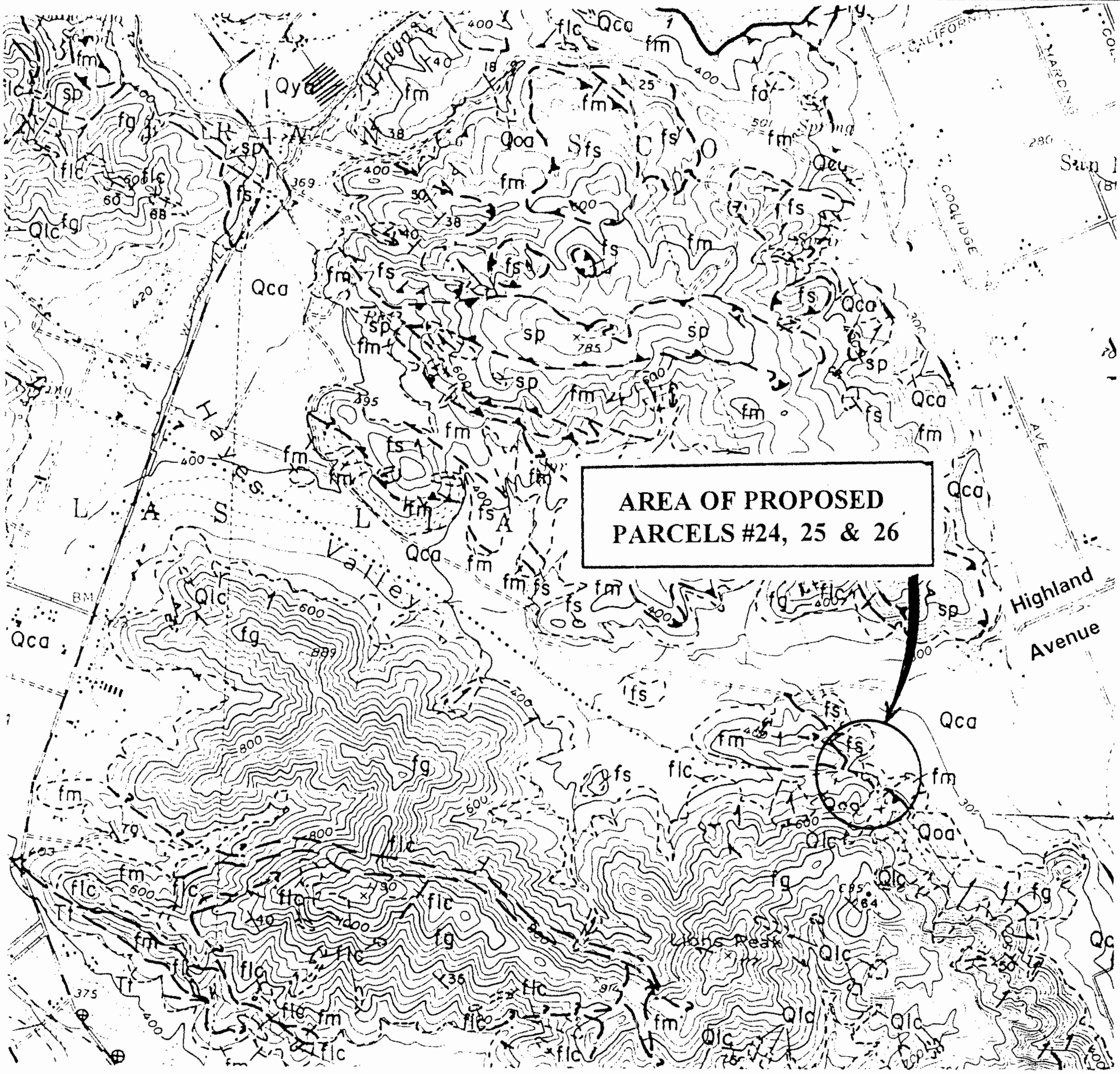

Base Map: Areal Geology, South County Study Area, 1973, by Williams and others, CDMG PR-18, 1" = 2000'

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EXPLANATION

Qca	Alluvium and thick collvium
fm	Franciscan Complex melange
fg	Franciscan Complex greenstone
flc	Franciscan Complex limestone & chert
fs	Franciscan Complex sandstone
sp	serpentinite
	Landslide

PACIFIC GEOTECHNICAL ENGINEERING	DATE DEC. 1995	GEOLOGIC INDEX MAP	FIGURE 1
	SCALE 1"=2000'	THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	PROJECT 1385/7G

GEOLOGIC FEASIBILITY INVESTIGATION
GOLF COURSE MAINTENANCE BUILDING
THE LIONS GATE RESERVE
SAN MARTIN, CALIFORNIA

PROJECT 1385/6G

For

Mr. Tom Hix
Hayes Valley Development Partners
c/o Hix Rubenstein Companies
405 El Camino Real - Suite 127
Menlo Park, California 94025

By

PACIFIC GEOTECHNICAL ENGINEERING
16120 Caputo Drive, Suite D
Morgan Hill, California 95037
(408) 778-2818

December 1995

GEOLOGIC FEASIBILITY EVALUATION
GOLF COURSE MAINTENANCE BUILDING
THE LION'S GATE RESERVE
SAN MARTIN, CALIFORNIA

INTRODUCTION

This Geologic Letter Report presents the results of our Geologic Feasibility Evaluation for a proposed golf course maintenance building as part of The Lion's Gate Reserve development. The primary elements of the proposed development are a golf course with clubhouse and overnight lodges, and 41 executive homes. This study was directed at evaluating the geologic suitability of the area proposed for the golf course maintenance building only.

The property is situated within Hayes Valley and occupies 1676 acres. The proposed development will occupy about 400 acres, with the balance being dedicated to open space. The site is located about 2 miles southwest of the center of the rural community of San Martin. The site is about 5 miles south of the City of Morgan Hill. Hayes Valley extends from Watsonville Road on the west to Highland Avenue on the east. Location of the property is shown on our Geologic Index Map, Figure 1.

The overall development concept includes a golf course that will occupy much of the floor of Hayes Valley. The clubhouse and other facilities will lie at the southern margin of the valley. Four of the homesites will lie within Hayes Valley, with the remaining 37 homesites situated east of the golf course entrance on the alluvial plain of Santa Clara Valley. Access to the site will be by an extension of Highland Avenue. The overall development concept can be seen on the Development Plan, shown on Figure 2.

The golf course maintenance building will occupy about 1500 square feet. It will be situated at the western end of the valley. Sewage treatment for the facility will be by on-site septic tank and leach field. The site of the leach field was investigated and informally approved on May 25, 1995, by Mr. Matthew Smith of the County Department of Environmental Health. For that work, we coordinated subsurface exploration and logged exploratory excavations, but we did not analyze data or prepare any written documents.

For our work on this project, we were provided with a 24-page set of plans titled "The Lion's Gate Reserve" prepared by Forsgren Associates, Inc., dated November, 1995. During this Geologic Feasibility Evaluation, we reviewed pertinent technical literature, performed a geologic reconnaissance of the site, evaluated our field findings from the earlier leach field evaluation, and prepared this Geologic Letter Report.

FINDINGS

Terrain

The physiographic setting of the property can be seen on our Geologic Index Map, Figure 1. Hayes Valley is an intermontane valley in the eastern foothills of the Santa Cruz Mountains. It lies along the lowest fringe of the mountains, just 20 to 30 feet above the floor of Santa Clara Valley. The east-west trending valley is almost an embayment of the Santa Clara Valley, with a few bedrock inselbergs protruding marginally above the valley floor.

Hayes Valley is flanked by moderately to steeply sloping hillside terrain. Hills north of the valley rise gradually to 785 feet above sea level, while hills south of the valley rise rather directly to more than 1000 feet. The prominent mountain peak, termed "Lion's Peak" or "Lion's Head", rises immediately south of the valley.

The site of the proposed golf course maintenance building is on the flat alluvial plain of Hayes Valley. At that site, the ground slopes about one degree towards the northeast, towards a seasonal creek.

There has been no grading at the site of the proposed improvements.

Drainage

Drainage of surface water at the site occurs by uncontrolled, overland sheet flow to the northeast towards the seasonal creek. That creek flows generally southeast into a stock pond. Ultimately, flow from the stock pond follows the primary drainage of the valley to the east and into Llagas Creek in Santa Clara Valley. At the time of our field work on May 25, and November 30, 1995, there was no flow within that creek; however, it was evident that flow occurs periodically during and after major rain storms.

We did not observe evidence of springs or seeps within the proposed development area, although several springs are present in hillside areas of the property. Exploratory excavations performed over the years within the valley floor have revealed that ground water is generally found at relatively shallow depths within the alluvium (W.A. Wahler and Associates, 1973; Peter Kaldveer and Associates, 1977; Kaldveer and Associates, 1989; Wahler Associates, 1990; Engeo Incorporated, 1991, 1993). On May 25, 1995, just a few months after one of the wettest winters in recent years, ground water was measured at a depth of 15.5 feet within our 16-foot deep exploratory backhoe test pit.

Regional Geologic Setting

Earth materials underlying the eastern foothills of the Santa Cruz Mountains are composed of rocks belonging to the Franciscan Complex of Jurassic to Cretaceous age. Bedrock types found within the Hayes Valley area include sandstone, shale, chert, limestone, greenstone, and low-grade metamorphic rocks. Many areas of the bedrock terrane include a mixture of different rock types in a sheared matrix; this formational mixture is termed a melange.

The regional trend of geologic structure in the Hayes Valley area is roughly east-west, somewhat acute to the overall geologic structure of N40W for the Santa Cruz Mountains as a whole. Bedrock contacts as well as faults are generally parallel to the this structural grain. A study by W.A. Wahler and Associates (1973) for a proposed dam site found that alluvial deposits in the valley are 92 feet thick about 1000 feet west of the proposed maintenance building.

Earth Materials Surficial soil observed at the project site is a dark brown (7.5YR3/2) silt (MI). This surficial layer is underlain at a depth of about two feet by clay with sand (CI), which in turn is underlain at a depth of about 5 feet by sandy clay (CI). Near the bottom of our 16-foot deep exploratory backhoe test pit, we encountered clayey gravel (GC).

Faulting

The site is located nearly equidistant between the two largest active faults in the south Bay Region. The San Andreas fault crosses western side of the Santa Cruz Mountains about 7.4 miles southwest of the site. On the northeastern side of the Santa Clara Valley, the Calaveras fault crosses the base of the Diablo Range about 5.6 miles to the northeast. Other active faults in the region include the Hayward fault, located about 16 miles to the northwest, and the Sargent-Berrocal fault, located about 4 miles to the southwest. All of these faults can be considered capable of generating a large magnitude earthquake that could cause high intensity ground shaking at the site.

Several faults of unknown activity are located much closer to the project site. Regional geologic maps by Dibblee (1973) and Williams et al (1973) show bedrock faults on both sides of the valley and one fault crossing the alluvium near the maintenance building. The regional trend of these faults (30 to 50 degrees to the trend of the regional active faults), and the type of formational materials they juxtapose (Franciscan rocks only) suggest that the faults are of a much earlier geologic period and are not active.

The site is not located within any of the State of California Earthquake Fault Zones (formerly Special Studies Zones), established to ensure that structures for human occupancy are not sited across the trace of an active or potentially active fault.

Seismicity

The property is in an area of high seismicity. The San Andreas fault and the Calaveras fault have each caused damaging earthquakes near the site within recent years. The Hayward fault caused at least two damaging earthquakes during the 1800's.

The San Andreas fault generated the October 17, 1989 Loma Prieta earthquake that registered 7.1 on the Richter scale, causing 64 deaths, about 4000 injuries and causing about 6 billion dollars damage in the Bay Area. The epicenter of that earthquake was about 15 miles west of the site in the Santa Cruz Mountains. The San Andreas fault also generated the 1906 San Francisco earthquake that was estimated to have been 8.3 Richter magnitude; that earthquake killed thousands of people and caused so much damage that threw the economy of Northern California into disarray. The San Francisco earthquake released about 60 times the amount of energy released during the Loma Prieta earthquake.

The next major earthquake to have serious impact on the San Martin area may occur on the San Andreas fault along the segment north of the Loma Prieta area. In a 1990 publication, The Working Group on California Earthquake Probabilities estimated that there was a 37% probability of a Richter magnitude 6.5 or 7 earthquake occurring along that segment (the San Francisco Peninsula segment) of the fault by the year 2020. If that earthquake occurs, it could cause high intensity ground shaking at the site that would be equivalent or greater than that experienced there during the Loma Prieta earthquake.

The Calaveras fault is one of the major branches of the San Andreas fault in the Bay Area. The damaging "Morgan Hill" earthquake of April 24, 1984, was epicentered on the Calaveras fault in the Halls Valley area about 19 miles north of the site. The magnitude of the earthquake was reported to be 6.2 on the Richter scale. The "Coyote Lake" earthquake of August 6, 1979 was epicentered on the Calaveras fault also, about 7 miles southeast the subject property. This earthquake had a Richter magnitude of 5.9, and peak ground accelerations (horizontal) were as high as 0.28g at Coyote Dam and 0.42g in Gilroy. Repeatable high ground accelerations (10 cycles or more) in the Morgan Hill area were in the range of 0.2 to 0.25g. There were no deaths in either of these earthquakes, but damage reached several million dollars for each earthquake.

During historic time, the Hayward fault has generated two large magnitude earthquakes (in 1836 and 1868). Both of these earthquakes are estimated to have been roughly equivalent to a Richter magnitude 7. Both earthquakes were in Alameda County. It is anticipated that the Hayward fault will someday generate earthquakes of equivalent magnitude. The Working Group estimated in 1990 that the probability of a Richter magnitude 7 earthquake occurring by the year 2020 was 28% for the northern segment of the fault, and 23% for the southern segment.

Following more recent studies of earthquake recurrence periods, the Working Group may be raising their estimated probability of a major earthquake occurring within the Bay Area in the next 25 years from 67% to possibly as much as 90% (David Schwartz, the Working Group, personal communication).

Due to the proximity of these active faults it is very likely that the site will experience severe ground shaking during the lifetime of the proposed improvements.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the information we have studied, it is our opinion that the proposed site is geologically suitable for construction of a golf course maintenance building. There are essentially no geologic constraints to the proposed development that cannot be mitigated by proper engineering, design and construction. It appears that routine, design-level studies should be able to adequately address any potentially adverse soil condition and that any mitigation measures deemed necessary can be constructed using conventional methods.

The probability of ground rupture caused by active surface faulting at the site is very low because there are no active faults known to cross the site. The geologic processes associated with expansive soils and soil creep can be addressed and mitigated by conventional geotechnical engineering, design and construction. The potential for stream flooding can be quantified through hydraulic analyses, and hazard mitigation solutions can be developed accordingly. Any potential adverse impact of possible shallow ground water can be analyzed during future geotechnical studies; it is important, however, to recognize this condition when planning for underground structures and utilities. Based on the backhoe test pit we observed and our review of regional studies, we presently consider the probability of soil liquefaction and lateral spreading to be very low. The hazards of seiche, tsunami, and landsliding do not exist at the maintenance building site.

Due to the close proximity of the San Andreas, Hayward and Calaveras faults, as well as other active and potentially active faults, it is reasonable to assume that the site will experience high intensity ground shaking at least once within the design life of the proposed improvements. It is possible that a future large-magnitude earthquake could generate ground shaking intensities at the site that could equal or exceed those experienced during the Loma Prieta earthquake. We currently suggest that the "design earthquake" for the project site be a magnitude 7.0 earthquake with an epicenter near the southern end of the San Francisco Peninsula segment of the San Andreas fault, or a similar earthquake at the southern end of the southern segment of the Hayward fault. Those hypothetical epicenters are each about 18 miles from the site; those earthquakes have the capability to generate peak horizontal ground accelerations at the site of 0.3g and repeatable high ground accelerations (10 cycles or more) of 0.2g. Ground motions of this character could result in shaking intensities in the range of Modified Mercalli Intensity VII-VIII, similar to that experienced during the Loma Prieta earthquake. The occurrence probability of these design earthquakes is somewhere between 67% and 90% over the next 25 years.

The Loma Prieta earthquake caused a variety of ground deformation features that had not been anticipated by geologists prior to that time. It is certain that future earthquakes will teach us more about the impact of permanent ground deformation associated with earthquake ground shaking. It must be understood that it is not possible to predict exactly how the subject property will respond to future large-magnitude earthquakes.

Once the development concept is confirmed, we recommend that a geotechnical engineering investigation be included along with the other anticipated design-level studies.

Access to the proposed development area from Highland Avenue is geologically feasible. Emergency access or egress from Watsonville Road is geologically feasible.

LIMITATIONS

The recommendations contained in this report are based, in part, on certain information and data that have been provided to us. In the event that any changes in the general grading concept, building location, or general type of structure are required, our conclusions and recommendations shall not be considered valid unless we are commissioned to review such changes and to make any necessary additions or changes to our recommendations.

Subsurface exploration is necessarily confined to selected locations and conditions may, and often do, vary between these locations. Should conditions different from those assumed in this report be encountered during future studies or project development, additional exploration, testing and analysis may be required.

Any person concerned with this project, observing features or conditions at the site or surrounding area which are different from those described in this report, should report them immediately to this office for evaluation.

In preparing the findings and professional opinions presented in this report, we have endeavored to follow all generally accepted principles and practices of the geotechnical engineering professions. This warranty is in lieu of all other warranties, express or implied.

It is the responsibility of the client to ensure that the recommendations given in this report are made known to all design professionals involved with the project. A copy of this report should be provided to new owners if the property is conveyed.

Report prepared by,

PACIFIC GEOTECHNICAL ENGINEERING

Peter C. Anderson
RG 3833
CEG 1189

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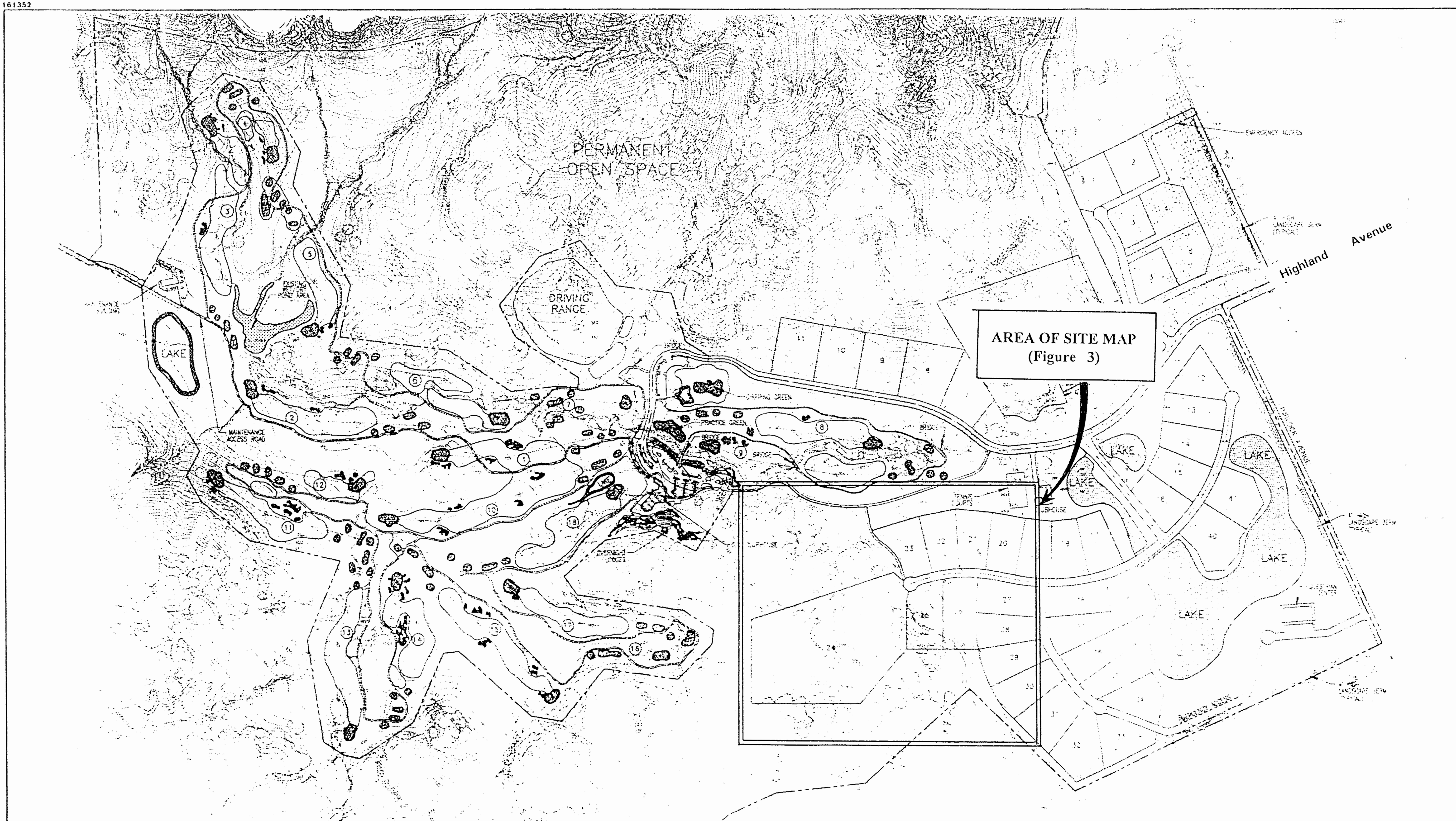

Base Map: Reduction of "Overall Site Plan", by Forsgren Associates, Inc.

PACIFIC GEOTECHNICAL ENGINEERING	DATE: DEC. 1995	DEVELOPMENT PLAN	FIGURE: 2
	SCALE: 1"=600'	THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	PROJECT: 1385/7G

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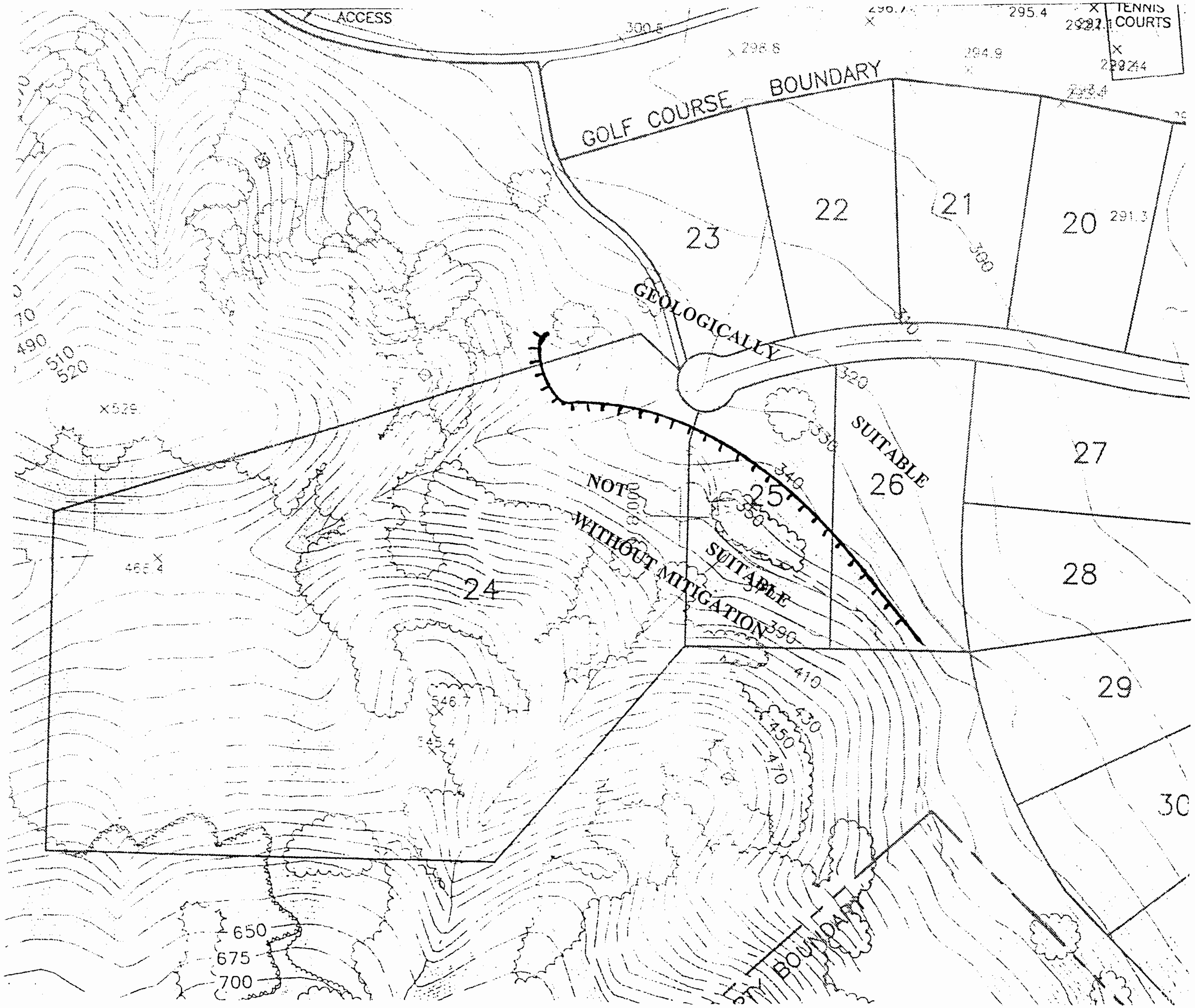

Base Map: "G.C. Buildings / Subdivision Site Plan", by Forsgren Associates, Inc.

PACIFIC GEOTECHNICAL ENGINEERING	DATE: DEC. 1995	SITE MAP	FIGURE: 3
	SCALE: 1"=200'	PROPOSED PARCELS #24, 25 & 26 THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	PROJECT: 1385/7G

FIGURES

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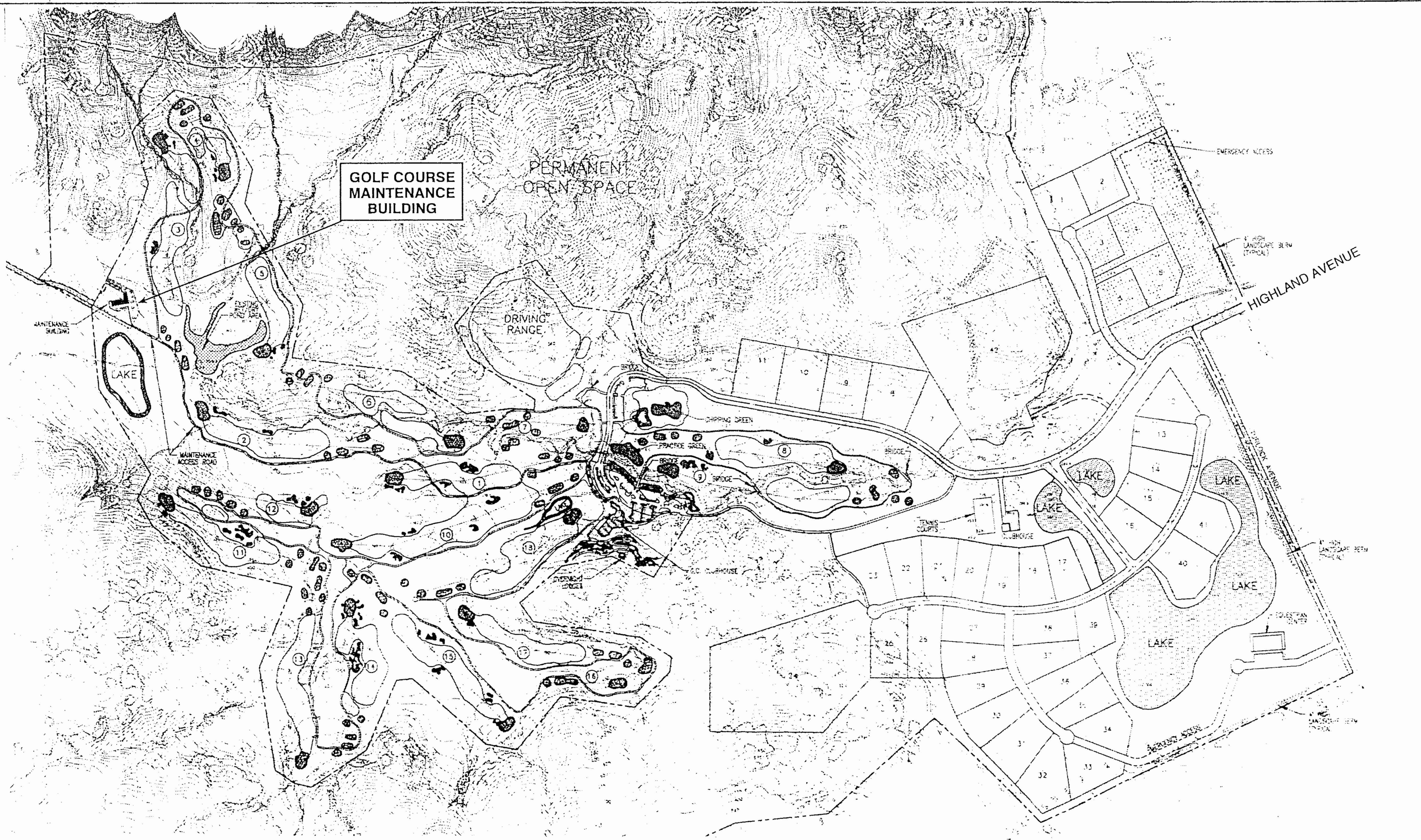

PACIFIC GEOTECHNICAL ENGINEERING	DATE DEC. 1995	DEVELOPMENT PLAN	FIGURE 1
	SCALE 1" = 600'	GOLF COURSE MAINTENANCE BLDG. THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	PROJECT 1385/5G

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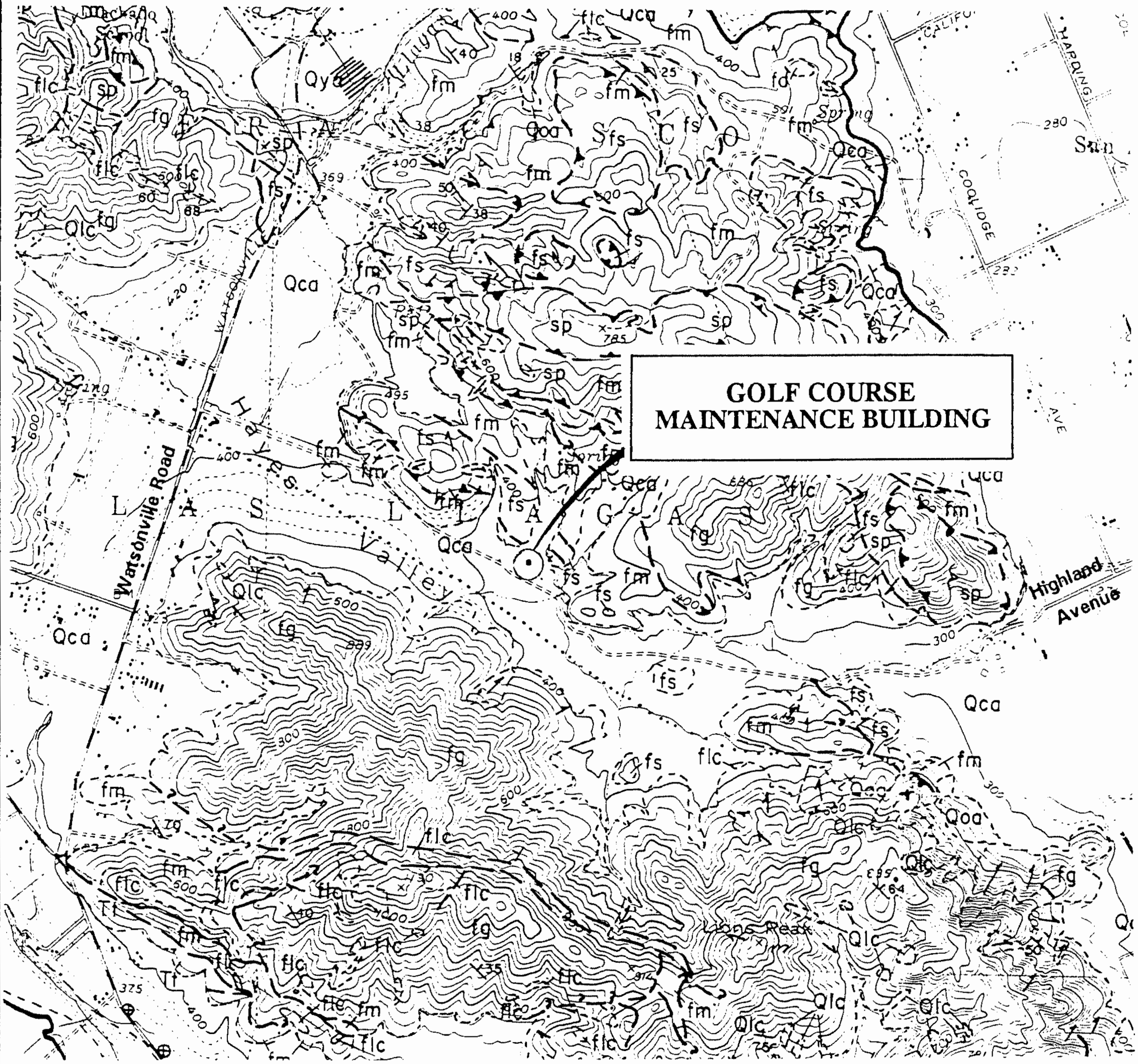

Base Map: Areal Geology, South County Study Area, 1973, by Williams and others, CDMG PR-18, 1" = 2000'

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EXPLANATION

Qca	Alluvium and thick colluvium
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sp	Serpentinite
	Landslide

PACIFIC GEOTECHNICAL ENGINEERING	DATE DEC 1995	GEOLOGIC INDEX MAP	FIGURE 2
	SCALE 1" = 2000'	GOLF COURSE MAINTENANCE BLDG. THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	PROJECT 1385/6G

Wahler Associates

Geotechnical and Water Resources Engineering

April 17, 1990
Project HRC-101B

Mr. Thomas Hix
HR Development Partners
1400 Fashion Island Boulevard, Suite 1000
San Mateo, California 94404

Subject: Geologic Input to Draft Environmental Impact Report Lions Gate Development

Dear Tom:

Enclosed is a copy of the geologic input to the Draft Environmental Impact Report for the Hayes Valley development, located in Santa Clara County. This work was performed in accordance with our proposal dated March 7, 1990.

It has been our pleasure to be of service to you on this project. If you have any questions regarding this report, or if we can be of further assistance to you, please do not hesitate to call.

Very truly yours,

WAHLER ASSOCIATES

Antonio S. Buangan
CEG No. 824, California

John J. Heneghan
GE No. 392, California

RL/ASB/JJH:F

cc: Mr. Burt Verrips,
Nolte & Associates

1023 Corporation Way. P.O. Box 10023. Palo Alto. California 94303 • Telephone Number (415) 968-6250
FAX: (415) 968-5365

LIONS GATE DEVELOPMENT

I. GEOLOGY AND SOILS

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A. GEOLOGIC SETTING

The Lions Gate (Hayes Valley) development site is located in the foothills of the Santa Cruz Mountains, approximately in the center of the structural and geomorphic Coast Ranges province about 25 miles southeast of San Jose. Figure 1 shows the site geology.

Geologic units at the project site consist mainly of an assemblage of Franciscan rocks intruded by serpentine and covered partially by alluvial deposits. These Franciscan rocks are mainly graywacke, shale, chert, metavolcanic rocks, minor limestone, and some diabase. They are generally moderately to intensely folded and faulted by a system of northwest-trending fault zones. The most important fault zone that crosses the Hayes Valley area is probably an extension of the Ben Trovato fault and is considered to be inactive. The fault zone is comprised of several shear zones along which weakened bedrock has been eroded. Therefore, the shear zones are represented in the topography by saddles or breaks in slope. The shape and size of Hayes Valley is thought to have been controlled by differential erosion along several parallel and interlacing shear zones.

Hayes Valley is an almost east-west trending valley, 1/2-mile to nearly 1 mile wide. A low topographic divide exists near the westerly end of the valley. From this topographic divide, Llagas Creek drainage flows northwest and the west branch of Llagas Creek flows east. The sides of Hayes Valley are underlain by Franciscan rocks, which are partially covered by soil, talus debris, and landslide deposits. Alluvial deposits cover the Franciscan bedrock on the valley floor to depths known to approach 100 feet.

B. FAULTING

The major active faults that would be of significance to the project area are the Calaveras, which is approximately 5.5 miles east of the site and the San Andreas, approximately 8 miles to the southwest of the site. Each of these faults is associated with historic, large magnitude, destructive earthquakes and is a potential source of strong shaking at the site. The Sargent fault, which shows evidence of recent activity, is located about 5 miles west of the site. Regional faulting is presented on Figure 2 and local faulting is shown on Figure 3.

The Calaveras fault zone consists of several subparallel faults and is approximately 90 miles long. It is considered to have been the source of the July 3, 1861 magnitude 6.5 (estimated) earthquake with ground rupture in the San Ramon and Amador valleys and is the causative fault for both the 1979 Coyote Lake and 1984 Morgan Hill earthquakes. It is considered capable of generating a magnitude 7.5 earthquake.

The San Andreas fault zone has an approximate total length of 700 miles and is considered capable of generating a magnitude 8.5 earthquake. The magnitude 8.25 San Francisco earthquake in 1906 resulted from movement on the San Andreas fault. The recent 7.1 Richter magnitude Loma Prieta earthquake on October 17, 1989 was centered on the San Andreas fault.

Hayes Valley apparently coincides with the easternmost extension of the Ben Trovato fault zone, believed by some to be about one-half mile wide at the site. Previous explorations performed by Wahler Associates indicate that there are several individual faults and shear zones along the hills rimming the valley and in the bedrock underlying the alluvial deposits on the valley floor. A prominent fault is marked in the topography by an alignment of springs, slope changes and topographic lows along the northern side of the valley. Another important fault is inferred along the south side of the valley. The serpentine bodies along the crest of the hills north of the reservoir are bounded by faults and shear zones.

None of the faults that occur in, or are inferred to cross, the valley show surficial evidence of geologically or historically recent activity. To investigate possible recent fault activity, backhoe trenches were excavated, during our previous investigation, across known or inferred fault traces that cross the proposed project area. Each trench was carefully logged by an engineering geologist in the field, with special attention being given to any indication of displacements of alluvial or colluvial materials. None was found, and it is concluded that the investigated faults were inactive during the recent geologic past. Terratech, Inc. (1988) reported photolineaments in the alluvium along the segments of the fault not investigated by W.A. Wahler and Associates in 1973, which they indicated might suggest "active" faulting. However, there are no obvious geomorphic evidences in the alluvium such as topographic scarps that would suggest more recent fault activity. Furthermore, trenching exploration during previous studies (W.A. Wahler and Associates, 1973) across projections of the faults in the bedrock areas, did not show any evidence of geologically recent activity. Photolineaments do not necessarily suggest active faulting; in fact, they may not necessarily indicate a fault feature.

C. LANDSLIDES

Generally, the property is relatively free of major landslide features, except for two prominent landslides near the southeasterly corner of the property. A mudflow, probably occurring as a result of the wet winter season in 1982, did occur at the site area, and areas of surficial sliding were observed during our recent site reconnaissance.

In the landslide areas, the ground surface is typically hummocky and shows evidence of active creep movement. The slide debris consists of a chaotic mixture of angular rock fragments in a sandy clay matrix. The lower portions of the landslides are moist and soft. The location of the two prominent landslides and the mudflow are shown on Figure 1.

D. SITE SOIL CONDITIONS

The ground surface in the flatter areas of the site is generally underlain by a dark brown, moderately to highly plastic silty to sandy clay topsoil (CL to CH per the Unified Soil Classification System) from 1 to as much as 6.5 feet in thickness, but mostly about 2 to 4 feet thick. During our site reconnaissance, the topsoil was observed to be dry with many shrinkage cracks, indicating a moderately to highly expansive clay topsoil.

Alluvium underlies the topsoil in the valley bottom. It includes slope-wash materials on the lower hill slopes. The alluvium consists mainly of sandy clay, gravelly clay and clayey gravel. The thickness of the alluvium, as indicated by previous explorations by Wahler Associates (1973), ranges from 40 to 95 feet near the center of the valley. The alluvial deposits cover an irregular subsurface bedrock topography.

The alluvial materials range from sandy clay to clayey gravel. In place, the alluvial soils are relatively dense, stiff to hard, damp to moist, and have good strength characteristics.

Bedrock areas are partially covered by a light brown sandy to clayey soil which varies in thickness from less than 1 foot to 3 or 4 feet. This soil supports sparse to abundant grassy and brushy vegetation. Areas underlain by serpentine are less vegetated than areas underlain by other types of rocks. Trees, mainly oaks, cover the higher portions of the hilly terrain, especially on the north-facing hills on the south rim of the valley.

E. GROUNDWATER

During our previous (1973) investigation, groundwater was encountered in all of the borings at depths ranging from 13 feet to 20 feet and several springs were noted in the project area, which are shown on Figure 1. During our recent site reconnaissance, the springs were observed to continue to exist.

Some of the springs have been developed into shallow wells to provide stock water. Springs SPG-1 and SPG-2 have been developed into wells; spring SPG-3 is an active surface spring; and springs SPG-4 and SPG-5 had been excavated to form small ponds. No free water was observed in the spring areas during our recent site reconnaissance, although green areas were observed. These green areas are probably areas of active seepage during the winter months.

II. GEOLOGICAL IMPACTS AND MITIGATION MEASURES

A. SEISMIC HAZARDS

The project site is located in a seismically active region which has been subjected to several strong earthquakes during historic time. Earthquakes have occurred throughout the entire San Francisco Bay region, with most of them concentrated along the San Andreas, Hayward, and Calaveras fault zones. Figure 3 shows the location of these faults and the distribution of 4.0 and greater earthquakes in the San Francisco Bay region up to 1984, and larger magnitude earthquakes (6.0 and greater) up to the present.

Three active fault systems are known to exist in the vicinity of the site. The San Andreas fault is approximately 8 miles southwest of the site, the Calaveras fault is approximately 5.5 miles east of the site and the Sargent fault is approximately 5 miles west of the site.

1. Surface Rupture

During our previous investigations of the project site, it was concluded that none of the faults that occur in, or are inferred to cross, Hayes Valley showed surficial evidence of geologically recent activity. Seismicity maps show no earthquake epicenters in that area that may be ascribed to these faults. Therefore, the likelihood of fault rupture is low.

2. Ground Shaking

Severe ground shaking due to a large earthquake on the nearby San Andreas, Calaveras, or other fault system, may be experienced during the life of the development. Anticipated severe ground shaking must therefore be considered in the structural design of the development.

Estimating shaking effects at the site involve analyzing a record of a possible earthquake. This can be done using a record of an actual earthquake (accelerogram) or a modified or synthesized record. The parameters most often used for engineering design purposes are ground acceleration or ground particle velocity, duration and predominant periods.

Strong shaking in Hayes Valley induced by a large earthquake need not necessarily produce serious damaging effects, provided proper design techniques are utilized. The foundation materials at the site are generally strong and dense and should respond satisfactorily under the stresses imposed by strong ground motion. Rocks of the Franciscan formation underlie areas of the proposed development and are relatively hard, but sheared in some places. The valley area is underlain by up to about 100 feet of normally consolidated clayey and sandy gravel. Shaking can be expected to generally be more intense in the alluvial materials than in the metamorphic Franciscan rocks.

Studies by Seed and Idriss (1969) suggest that ground motion is affected by the maximum acceleration of the underlying rock in such a way that the higher the acceleration, the smaller the difference in shaking intensity of different soils. Thus, the shaking intensity of all the foundation materials would be essentially the same for the maximum probable earthquakes on the Calaveras and San Andreas faults.

3. Ground Failure

Because of the cohesive and dense nature of the on-site materials, liquefaction is preliminarily not considered to be a major concern, although some lateral spreading could take place during a large earthquake adjacent to natural stream banks. It is recommended that a preliminary setback of at least 50 feet from stream banks be planned for any structural features.

B. GROUNDWATER

Our previous site exploration indicates that the depth to groundwater in the project area varies seasonally with areas of perennial spring activity as shown on Figure 1. Groundwater is anticipated to affect below-ground structures including basements and utilities located at depths greater than 10 feet below the original ground surface in spring areas and in the valley floor area. Excavation for stormwater retention basins or ponds, requiring cuts greater than a depth of 10 feet, may encounter groundwater.

Adequate attention to improving surface and subsurface drainage during grading plan design should alleviate the seasonal groundwater problem. Construction problems can be minimized by accomplishing grading and major construction during seasons of lower rainfall.

A number of perennial springs have been mapped in the higher elevations of the site. Proposed structures to be constructed in these areas should be designed with adequate drainage and subdrainage provisions.

C. EXPANSIVE SOIL CONSIDERATIONS

A majority of the near surface soil (1 to 6.5 feet in thickness) consists of silty to sandy clay, which is moderately to highly expansive. Where possible during the design of the grading scheme, consideration should be given to removing expansive soils from areas where buildings, slabs-on-grade and pavements are to be constructed. This will result in reduced foundation requirements and lower foundation costs. If removal of expansive soils is not possible, the foundations should be designed to accommodate the conditions created by the expansive soils.

D. DRAINAGE SWALES

It is observed that many of the roads and structures are proposed to be constructed across natural drainage swales. In order to minimize post-construction damage to facilities, a stormwater drainage pipeline should be placed along the natural drainage swale.

E. SURFACE DRAINAGE

Drainage control should include provisions for positive surface gradients so that surface runoff is not permitted to pond, either on slopes or adjacent to building foundations. Surface water runoff and roof gutters should direct water to lined ditches or natural drainage swales that lead to a storm drain, paved roadway or water course. Surface water should not be allowed to drain onto slopes.

F. SLOPE STABILITY

Existing landslide debris, a small mudflow, and some surficial sliding were observed on the project site in the southeast portion of the proposed subdivision. Housing units are planned in this area; therefore, special care must be taken to repair the existing slides and control erosion and surficial sliding on the slopes.

The existing landslide debris is not a strong and appropriate foundation material. Therefore, the landslide materials should be removed and replaced with engineered fill benched and keyed into the bedrock in order to stabilize the area before construction of the planned housing units in the vicinity of the landslides.

Slopes should be provided with permanent protection against erosion and surface water drainage. Provisions should be provided on slopes in order to mitigate surficial sliding and erosion.

G. CUT AND FILL SLOPES

Cut and fill slopes should be constructed at a slope inclination not steeper than 2:1 (horizontal to vertical). Setbacks between houses and slopes, terracing of slopes, and drainage provisions on slopes should be designed in accordance with the most recent Uniform Building Code.

All fill slopes should be benched into competent material and keyed at the toe of the slope for stability. In addition, slopes cut into the sheared, crushed Franciscan bedrock may require flatter slopes. Slopes that will be saturated, such as any slopes in proposed shallow pond areas, should be graded no steeper than 4:1 (horizontal to vertical). All slopes should be provided with permanent protection against erosion.

H. EXCAVATIONS

Trenches should be excavated with conventional trenching equipment in the alluvial material to depths of 10 feet. Areas underlain by weathered, but dense, bedrock may require special excavation techniques, such as jack-hammering or possible blasting. Bedrock outcrops were observed in the hillside areas adjacent to Hayes Valley.

I. RECLAIMED WATER SPRAYFIELDS

Spraying reclaimed water on the flat portions of the Hayes Valley development for irrigation purposes is geotechnically acceptable. Irrigation of hillside areas with reclaimed water will require further investigations in order to determine the affects this will have on slope stability.

J. EROSION AND SEDIMENTATION

Slopes should be provided with permanent protection against erosion and surface water drainage. These provisions should be provided on slopes in order to mitigate surficial sliding and erosion.

Siltation fences, consisting of straw bales, may be used during grading to control silting on hillsides.

K. SERPENTINE ROCK CONSIDERATIONS

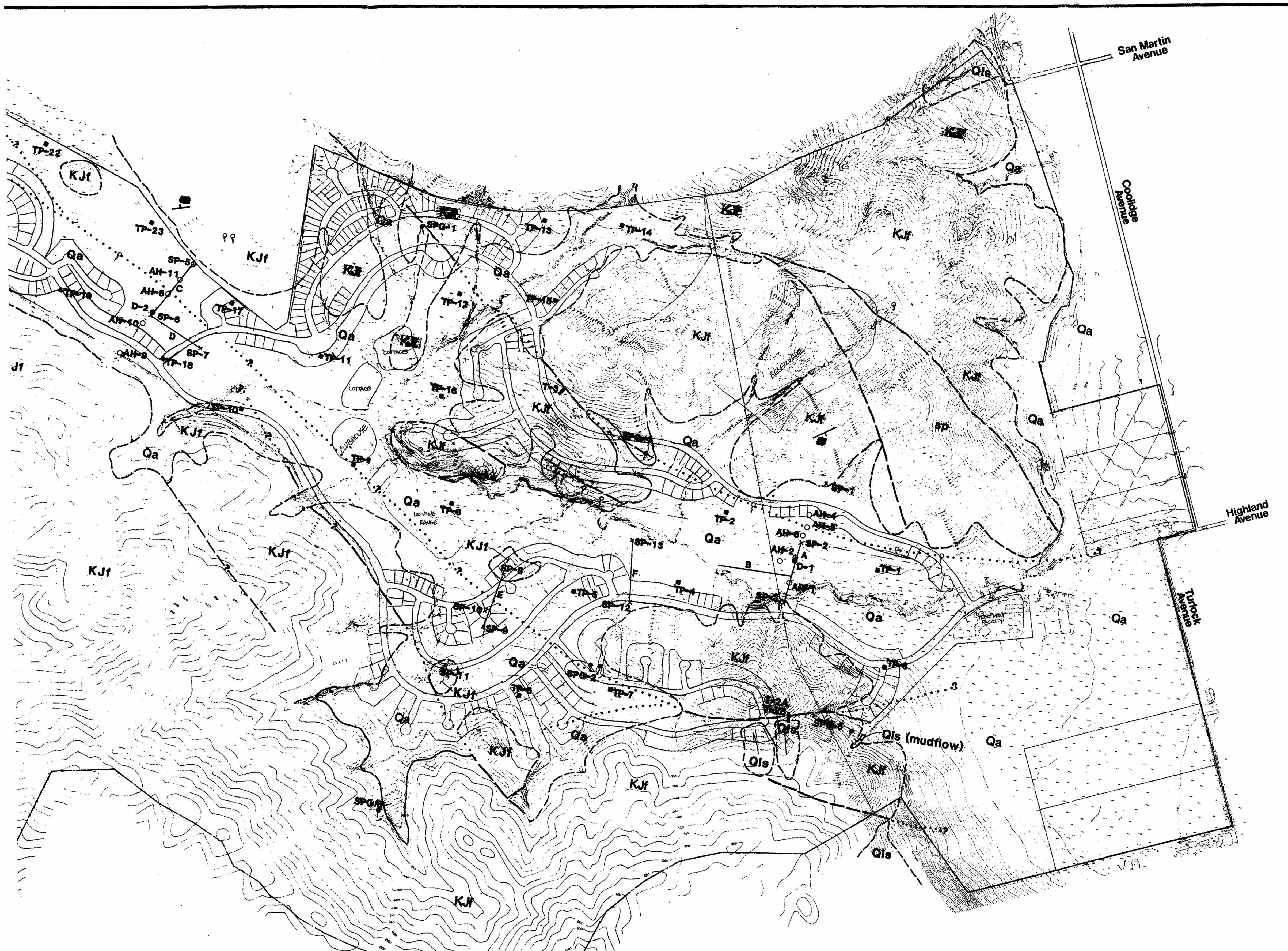
Asbestos minerals are generally associated with ultrabasic types of rocks such as serpentine. The release of asbestos fibers (if occurring in significant amounts) into the atmosphere could be mitigated with soil blanket cover or possibly vegetation cover. The requirement for mitigation measures will depend on the amount of asbestos minerals contained in the serpentine rock.

L. PROPOSED ACCESS ROAD CONSIDERATIONS

Proposed access roads will traverse areas underlain by various rock and soil types which would therefore impact excavation characteristics. Massive sandstone rocks may require some local blasting. Road routes in expansive soils will require stripping of expansive soil in the foundation subgrade. Some springs or seepage areas may be traversed by proposed access roads and will require subdrains as a mitigation measure.

M. RESERVOIR

The proposed reservoir will require construction of an earth dam embankment to provide for the impoundment of water. The primary impact of the proposed reservoir to the site soils and geology is the source of construction material for the proposed dam. It would be ideal to obtain most of the embankment materials from within the proposed reservoir, which will require extensive excavation and permanent excavation surfaces. Some materials may need to be imported from off-site sources, such as filter and drain materials. Clay materials for the impervious core of the dam may be provided by the alluvial units at the site and may be supplemented from sources outside the impoundment area. Appurtenant structures of the dam such as spillways and outlet-inlet conduits, may require permanent cuts that may be lined or unlined. Details of the engineering measures required to mitigate geologic impacts such as construction material sources and cutslope stability, would be presented after intensive geotechnical investigation of the proposed reservoir site.



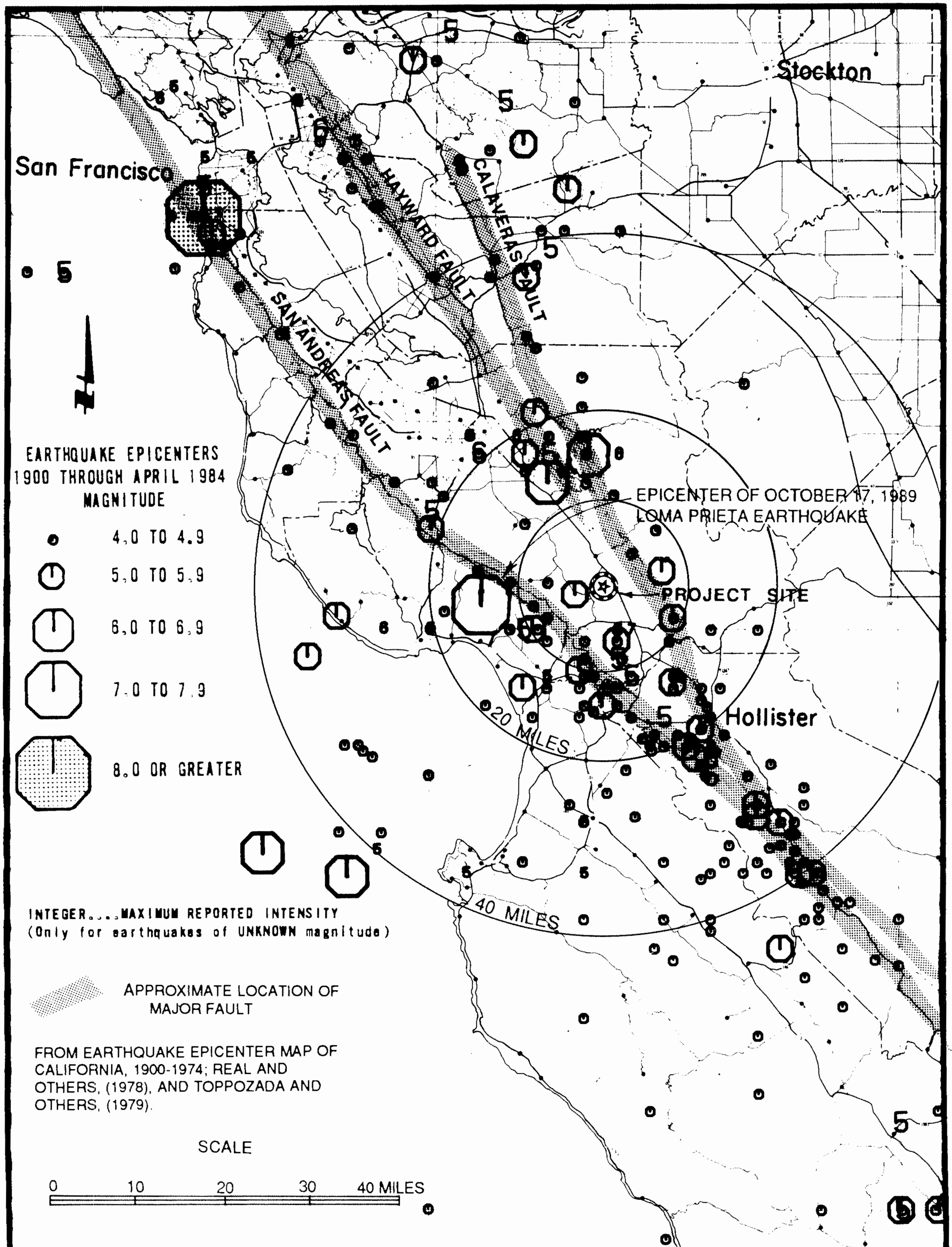
EXPLANATION

Qls	LANDSLIDE DEPOSITS
Qa	ALLUVIAL DEPOSITS
sp	SERPENTINE
KJf	FRANCISCAN ROCKS
	GEOLOGIC CONTACT
?	FAULT; DOTTED WHERE CONCEALED, QUERIED WHERE DOUBTFUL
	STRIKE AND DIP OF BEDDING
	SPRING - NOTED DURING PREVIOUS MAY 1973 INVESTIGATION
D-2	ROTARY DRILL HOLE (MAY 1973)
AH-11	AUGER HOLE (MAY 1973)
T-2B	EXPLORATION TRENCH (MAY 1973)
F SP-1 SP-2	SEISMIC REFRACTION LINE (MAY 1973)
TP-23	BACKHOE TEST PIT (OCTOBER 1984)
SPG-5	SPRING - NOTED DURING OCTOBER 1984 RECONNAISSANCE

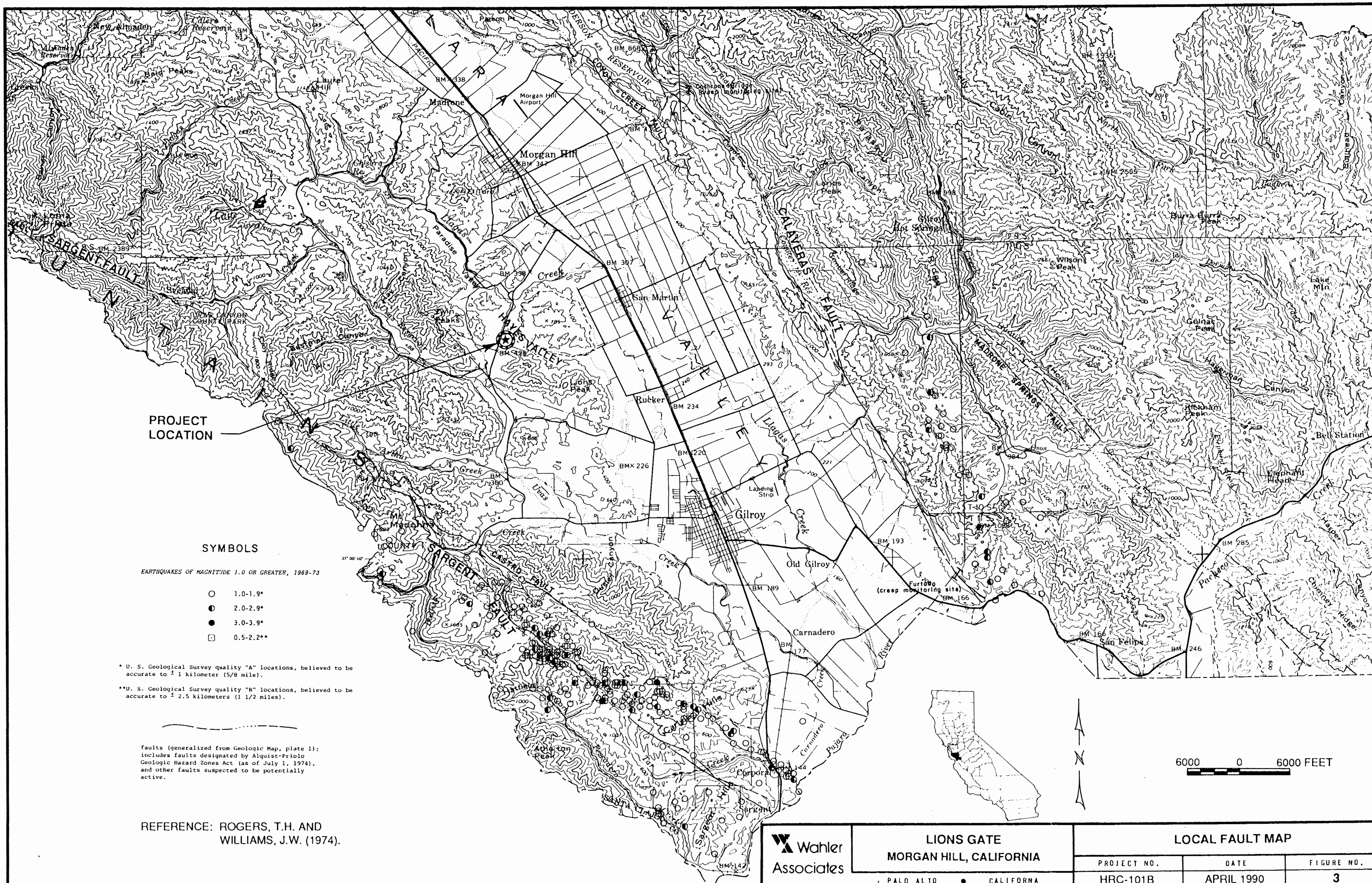
SCALE

900 0 900 FEET

Wahler Associates	LIONS GATE MORGAN HILL, CALIFORNIA	AERIAL GEOLOGIC MAP		
		PROJECT NO.	DATE	FIGURE NO.
	PALO ALTO • CALIFORNIA	HRC-101B	APRIL 1990	1



Wahler Associates	LIONS GATE MORGAN HILL, CALIFORNIA	REGIONAL FAULT & SEISMICITY MAP SAN FRANCISCO BAY REGION		
		PROJECT NO.	DATE	FIGURE NO.
	PALO ALTO • CALIFORNIA	HRC-101B	APRIL 1990	2



SYMBOLS

EARTHQUAKES OF MAGNITUDE 1.0 OR GREATER, 1969-73

○	1.0-1.9*
◐	2.0-2.9*
●	3.0-3.9*
⊡	0.5-2.2**

* U. S. Geological Survey quality "A" locations, believed to be accurate to ± 1 kilometer (5/8 mile).

**U. S. Geological Survey quality "B" locations, believed to be accurate to ± 2.5 kilometers (1 1/2 miles).

faults (generalized from Geologic Map, plate 1); includes faults designated by Alquist-Priolo Geologic Hazard Zones Act (as of July 1, 1974), and other faults suspected to be potentially active.

REFERENCE: ROGERS, T.H. AND WILLIAMS, J.W. (1974).

Wahler Associates	LIONS GATE MORGAN HILL, CALIFORNIA	LOCAL FAULT MAP		
	PALO ALTO • CALIFORNIA	PROJECT NO. HRC-101B	DATE APRIL 1990	FIGURE NO. 3

126961

SUPPLEMENTAL GEOLOGICAL
RECONNAISSANCE INVESTIGATION
FOR
PROPOSED HAYES VALLEY DAMS
SANTA CLARA COUNTY,
CALIFORNIA

Kaldveer Associates
Geoscience Consultants

Peter Kaldveer, P.E., G.E.
President
Richard Short, P.E., G.E.
Executive Vice President
Ronald L. Bajuniemi, P.E., G.E.
Vice President Engineering
Patrick Stevens, P.E., G.E.
Associate
David Hoexter, C.E.G., R.E.A.
Associate
Michael McRae, P.E.
Associate
Dawn Rinaldi, P.E.
Barbara L. Potter, P.E.
Randy P. Rowley, R.E.A.
Polly L. Worrell, R.E.A.

August 4, 1989
K1076-2A, 14351

Whitley, Burchett and Associates
33 Quail Court, Suite 300
Walnut Creek, California 94596

Attention: Mr. Max E. Burchett

RE: SUPPLEMENTAL GEOLOGICAL RECONNAISSANCE INVESTIGATION
PROPOSED HAYES VALLEY DAMS
SANTA CLARA COUNTY, CALIFORNIA

Gentlemen:

In accordance with your request, we have performed a supplemental geological reconnaissance investigation for two proposed Hayes Valley Dam sites. The accompanying report presents the results of our field reconnaissance and geological engineering interpretation and evaluations. The geological conditions are discussed and preliminary recommendations for siting of the dams are presented. The preliminary conclusions and recommendations contained herein are based upon applicable standards of our profession at the time this report has been prepared. Copies of this report are furnished only to provide the factual data which were gathered and which were summarized in the report.

We refer you to the text of the report for our preliminary recommendations. If you have any questions concerning our findings, please call us.

Very truly yours,

KALDVEER ASSOCIATES, INC.

Prepared By: Randy P. Rowley
Senior Engineering Geologist

Mike McRae, P.E.
Associate

REGISTERED PROFESSIONAL ENGINEER
PETER KALDVEER
No. 452
EXPIRES 9-30-89
GEOTECHNICAL
STATE OF CALIFORNIA

Reviewed By: David F. Hoexter, C.E.G.
Manager, Environmental/Geological Services
Associate

Peter Kaldveer, P.E./G.E.

RPR/MMc/DFH/PK:pv
Copies: Addressee (6)

SUPPLEMENTAL GEOLOGICAL
RECONNAISSANCE INVESTIGATION

For
PROPOSED HAYES VALLEY DAMS
SANTA CLARA COUNTY, CALIFORNIA

To
Whitley, Burchett and Associates
33 Quail Court, Suite 300
Walnut Creek, California 94596

August, 1989

TABLE OF CONTENTS

SUPPLEMENTAL GEOLOGICAL RECONNAISSANCE
INVESTIGATION
PROPOSED HAYES VALLEY DAMS
SANTA CLARA COUNTY, CALIFORNIA

INTRODUCTION

This report presents the results of our supplemental geological reconnaissance investigation for the two proposed Hayes Valley Dams. The dam embankments will be constructed within Hayes Valley, located west of the community of San Martin and approximately 25 miles south of San Jose, in Santa Clara County, California, as shown on the Vicinity Map, Figure 1. The purpose of our investigation has been to evaluate the geological conditions in the vicinity of the proposed dams to determine on a preliminary basis the feasibility of constructing a dam at two locations within Hayes Valley. The approximate locations of the two dames, identified as Dam #1 and Dam #2, are shown on the Regional Geology Map, Figure 2 and on the Site Geology Map, Figure 3.

It should be noted that our firm has previously performed a geologic reconnaissance of another dam location within Hayes Valley and a preliminary hydrogeologic study for the project. The results of these previous studies were presented in the reports titled, "Geologic Reconnaissance Investigation - Proposed Hayes Valley Dam, Santa Clara County, California", dated May 15, 1989 and "Reconnaissance Hydrogeologic Investigation of the Hayes Valley Area - Santa Clara County, California", dated May 15, 1989.

Based on conversations with Mr. Max Burchett, it is our understanding that the project has been revised since the submittal of the aforementioned reports. Originally the project involved a single earthfill dam for the purpose of storing treated waste water. However, due to the storage volume requirements and property limitations, the current plan is to construct two earthfill dams. The stored water will be used during the summer months for irrigation within the proposed residential and recreational development planned for Hayes Valley. The maximum pool elevation of Dam #1 will be approximately 535 feet and the corresponding maximum storage behind the dam will be approximately 530 acre-feet. The proposed maximum pool elevation of Dam #2 will be approximately 480 feet and the corresponding maximum storage behind the dam will be approximately 1,760 acre-feet. The elevations presented in this report are based on the published USGS topographic maps for the site area. Based on the most recent concept for the project, the maximum height of the embankment for Dams #1 and #2 could be approximately 100 and 140 feet, respectively. A total of approximately 1.4 to 1.5 million cubic yards of material will be required to construct both embankments.

SCOPE

The scope of work of our investigation consisted of literature research, aerial photographic interpretation, geologic field reconnaissance and mapping, an engineering evaluation of the field data, and preparation of this report. The data obtained was for the purpose of evaluating, on a preliminary basis, the feasibility of the site for the proposed dam.

This report has been prepared in accordance with generally accepted geotechnical and geological engineering practices for the exclusive use of the City of Morgan Hill and Whitley, Burchett and Associates, for specific application to the proposed Hayes Valley Dam. In the event that any changes are made in the proposed locations of the dam, the conclusions contained in this report shall not be considered valid.

SITE INVESTIGATION

Our geologic reconnaissance of the site was performed during mid-April and mid-July, 1989. The geologic reconnaissance consisted of the examination of bedrock and soil exposed in outcrops, gullies and road cuts. The geologic input for the project was provided by Mr. Randy P. Rowley, Senior Engineering Geologist, and Mr. David F. Hoexter, Certified Engineering Geologist.

The literature and aerial photographs reviewed for this report are listed at the end of the text under "References". The regional geology of the site and vicinity is presented on the Regional Geology Map, Figure 2. The results of our geologic mapping are presented on our Site Geology Map, Figure 3.

SITE DESCRIPTION

The site is an approximately east-west trending valley one-half mile to nearly one-mile wide. The valley narrows to the east and opens into the southerly reach of the Santa Clara Valley. The surface drainage from Hayes Valley generally flows out through the eastern end of the valley. The western end of the valley broadens into a larger inner mountain valley which trends roughly north-south. A drainage divide exists near the western opening and surface drainage for a small portion of Hayes Valley flows out to the west. The north-south trending inner mountain valley is drained by Llagas Creek which flows northeast and then east to the Santa Clara Valley.

The hills on both sides of Hayes Valley are moderately steep and increase in elevation from 400 feet at the valley floor to 1,100 feet on the hilltops south of the valley and to 800 feet on the hilltops to the north of the valley. The hillsides and adjoining topographic saddles north of the valley area are grass-covered and are currently in use as fenced grazing land. At the time of our field reconnaissance the area around Dam #2 was bare of grass ground cover due to a recent grass fire at the site. The southern hillsides are somewhat steeper and covered with a dense growth of trees and brush. The valley is cultivated and produces grasses and hay for grazing. Stands of oak and other trees are located throughout the property. Improvements primarily consist of fenced areas, ranch houses, livestock out-buildings (confined to the eastern end of the valley) and several developed springs with holding ponds or troughs.

REGIONAL GEOLOGY

Hayes Valley is located in the Coast Range Geomorphic Province of California. The province extends from the Transverse Range in the south, to beyond the Oregon border in the north. The Coast Range is generally a northwest trending, approximately fifty miles wide, sequence of mountain ranges separated by elongate northwest-trending inner-mountain valleys. Within the province, the project site is located in the foothills of the Santa Cruz Mountains.

The Santa Cruz Mountains in the site area consist of an assemblage of Franciscan Complex rocks which are intruded by serpentine and partially covered by alluvial deposits. The Franciscan Complex is primarily a mixture of deep ocean sediments and volcanic rocks which have undergone a complex tectonic history of folding, faulting, uplift and erosion.

REGIONAL FAULTING AND SEISMICITY

The San Francisco Bay Area is recognized by geologists and seismologists as one of the most active seismic regions in the United States. The significant earthquakes which occur in the Bay Area are associated with crustal movements along well defined active fault zones which trend in a northwesterly direction.

The site and the entire San Francisco Bay Area is seismically dominated by the presence of the active San Andreas system. In the theory of plate tectonics, the San Andreas fault system forms the boundary between the northward moving Pacific Plate (west of the fault) and the southward moving North American Plate (east of the fault). In the south Bay Area, this movement is distributed across a complex system of active strike-slip, right lateral subparallel faults which include the San Andreas (eight miles southwest), the Calaveras (five and one-half miles northeast) and the Sargent fault (about five miles west).

While it is not yet possible to predict when and where a major earthquake will occur, it is reasonable to assume that such an earthquake, accompanied by very strong ground shaking at the site, will occur in the San Francisco Bay Area during the design life of the dams and related facilities planned for the property.

SITE CONDITIONS

1. General

The site surficial soils consist of residual bedrock soils on the hillsides and alluvial soils in the valley proper. The alluvial soils are reported by others to extend to a maximum depth of approximately 95 feet. The soils on the hillsides vary in thickness due to the variable weathering characteristics of the bedrock. Instability (such as landslides and soil creep) has developed on slopes with thicker soils. The soils in the valley are generally more clayey than the hillside soils.

The site bedrock, as exposed in surface outcrops, gullies and road cuts, consisted of Franciscan Complex greenstone (altered volcanic rock) and sandstone with discrete blocks of limestone and chert. Locally the Franciscan Complex has been intruded with serpentine. The various units of the Franciscan Complex and the areas of slope instability are present on the Site Geology Map, Figure 3.

In the vicinity of the left abutment (toward the south) of Dam #1, the bedrock material is sandstone and no major unstable slopes are noted. The dam's right abutment (toward the north) will be placed in an area underlain by both serpentine and greenstone, and the general area exhibits several landslides and shallow soil slumps.

Both abutments of Dam #2 will be constructed in areas underlain by sandstone. Within the vicinity of the dam's left abutment (eastern) a large area of shallow landslides and slope instability exists, as shown on the Site Geology Map, Figure 3.

2. Surficial Deposits

a. Colluvium

Colluvium is present as a soil mantle overlying bedrock in swales and the lower hillside slopes. The colluvium generally consists of deposits of expansive clays. The thickness of these deposits generally increases downslope. The colluvium deposits represent accumulation of soil and bedrock debris by down slope wash, creep, landsliding, and other mass wasting processes. Due to their unconsolidated nature, these deposits are generally susceptible to accelerated erosion and gulleying. These deposits were not specifically mapped for this investigation, but are generally represented on the Site Geology Map as landslides or areas of slope instability.

b. Landslides (Qls)
Landsliding has occurred in several areas of the site, as shown on the Site Geology Map. Most of these slides appear to be the result of thick soil accumulation on hillsides being undercut at the toe by drainage ways. Slides appear to involve primarily soils and deeply weathered bedrock. The areas of landsliding are characterized by an over-steepened head scarp region, minor scarps, benches, depressions, hummocky topography, toe bulges, springs, disrupted drainages and other features.

3. Bedrock Deposits (Franciscan Complex (KJf)

The rocks of the Franciscan Complex are of Jurassic to Cretaceous and possibly to Tertiary age and comprise a highly sheared and deformed "melange" unit consisting of greenstone, limestone, sandstone, chert, and serpentine. The following descriptions of the various rock types are according to the Rock Characteristics Chart which is included as Figure 4.

a. Greenstone (KJfgs)
The greenstone (altered volcanic rock) was found to be generally a gray-green, moderately fractured, hard to very hard, little weathered rock which occurs over a majority of the project hillsides. The color and hardness varied throughout the site, often to a more reddish gray, moderately weathered rock.

b. Serpentine (KJfsp)
Serpentine at the site is usually found to be dark green or blue-green, massive, close to intensely fractured, and of low to moderate hardness. It exhibits moderate to deep weathering. In outcrop exposures the serpentine is highly sheared with fractures which are commonly open up to two inches and which are deeply weathered. Fractures appear to be parallel to foliation within the serpentine and show a general northwest trend and steep northerly dip. The serpentine is an intrusive rock material which usually is intruded along zones of weakness such as ancient fault or shear zones.

c. (Calera?) Limestone (KJfls)
The limestone is found as a light gray, massive, moderately close fractured, very hard, little weathered rock. The rock is found in rare outcrops in the northeastern portion of the site and in a mappable mass just northeast of Dam #2. The limestone is similar in appearance and occurrence to limestone attributed to the Calera Formation.

d. Sandstone (KFfs)
The sandstone is observed in rare outcrops in the eastern hills of Hayes Valley. The fine grained sandstone is dark reddish brown, massive, intensely fractured to crushed, friable and moderately to deeply weathered. Abutments of both alternate dam sites will be within this material.

e. Chert (KJfc)
The chert is found in discrete blocks usually within the greenstone matrix. The chert is gray-green, occasionally fractured, very hard and little weathered to fresh.

4. Structure

As previously mentioned, the Franciscan Complex has a varied history of faulting, folding and uplift with a general structural trend to the northwest. The general trend of the Franciscan bedrock units at the project site is northwest, with relatively steep dip (to 78^{o}) to the north. In the hills in the northern portion of the investigated area, synclinal folding is apparently present as indicated by the occurrence of two bands of serpentine with greenstone underlying, overlying and separating, the bands, as shown on Figure 3. There is insufficient evidence available from our geologic reconnaissance of the site to establish a complete structural history.

5. Faulting

Two subparallel fault traces cross the southern and northern portions of Hayes Valley, as shown on Figure 3. The northern fault trace is in the near vicinity of both proposed dam sites. The Hayes Valley faults appear to be the easternmost extension of the Ben Trovata fault zone. Evidence for the existence of the two main faults includes topographic troughs, drainages, and springs which form identifiable lineaments observable in aerial photographs. Earlier fault investigations at the site have identified several associated traces or shear zones which were interpreted as being inactive. The Alquist-Priolo Fault Hazards Maps of the site vicinity (maps of identified active faults) do not show the faults. We have found no information or data to indicate the mapped faults are active within the last 11,000 years.

6. Ground Water

Springs are found throughout the site. During our previous field reconnaissance in early April 1989, most of the springs exhibited varying amounts of active seepage. During the mid-July reconnaissance there was only minor active seepage from a few of the spring areas. The majority of the springs appear to be associated with major geologic transition zones, such as faults, shear zones, and geologic contacts. An obvious line of springs exists at the contact between serpentine and greenstone just to the north of the project property and just above the proposed Dam #1 reservoir pool.

Ground water levels have been reported to range from a depth of 13 to 20 feet in the main valley area after a heavy rainy season. However, these levels would vary with the season and the rainfall amounts. Our investigation involved no subsurface exploration so we could not determine the present ground water conditions.

7. Erosion and Surface Creep

Active erosional down-cutting is occurring in the central portion of the main valley (gulley banks as deep as eight feet deep) and in some of the steeper canyons. Elsewhere, localized gulleying is occurring on some of the steep slopes underlain by thick soil or landslide deposits.

There are several areas of suspected and observed soil creep, primarily on the steep slopes with thick soil cover. These areas, which are designated on Figure 3, are characterized by shallow erosion and sloughing, leaning trees or fences, and slightly irregular or hummocky surface.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our geological reconnaissance investigation, it is our opinion that no major geological constraints exist at the site which would preclude the construction of the proposed dams. However, we have identified one major and three secondary geological considerations which may impact the siting and construction of the proposed dams.

The major geological consideration is the relatively weak and potentially unstable bedrock materials which are located in the vicinity of the proposed right abutment (northern) of Dam #1. Two bands of serpentine bedrock outcrop in the vicinity of the proposed right abutment (as shown on Figure 3). Serpentine in a weathered condition is a relatively weak rock which is particularly susceptible to slope failures. In addition, weathered serpentine can be quite fractured and pervious. Therefore, we recommend that the location of the right abutment be carefully studied to avoid possible stability and/or leakage problems. Preliminary locations for Dams #1 and #2 are shown on the plan titled, "Potential Embankment Axis and Source Area for Fill", included as Figure 5. These locations should be further studied during the feasibility investigation to identify any geologic considerations not identified during our surface reconnaissance study.

The secondary geological considerations for the design of the proposed embankments are 1) the existing landslides and potentially unstable areas located around the reservoir area of both proposed alternatives, 2) the potentially pervious nature of the foundation materials below the proposed embankment location and around the reservoir area, and 3) the exact location and recency of fault activity on the nearby northern fault trace.

Several landslide areas were mapped around the reservoir areas as shown on Figure 3. Most of the mapped landslides are located above the proposed pool elevations. However, several areas of potentially unstable soil were mapped below the proposed pool elevation. When these areas are saturated, it is likely that some failures will occur. Therefore, removal and/or buttressing of these materials may be required. In addition, some periodic maintenance of the slopes around the reservoirs should be anticipated.

Several springs were also mapped within the area of the proposed reservoirs as shown on Figure 3. These springs indicate that the bedrock units are fractured and sufficiently pervious to transmit significant quantities of water. Even though these springs are above the proposed pool elevation, additional study of these areas will be required.

Another area of particular concern are the springs located on the northeast facing slopes north of the proposed reservoir of Dam #2. The permeability of the bedrock materials in this area should be thoroughly investigated during the future investigations for the project to evaluate the possibility of significant reservoir leakage in the area.

The alluvial materials below the proposed embankment locations are probably less than 30 feet thick. Therefore, the construction of a relatively shallow cut-off trench extended into bedrock would minimize seepage below the dams. However, as previously discussed, the right abutment of Dam #1 will be founded within or close to a serpentine intrusion which is in ancient fault contact with the greenstone and sandstone bedrock. We recommend that the permeability of this area be thoroughly investigated during the future studies to identify potential seepage problems.

No site specific information is available for the northern fault trace extension near the proposed dam sites. Due to its proximity to the proposed dams, further specific investigation needs to be performed to exactly locate the trace and determine its recency of activity.

CONSTRUCTION CONSIDERATIONS

Based on previous work in the site vicinity, the alluvial materials located upslope from the proposed embankment locations and within the main valley area will probably be suitable for constructing impervious sections of the proposed embankment. In addition, the weathered bedrock materials located close to the surface on the lower slopes and outcropping the main valley area would be suitable for construction of the outer sections of the proposed embankment. It should be noted, however, that we did not evaluate any specific source areas and our evaluation is based on a review of the previous work performed at the site by others.

We understand that construction of the dams will require a total of approximately 1.5 million cubic yards of material. The potential source areas for alluvial material are shown on Figure 5. The volume of alluvial material available upslope from the proposed dam locations is minimal. However, the previous work by others estimates that approximately 8,000,000 cubic yards of material is available within the main valley area. The alluvial source within the main valley, identified on Figure 5, encompasses an area of approximately 380 acres. Based on our calculations we estimate that approximately 5 to 10 million cubic yards of alluvial soils are located on the property. To obtain 1.5 million cubic yards of material from the main valley area will require excavations on the order of 2 to 3 feet deep over the entire valley floor area. In addition, the narrow ridge located within the reservoir area of Dam #2 could provide a source for pervious embankment fill. Removing this ridge would also increase the storage capacity of the reservoir. We estimate that the ridge includes approximately 75,000 to 150,000 cubic yards of material. Additional pervious material could be obtained from any of the slope areas throughout the property underlain by bedrock materials. It should be noted, however, that excessive trimming of the slopes could cause slope instability.

Ground water within the main valley area has been measured at depths of 13 to 20 feet. Therefore, if localized quarrying of the alluvial material to a depth of greater than 11 to 12 feet is performed, ground water and saturated subgrade conditions could be encountered. If saturated subgrade conditions are encountered excavations using conventional earthmoving equipment could become difficult.

FUTURE STUDIES

This report and attached figures have been prepared to assess the major geological features at the site and their general impact on the proposed dams and reservoirs. A more detailed investigation should be performed to evaluate the feasibility of the chosen site or sites. The future studies may involve but would not be necessarily limited to:

1. Coordination with the California Division of Dam Safety to satisfy their criteria for dam feasibility investigations.

2. Detailed mapping of the proposed embankment and reservoir area(s).

3. Subsurface exploration including exploratory borings, backhoe test pits, trenches, and seismic refraction lines to evaluate the subsurface conditions below the proposed embankments, in the vicinity of the mapped northern fault, and in the proposed source areas.

4. In-situ permeability tests to evaluate the permeability of the foundation and abutment materials.

5. Laboratory testing of the samples obtained from the field investigation including classification, strength, gradation, permeability, compaction and index property tests.

6. Geotechnical engineering analysis of the field and laboratory data to evaluate the feasibility of the site for the proposed dam. Our geotechnical analysis would include preliminary design calculations involving both static and dynamic stability analyses.

7. Fault rupture hazard evaluation of the northern fault trace due to the proximity of the fault to the proposed embankments.

8. Preparation of a feasibility report discussing the results of our study and providing preliminary design recommendations for the proposed dams.

* * * * * * * * * * * * * * * *

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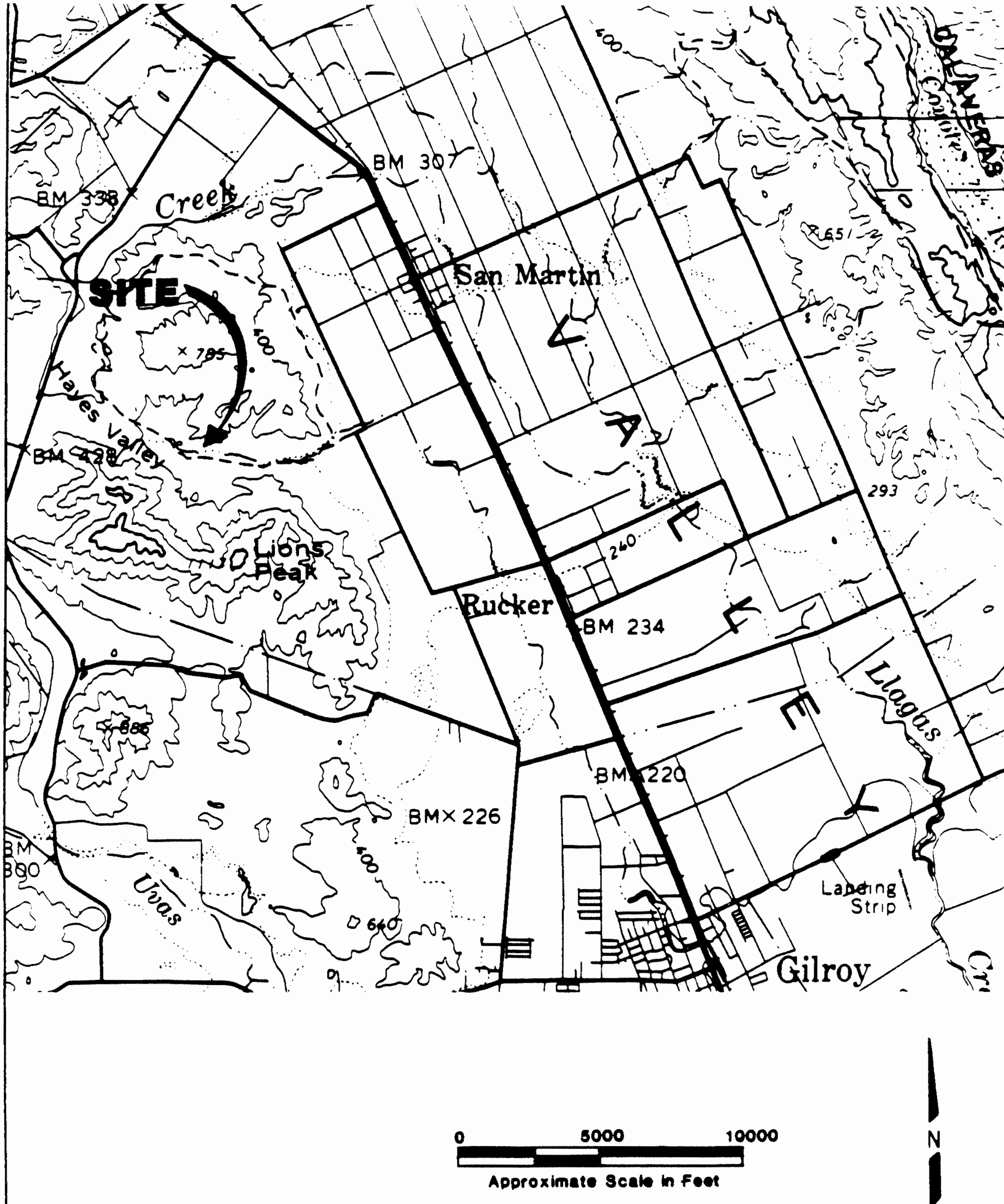

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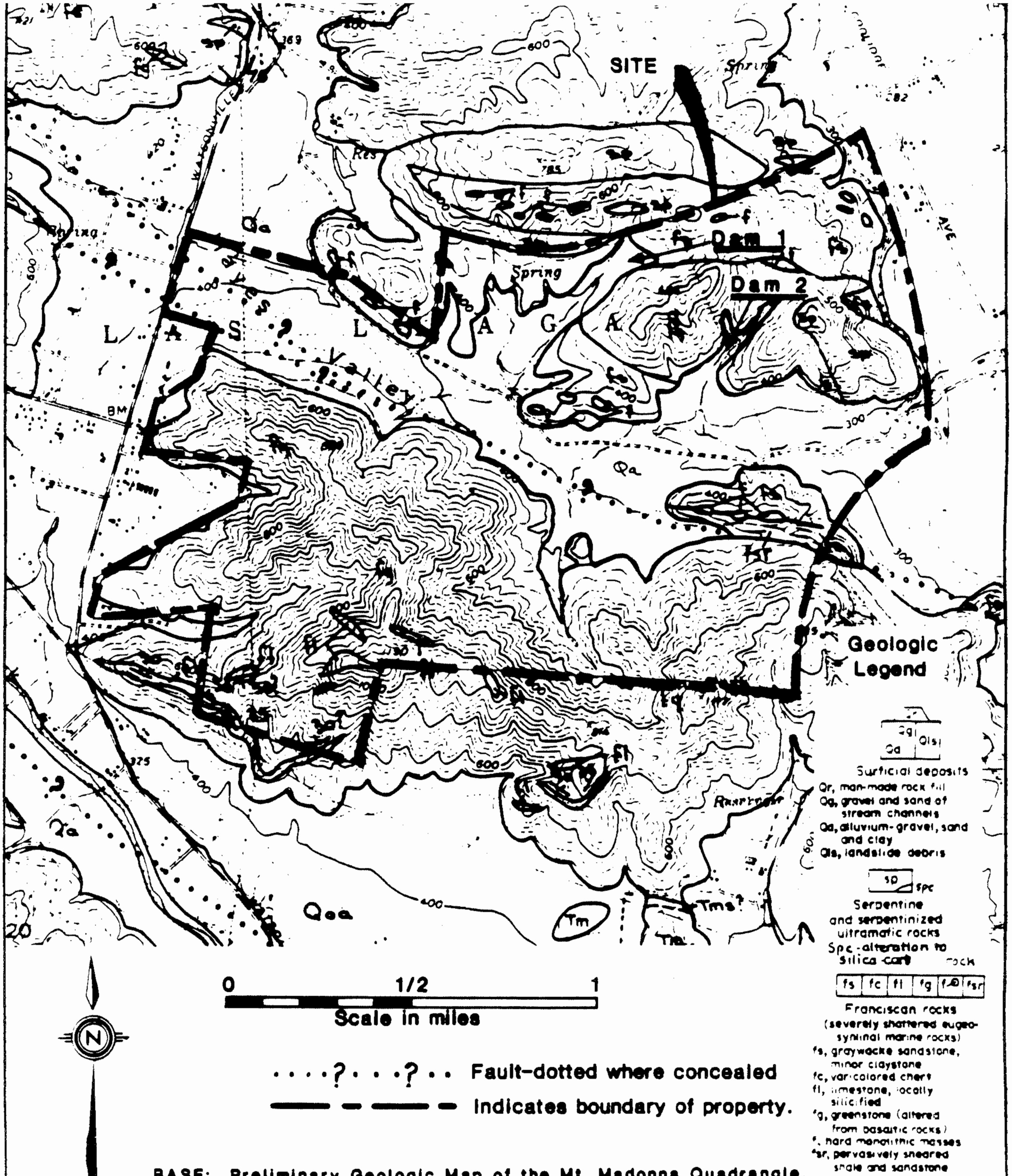
SITE VICINITY MAP		
HAYES VALLEY DAM Santa Clara County, California		
PROJECT NO.	DATE	Figure 1
K1076-2A	August 1989	



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Kaldveer Associates
Geoscience Consultants
A California Corporation

REGIONAL GEOLOGY MAP

HAYES VALLEY DAM
Santa Clara County, California

PROJECT NO.	DATE	
K1076-2A	August 1989	Figure 2

NOTE

Oversized Sheets Have Not Been Included

ROCK CHARACTERISTICS CHART

Bedding of Sedimentary rocks

Stratification	Thickness of Beds
Massive	No apparent bedding
Very thick bedded	Greater than 4 feet
Thick bedded	2 feet to 4 feet
Thin bedded	2 inches to 2 feet
Very thin bedded	1/2 inch to 2 inches
Laminated	1/8 inch to 1/2 inch
Thinly laminated	Less than 1/8 inch

Fracturing

Intensity	Size of Pieces
Little	Greater than 4 feet
Occasional	1 foot to 4 feet
Moderate	6 inches to 1 foot
Close	1 inch to 6 inches
Intense	1/2 inch to 1 inch
Crushed	Less than 1/2 inch

Strength

Soft - Plastic or very low strength

Friable - Crumbles easily by hand

Low Hardness - Crumbles under light hammer blows

Moderate Hardness - Crumbles under a few heavy hammer blows

Hard - Breaks into large pieces under heavy, ringing hammer blows

Very Hard - Resists heavy, ringing hammer blows and will yield with difficulty only dust and small flying fragments

Weathering

Deep - Moderate to complete mineral decomposition; extensive disintegration; deep and thorough discoloration; many extensively-coated fractures.

Moderate - Slight decomposition of minerals; little disintegration; moderate discoloration; moderately-coated fractures.

Little - No megascopic decomposition of minerals; slight to no effect on cementation; slight and intermittent, or localized discoloration; few stains on fracture surfaces.

Fresh - Unaffected by weathering agents; no disintegration or discoloration; fractures usually less numerous than joints.

Kaldveer Associates
Geoscience Consultants
A California Corporation

ROCK CHARACTERISTICS CHART

HAYES VALLEY DAM
Santa Clara County, California

PROJECT NO.	DATE	Figure
K1076-2A	August 1989	4

ENGEO
INCORPORATED

GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS

In Reply
Please Refer to:
3224-W3

April 13, 1993

Lion's Gate Development Partners
1400 Fashion Island Boulevard, Suite 1000
San Mateo, CA 94404

DRAFT

Attention: Mr. Thomas Hix

Subject: Lion's Gate Property
Hayes Valley
Santa Clara County, California

GEOLOGIC INPUT TO EIR

Gentlemen:

At your request, ENGEO Incorporated provides with this report geologic input for use in preparing the Environmental Impact Report for the proposed development of the Lion's Gate property located in Hayes Valley, Santa Clara County, California.

The accompanying report presents the results of our studies and provides an assessment of potential geologic and geotechnical hazards affecting the site and mitigation measures, if required.

We appreciate the opportunity to perform this investigation and will be pleased to meet with you at your convenience to further discuss it. If you have any questions, please feel free to call us.

Very truly yours,

ENGEO INCORPORATED

Reviewed by:

Steven F. Connelly
Senior Geologist

William B. Wigginton
Chief Geologist

cc: 1 - Addressee
1 - Nolte and Associates, Inc.

GEOLOGIC INPUT FOR EIR

FOR THE

LION'S GATE PROPERTY

SANTA CLARA COUNTY, CALIFORNIA

SUBMITTED

TO

LION'S GATE DEVELOPMENT PARTNERS

SAN MATEO, CALIFORNIA

PREPARED

BY

ENGEO INCORPORATED

PROJECT 3224-W3

APRIL 13, 1993

TABLE OF CONTENTS

Letter of Transmittal

Purpose and Scope

This study was undertaken to identify existing geologic conditions and potential geologic and geotechnical hazards affecting the Lion's Gate property located in Hayes Valley in southern Santa Clara County, California.

This study is based upon the review of existing published geologic, soils, landslide, and fault maps and unpublished site investigations cited in the text and in the list of references. The information gathered is intended for use in preparing the Environmental Impact Report for the site.

This report was prepared for the exclusive use of the Lion's Gate Development Partners and their consultants. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without the express written consent of ENGEO Incorporated.

Site Location and Description

The Lion's Gate property is located within Hayes Valley in southern Santa Clara County, California about 5 miles south of Morgan Hill as shown on Figure 1, Site Location Map.

Hayes Valley is a generally east-west trending valley, flanked to the north and south by moderately steep hills reaching elevations over 1,100. The valley ranges in elevation from about 400 to 300 feet and generally drains towards the east. A northwest flowing drainage, however, issues from a topographic high near the western margin of the Lion's Gate property. Stream flow and spring activity have been observed on the site even during summer months of drought years.

A dirt ranch road traverses the valley from east to west. Residences and several farm buildings are located at the eastern end of the valley. The property is vegetated by cultivated grass and hay for cattle grazing and by native brush and scattered oak trees.

Proposed Development

We understand that the proposed development of the Lion's Gate property includes an 18-hole championship golf course, a clubhouse, practice and maintenance facilities, and two cottage complexes. In addition, approximately 68 two-acre parcels and 2 twenty-acre parcels are planned for residential use. Preliminary development plans prepared by Robert Trent Jones II, dated June 16, 1992, have been reviewed as part of this study.

Regional Geology

The Lion's Gate property is located within the Coast Ranges of California, a geomorphic province composed of northwest-trending mountain ranges and intervening valleys which extend from southern California to beyond the Oregon border. The site is located in the eastern foothills of the Santa Cruz Mountains within the Coast Ranges.

Site Geology

Bedrock underlying the project site consists of Franciscan rocks (Dibblee, 1973), an assemblage of metasedimentary rocks composed of greenstone, limestone, sandstone, and chert. The metasediments are typically hard, sheared, and fractured and, in places, have been intruded by serpentine.

According to site specific geologic mapping by Kaldveer Associates (1989), the hills bordering the south side of Hayes Valley are predominantly composed of greenstone and the hills to the north are composed of greenstone, serpentine, sandstone, and minor limestone (see Figure 2).

Site Soils

Alluvial deposits fill Hayes Valley and the minor drainages along the flanks of the valley. Alluvial deposits are derived from the erosion of Franciscan bedrock materials which form the surrounding hillsides. According to Helley and Brabb (1971) these sediments are older alluvial fan deposits of Pleistocene age. The soils are composed of stiff to hard sandy clay, gravelly clay, and clayey gravel and range in depth from 40 to 95 feet (Wahler Associates, 1973).

Unconsolidated residual soil and colluvial soil mantles the ridges and hillsides of the site and interfingers downslope with alluvium located in the valley bottoms.

According to the Soil Conservation Service (USDA, 1974), permeability rates for soils on the site are typically moderately slow to slow and leachfield limitations are severe. ENGEO (1991) performed several percolation tests within valley soils which indicate that soils have passing percolation rates, however, shallow groundwater conditions may tend to limit the use of leachfields.

Landslides

Landslide deposits have been mapped on the Lion's Gate property by Kaldveer Associates (1989) and by Wahler Associates (1990) as shown on Figure 2. Wahler Associates (1989) describes one mudflow deposit near the southeast corner of the property (see Figure 2) which apparently failed as a result of the heavy rainfall occurring during the 1982 winter. According to Kaldveer Associates, landslides primarily involve soils and deeply weathered bedrock.

In a regional study of the southern Santa Clara County, Williams et al (1973) suggests that landslides associated with relatively undisturbed greenstone units of the Franciscan generally involve soils and not the underlying bedrock. Landslides within the highly disturbed melange units, however, may involve deeper bedrock materials.

The San Francisco Bay Region is recognized by geologists and seismologists as one of the most active seismic regions in the United States (see Figure 3). Earthquakes occurring in the region are commonly associated with the San Andreas, Hayward, and Calaveras faults. The San Andreas fault is located approximately 7 miles to the southwest of the Lion's Gate property. The Calaveras and Hayward faults are located about 6 miles and 7 miles northeast of the site, respectively.

The closest known active fault to the site is the Sargent fault located about 5 miles to the southwest. The Sargent fault has an estimated maximum credible earthquake of M7.0[1] and an estimated maximum probable earthquake of M6.4. According to EQFAULT, a deterministic computer program developed by Blake (1985), a maximum credible site acceleration of 0.48g and a maximum probable site acceleration of 0.43g are associated with the Sargent fault (see Table I).

The historical records indicate that the strongest recorded earthquake in the Bay Region was the 1906 event on the San Andreas fault, with an estimated Richter magnitude of 8.3 (see Figure 3). Other earthquakes associated with the San Andreas fault include an estimated Richter magnitude 7.0 event in 1838 and the 7.1 Loma Prieta Earthquake of 1989. An earthquake of estimated Richter magnitude 7.0 occurred on the Calaveras fault in 1861.

An approximately located and inferred east-west trending fault trace has been mapped generally through the center of Hayes Valley by Dibblee (1973) as shown on Figure 2. Kaldveer Associates (1989) and Wahler Associates (1990) have mapped additional east-west trending fault splays both to the north and south of the main trace as shown on Figure 2. These faults are not considered potentially active by the State of California (Jennings, 1992).

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[1]All earthquake magnitudes are given as Richter magnitude.

Based upon several seismic refraction lines and limited trenching of the main fault trace on the site, Wahler Associates (1990) conclude that the faults are inactive.

GEOLOGIC AND GEOTECHNICAL HAZARDS AND MITIGATION MEASURES

Earthquake Hazards

1. Surface Rupture

No active or potentially active faults have been identified on the Lion's Gate property. The potential hazard due to primary ground rupture along an active fault is therefore considered to be minimal. Secondary ground rupture or sympathetic movement along one of the inactive faults onsite could conceivably occur as the result of a large earthquake on one of the nearby active faults (ie Sargent or San Andreas faults). It should be noted that onsite faults are likely old bedrock faults since they have not been identified in subsurface investigations within alluvial sediments in Hayes Valley. In the event of a large nearby earthquake, sympathetic movement within bedrock materials at depth might not be transferred through the overlying sediments to break the ground surface.

Potential Impact: The hazard from primary surface rupture is negligible. Ground displacements resulting from sympathetic fault movement are possible but would likely be small, on the order of two inches or less. Minor damage to structures and lifelines crossing onsite fault traces as a result of secondary ground displacement is possible.

Risk of Occurrence: Low.

Possible Mitigation: Conduct further fault investigations to locate minor bedrock fault traces and confirm that faults do not offset alluvial soils.

2. Ground Shaking

Major earthquakes occurring along one of the active or potentially active faults in the Bay Region could cause severe ground shaking within the Lion's Gate property.

Potential Impact: As experienced in the Bay Region during the recent Loma Prieta Earthquake, ground shaking will cause dynamic loading of buildings and structures constructed for the proposed development. Structures designed according to the current Uniform Building Code should respond well except during the most severe potential ground shaking.

Risk of Occurrence: High. A major earthquake along one of the active or potentially active faults in the Bay Region is likely to occur during the design life of the proposed development.

Mitigation: Structures should be designed and constructed according to Uniform Building Code requirements.

3. Liquefaction

Alluvial soils within Hayes Valley are typically cohesive and dense. Liquefaction is, therefore, unlikely to occur on site.

4. Lateral Spreading

Since alluvial soils are cohesive and dense, lateral spreading is unlikely to occur onsite. Building setbacks from stream banks, however, are recommended to mitigate possible lateral spreading.

5. Settlement

Since site soils are dense and moderately consolidated, settlement as a result of seismic shaking is not anticipated.

6. Tsunamis, Seiches, and Flooding

Since no large reservoirs or lakes are located nearby or upslope from the subject site, tsunamis, seiches, and flooding in response to seismic shaking are not anticipated.

Mineral Resources

There are no known economic mineral resources located within the subject site (Stinson et al, 1983).

Waste Disposal Considerations

1. Leachfields

Shallow ground-water conditions limit the use of leachfields in the low-lying valley areas of the subject site (ENGEO, 1991). Additional percolation testing of hillside soils is necessary to determine suitability for leachfields.

2. Asbestos

Release of asbestos fibers into the air is possible if excavation of serpentine bedrock materials is planned within the hillside areas of the site. Serpentinite contains chrysotile, a source for asbestos considered a potential health hazard.

Potential Impact: Asbestos fibers may be released into the air with grading of serpentine bedrock areas.

Risk of Occurrence: High. Asbestos contents of from 1 to 5% have been measured in rock samples in southern Santa Clara County (ENGEO 1988, Terratech Inc., 1990).

Mitigation: Excavation of serpentine bedrock areas should be monitored by an Engineering Geologist. Soil and bedrock samples should be collected and tested during grading to determine if chrysotile asbestos is present. If chrysotile asbestos is present, water and dust palliatives should be applied frequently during grading to excavation surfaces and haul loads to reduce dust emissions. Asbestos bearing materials exposed in cut slopes should be sealed with gunite or covered by a minimum of 12 inches of serpentine-free fill. Asbestos bearing materials to be used as fill should be covered by a minimum of 12 inches of serpentine-free fill.

Slope Stability

The subject site is relatively free of landslide hazards. Several landslides have been mapped onsite as shown on Figure 2. We understand that most of the proposed structures will be located on the flat valley floor. However, two residences are planned for the hillside area north of Hayes Valley and the proposed golf course will extend upslope into hillside areas.

Potential Impact: Landslides are potentially unstable and could damage proposed structures or could pose periodic maintenance problems.

Risk of Occurrence: Moderate. Existing landslides could be reactivated by rainfall or seismic shaking, or could be destabilized by proposed grading and irrigation schemes. New landslides could also occur.

Mitigation: Site specific geotechnical investigations should be completed for structures to be located in hillside terrain. Landslide hazards should be identified based upon further air photo review and subsurface investigation. Proposed structures should avoid existing landslides or should be located with appropriate building setbacks. If landslides are to be located on or near landslides, landslides should be properly stabilized with retaining walls or unstable slopes should be reconstructed as engineered fill.

Erosion, Sedimentation and Flooding

Increased erosion and sedimentation could occur as a result of proposed grading. Installation of surface and or subsurface drains and seeding of graded slopes with erosion-resistant vegetation should limit erosion and sedimentation problems.

The flood hazard for Hayes Valley is low since it is located well above the 100-year flood zone according to Limerinos et al (1973).

Subsidence and Settlement

Land subsidence or settlement can occur as a result of ground-water withdrawal and lowering of the water table in poorly consolidated alluvial sediments. Since sediments underlying Hayes Valley are moderately to well consolidated, minimal subsidence or settlement is anticipated.

Volcanic Hazards

Hayes Valley is not located near an area of known active volcanism.

Groundwater Considerations

Shallow ground water occurs within Hayes Valley and several active springs have been identified in the surrounding hillsides. Installation of water wells, irrigation, grading, and construction will influence ground-water conditions and spring activity on the site.

Potential Impact: Drawdown of the water table is likely with pumping of water wells to be installed for the proposed development. Existing springs tend to destabilize soils and contribute to landsliding.

Risk of Occurrence: Moderate.

Mitigation: Drawdown of the water table may be controlled be planned irrigation or the golf course and by recharge from golf course ponds. To reduce landslide danger, spring activity should be controlled by subdrainage in development areas or in open space areas immediately upslope of development areas.

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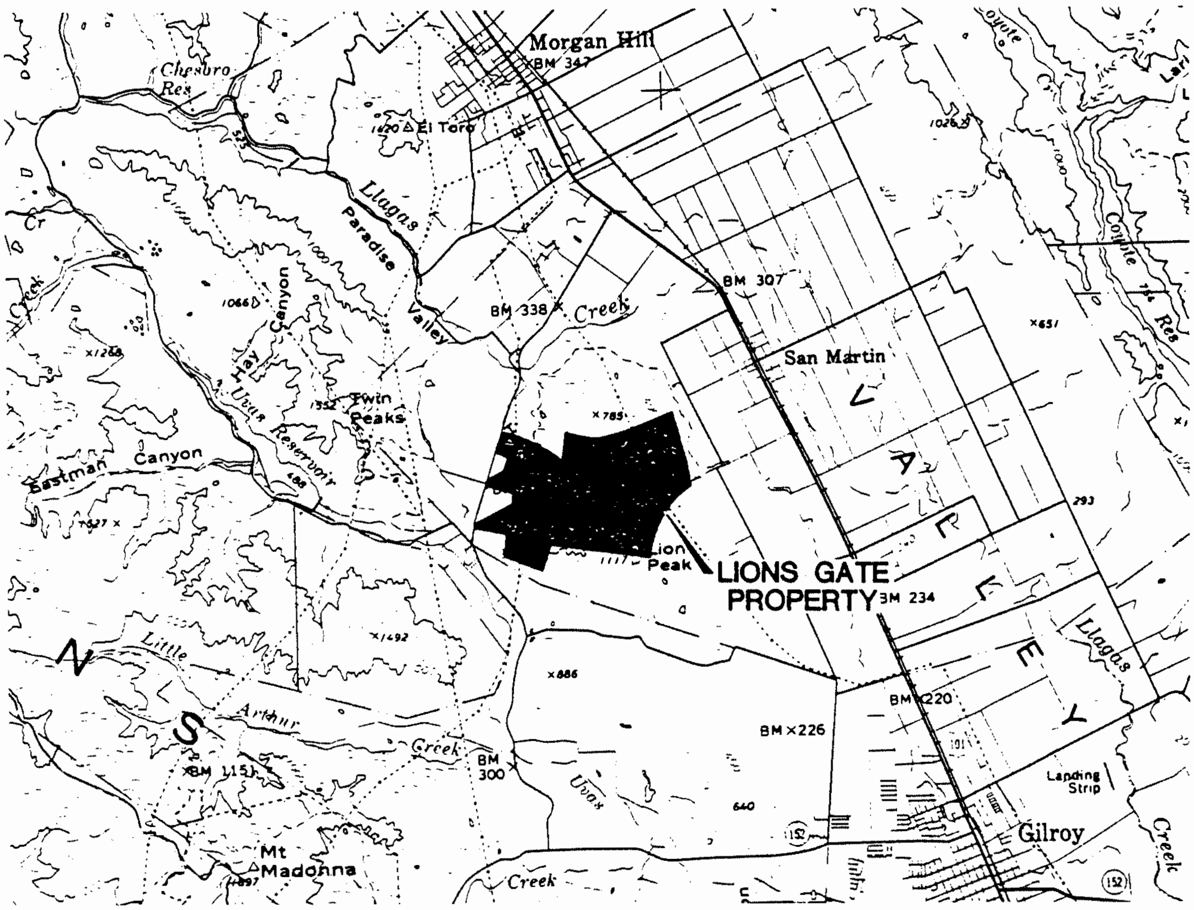
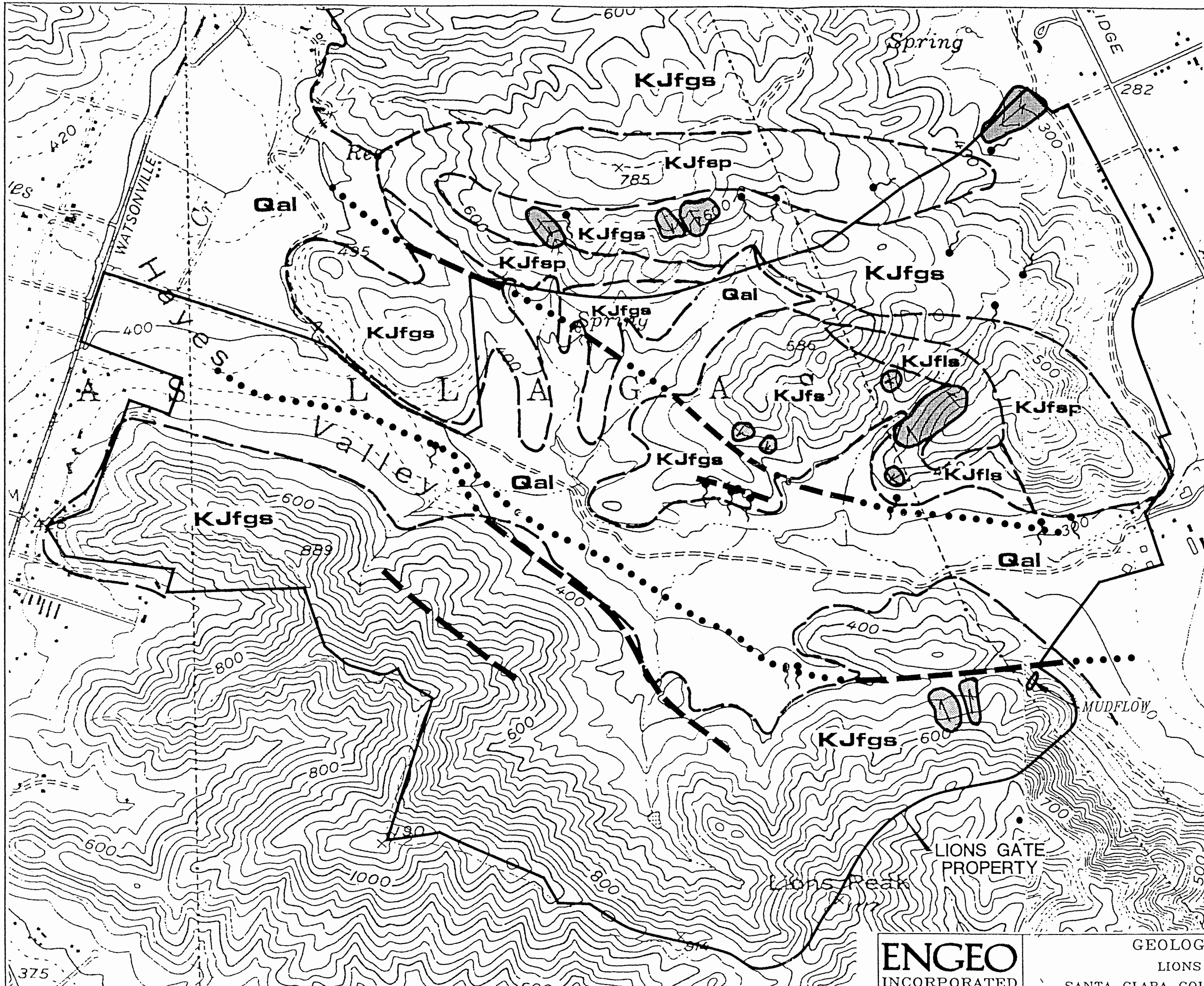
APPENDIX



ENGEO INCORPORATED	SITE LOCATION MAP LIONS GATE SANTA CLARA COUNTY, CALIFORNIA	JOB NO.: 3224-W3 DATE: APRIL 1993 DRAWN BY: DB CHECKED BY:	FIGURE NO. 1



EXPLANATION

Qal	ALLUVIUM
Qls	LANDSLIDE
KJfgs	GREENSTONE
KJfsp	SERPENTINE
KJfls	LIMESTONE
KJfs	SANDSTONE

FRANCISCAN COMPLEX

FAULT; APPROXIMATE WHERE DASHED, INFERRED WHERE DOTTED

GEOLOGIC CONTACT, APPROXIMATE

SPRING

N

0 1000
FEET

COMPILED FROM:
DIBBLEE 1973
KALDVEER ASSOC. 1989
WAHLER ASSOC. 1990

ENGEO
INCORPORATED

GEOLOGIC MAP
LIONS GATE
SANTA CLARA COUNTY, CALIFORNIA

JOB NO.: 3224-W3
DATE: APRIL 1993
DRAWN BY: DB
CHECKED BY:

FIGURE NO. 2

Environmental Management Plan

Lion's Gate Golf Course
Santa Clara County
Morgan Hill, California

Prepared for:

Hayes Valley Development Partners
405 El Camino Real, Suite 127
Menlo Park, CA 94025

Prepared by:

Audubon Conservation Services
PO Box 1226
Cary, NC 27512-1226

November 1995

AUDUBON COOPERATIVE SANCTUARY SYSTEM

Table of Contents

List of Tables

List of Figures

EXECUTIVE SUMMARY

Plans are being developed for the construction of an 18-hole golf course on a site in Hayes Valley, Morgan Hill, Santa Clara County, California. The parcel selected for development is currently used as rangeland for cattle and is bordered by residential areas. In order to provide an effective level of turf maintenance, yet ensure environmental integrity, the site was evaluated and this Environmental Management Plan developed based on site specific conditions. These strategies presented herein are developed from the interrelationship of Best Management Practices (BMPs) and Integrated Pest Management (IPM); and, when conducted in a timely and effective manner, provide maximum turfgrass quality, golf course playability, and environmental protection.

Site evaluation included examining the topography, existing vegetation, soils, water resources and climate. The site is in a valley with rolling to heavily sloped areas, similar to that on which hundreds of other golf courses have been constructed and coexist in complete environmental harmony with the natural conditions. The agronomic programs developed in this report for management of the golf course will provide the necessary margin of safety desired where this project interfaces with environmentally sensitive natural and residential areas.

Golf course design has provided for the storage and/or filtration of surface water runoff from fairways, tees and/or greens prior to discharge to any wetlands. All golf course fairways and roughs have a surface contour which detains surface water drainage within the fairway and/or buffer areas. This approach ensures significant and adequate attenuation of runoff. Additionally, research has shown that turfgrasses are very efficient systems for filtration of nutrients and improving water quality.

Best Management Practices (BMPs) have been incorporated throughout the agronomic programs. These BMPs include items related to drainage and runoff impoundment; identification of critical planting areas and selection of the best adapted species; identification of agronomic practices which will reduce pest problems and conserve resources; and pesticide selection and application methods. Specific recommendations have been made for mowing heights, fertilization programs including application rates and sources of fertilizer carriers, and irrigation system management. This will ensure that nutrients applied to the turf areas will not adversely affect surface and/or ground water quality.

Integrated Pest Management (IPM) has been incorporated into every aspect of The Environmental Management Plan including 1) selection of species and cultivars; 2) use of proven agronomic practices; 3) a sound pesticide management program; and 4) monitoring of turf and environmental conditions. Pesticide use is part of an IPM program. Pesticides have been carefully selected based on chemical characteristics, site conditions and management strategies. Materials were selected that had the lowest leaching and runoff potential from the site, and the lowest toxicity and exposure potential. Pesticide chemical properties included organic carbon partitioning, half-lives and solubility, and application methods. A list of recommended chemicals has been screened by several mathematical models as to their individual potential for environmental impact. Additional evaluation was based on sophisticated computer modeling for potential runoff and leaching and a risk factor determined for specific pesticides based on the screening models. Based on these results, restrictions for use based on specific qualifying situations are proposed for several materials.

Recommendations have been made for continuing site monitoring and consultation to update this plan. This program will provide environmental quality monitoring, assessment and adjustment of golf course management strategies and continuity which meet all environmental protection objectives. Once implemented, the agronomic programs specified in this management plan will make a positive impact on the development and surrounding environment.

INTRODUCTION

Golf has enjoyed a rapid increase in popularity over the past 30 years as golf. According to the National Golf Foundation, in 1960, 2.8 percent of the population participated in golf compared to 9.7 percent in 1988. Currently, approximately 12% of the population enjoys golf as a recreational activity on a regular basis (Beditz, 1994). Coupled with this has been a dramatic increase in the demand for golf courses because people include golf as an activity for their vacation and leisure time.

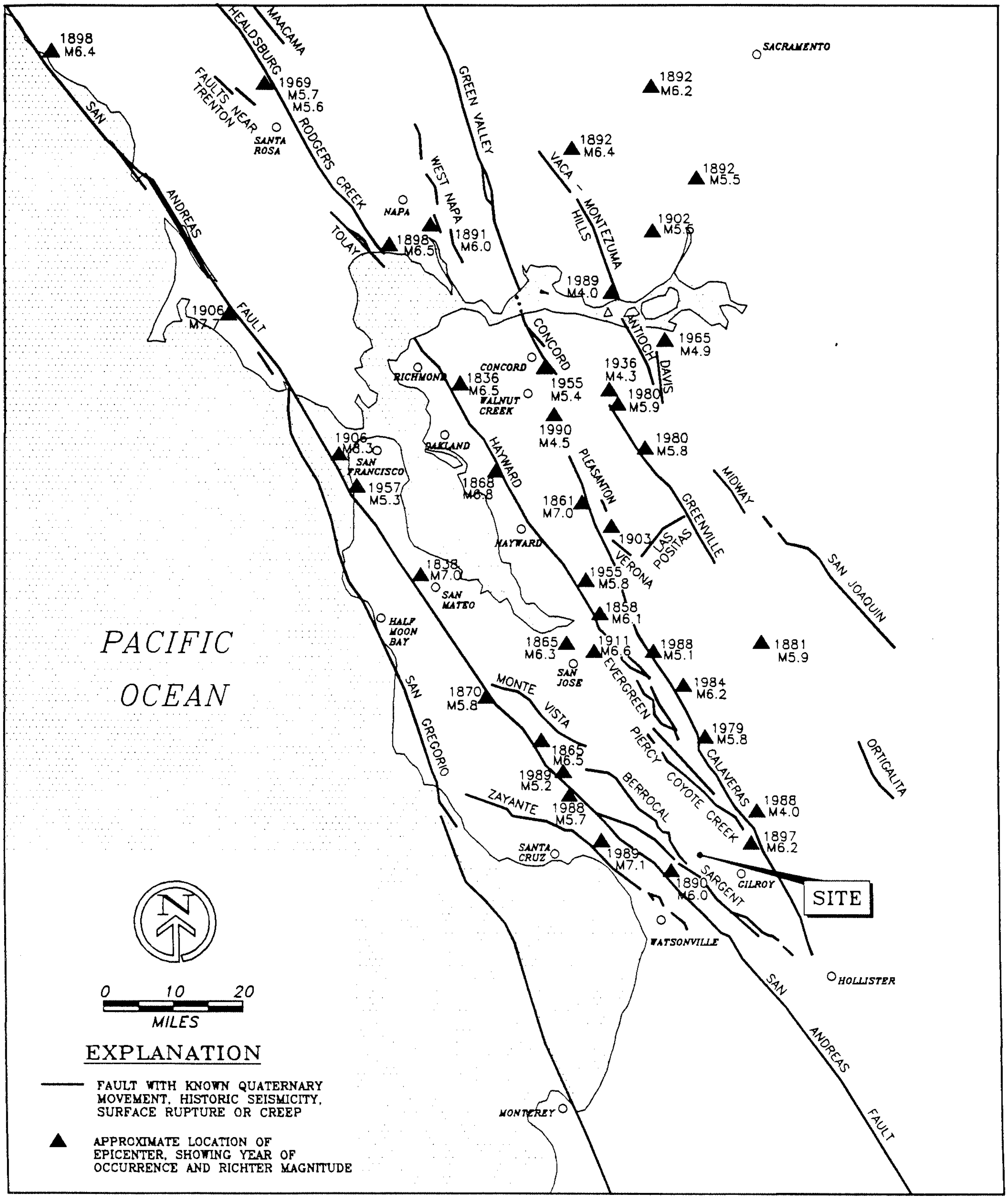
Besides golf courses serving as recreational and aesthetic areas, there is a functional aspect to their development. These broad expanses of open turf are functional in that they provide temperature, humidity and wind modification; soil stabilization and watershed management; and noise modification. They maintain biological diversity of flora and fauna in urban and urban-agricultural fringe areas even under intense cultural programs.

Major concerns have been expressed about golf course management and environmental impact from citizen groups and environmental regulatory agencies. A well maintained golf course does require the use of fertilizers and pesticides as part of the overall cultural program. Many times public concern focuses on the intensity of golf course management compared to other agronomic and horticultural operations. However, management decisions developed and implemented based on Best Management Practices (BMPs) and Integrated Pest Management (IPM) will ensure that any interaction of the golf course with the surrounding environment will be positive.

A well maintained golf course relies on a combination of cultural programs. The primary cultural practices include mowing, fertilization, and irrigation. Secondary cultural practices, no less important, but used less frequently, include cultivation (primarily vertical mowing and core aerification), topdressing and other mechanical practices. Pest management does rely on the use of pesticides, but by using an Integrated Pest Management (IPM) approach pesticide use is on an integrated basis with these other management skills. Erroneously, many people assume that when fertilizers or pesticides are used they either move off-site or downward to the groundwater in response to irrigation or rainfall and create environmental problems. While there is a potential for movement occurring, this possibility can be greatly reduced and virtually eliminated on a well designed golf course design by developing low risk irrigation, fertilizer and pesticide programs and ensuring that these programs are administered on a day-to-day basis by a qualified golf course superintendent and periodically monitored by agronomic consultants with environmental expertise.

There is a concern about golf course operations effects on water quality. This concern is based on protecting surface water from runoff pollution and ground water from leaching of pesticides and excess nutrients. The potential for leaching of fertilizer materials focuses on the amount of leachable materials present, the amount of water moving through the soil, and the management of cultural inputs into the soil-plant-water system. Numerous scientific studies have documented that efficiency in rate and timing of fertilizer and pesticide applications and efficient irrigation management, common Best Management Practices, will substantially eliminate any potential water quality problems.

This management plan has been developed to detail how the golf course design, construction, and most importantly, maintenance would protect environmentally sensitive areas such as wetlands and wildlife habitats and meet public and regulatory agency environmental objectives. By implementing the programs contained in this plan an environmentally sensitive approach to golf course management will be ensured. This plan focuses on the area of the property that will be the golf course as indicated in Figure 1, which is a site plan for the property.



ENGEO INCORPORATED	REGIONAL FAULTING & SEISMICITY LIONS GATE SANTA CLARA COUNTY, CALIFORNIA	JOB NO.: 3224-W3 DATE: APRIL 1993 DRAWN BY: DB CHECKED BY: AC	FIGURE NO. 3

TABLE I

ABBREVIATED FAULT NAME	APPROX. DISTANCE mi (km)	MAX. CREDIBLE EVENT			MAX. PROBABLE EVENT		
		MAX. CRED. MAG.	PEAK SITE ACC. g	SITE INTENS MM	MAX. PROB. MAG.	PEAK SITE ACC. g	SITE INTENS MM
ANTIOCH	59 (95)	6.20	0.019	IV	5.80	0.013	III
CALAVERAS	6 (9)	7.30	0.430	X	7.00	0.380	X
CONCORD	59 (95)	6.50	0.025	V	5.70	0.011	III
CORDELIA	81 (131)	6.75	0.021	IV	3.50	0.001	-
GREEN VALLEY	73 (117)	6.80	0.026	V	6.20	0.014	III
GREENVILLE	18 (28)	6.50	0.125	VII	6.00	0.085	VII
HAYWARD	7 (11)	7.30	0.392	X	7.00	0.343	IX
HEALDSBURG - ROGERS CREEK	86 (139)	6.80	0.020	IV	6.40	0.013	III
HOSGRI	82 (132)	8.00	0.066	VI	7.00	0.026	V
LAS POSITAS	38 (61)	6.50	0.048	VI	4.50	0.007	II
ORTIGALITA	27 (44)	6.75	0.091	VII	4.50	0.013	III
PALO COLORADO-SAN GREGORIO	33 (53)	7.60	0.128	VIII	7.00	0.085	VII
RINCONADA	28 (45)	7.50	0.138	VIII	6.75	0.089	VII
SAN ANDREAS (Creeping)	10 (16)	7.00	0.261	IX	6.00	0.142	VIII
SAN ANDREAS (Northern)	7 (12)	8.50	0.483	X	8.00	0.433	X
SARGENT	5 (8)	7.00	0.410	X	6.40	0.350	IX
WEST NAPA	84 (135)	6.50	0.015	IV	3.00	0.001	-

PRE-PURCHASE SITE ASSESSMENT OF GEOLOGIC HAZARDS, GROUND WATER SUPPLY AND ENVIRONMENTAL/TOXIC CONTAMINATION HAYES VALLEY PROPERTY SANTA CLARA COUNTY, CALIFORNIA

PROJECT 4297

For

LAND USE
Division of Creegan and D'Angelo
6150 Stoneridge Mall Road, Suite 100
Pleasanton, California 94566

By

TERRATECH, INC.
1365 Vander Way
San Jose, California 95112

January 20, 1988

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

PRE-PURCHASE SITE ASSESSMENT OF
GEOLOGIC HAZARDS, GROUND WATER SUPPLY AND
ENVIRONMENTAL/TOXIC CONTAMINATION
HAYES VALLEY PROPERTY
SANTA CLARA COUNTY, CALIFORNIA

INTRODUCTION

This report describes the findings, conclusions, and recommendations from our pre-purchase assessment of the Hayes Valley (Monschke-Hughes) property in Santa Clara County, California (see Figure 1). Included with this report is a site plan showing areas of concern. We understand the conceptual development plan for the property consists of an 18-hole golf course and approximately 800 dwelling units. The purpose of our assessment is to inform the potential buyer about possible geologic hazards, ground water supply deficiencies, and environmental/toxic contamination.

INFORMATION PROVIDED

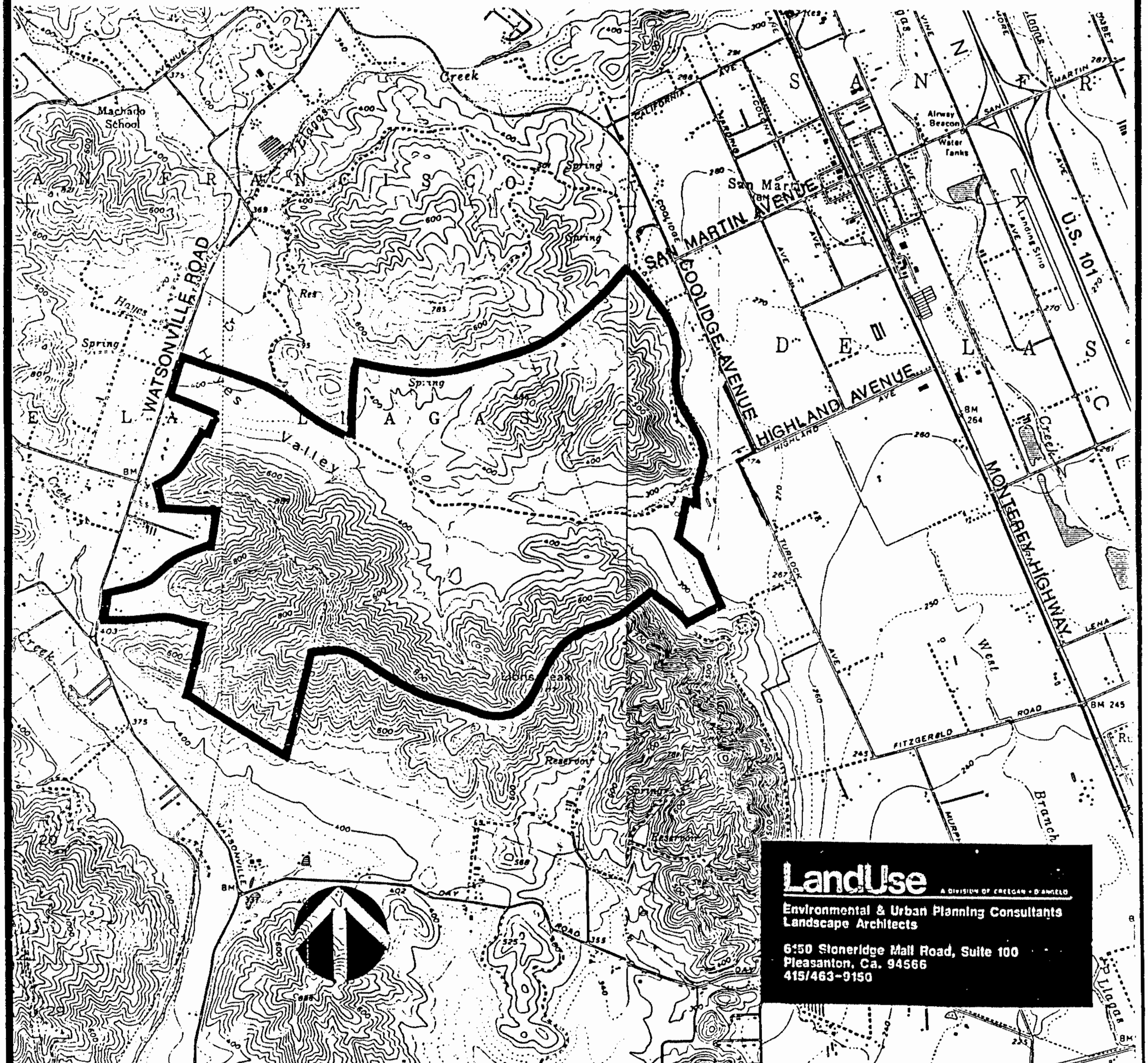
We were provided with the following information for this pre-purchase assessment.

1. Topographic map with slope categories, 1"=200' scale, untitled, prepared by Land Use, dated December 15, 1987.

2. "Preliminary Land Use Plan," 1"=400' scale, prepared by Landmark Land Company of California Inc., undated.

3. "Draft Recreation Master Plan for the proposed Hayes Valley Reservoir," prepared by Theodore Osmundson and Associates for the County of Santa Clara, California, Parks and Recreation Department, April 1974.

4. "The Ranch," Draft Feasibility Study Report, Technical Appendix," prepared by Anthony M. Guzzardo and Associates, Inc., undated.



SCALE: 1"~3000'

JANUARY 1988

TERRATECH

VICINITY MAP
HAYES VALLEY PROPERTY
SANTA CLARA COUNTY, CALIFORNIA

FIGURE
1

PROJECT
4297

WORK PERFORMED

The following is an outline of the work performed.

A) Geologic Hazards Assessment

1) Reviewed on-file geologic literature, consultant reports, and maps pertaining to this area of the County.
2) Examined stereoscopic aerial photographs.
3) Discussed site geology and development concepts with the Santa Clara County Geologist.
4) Made a brief geologic site reconnaissance to observe suspicious features previously identified and to evaluate additional significant features that were readily apparent.

B) Ground Water Supply Assessment

1) Researched and reviewed available hydrogeologic literature, maps and well data for this area of the County.
2) Contacted local water agencies and well drillers to obtain information on the potential availability and quality of ground water.
3) Made a brief site reconnaissance on foot to identify areas of potential well siting.

C) Environmental/Toxic Contamination Assessment

1) Determined the prior uses of the site and immediate surrounding area by locating and examining a chronology of aerial photographs.
2) Reviewed pertinent reports and discreetly contacted public agencies to find out if there are any known contamination problems at the site and its immediate surroundings.
3) Inspected current site conditions to identify suspicious areas (such as chemical storage sheds) and assess their potential for toxic contamination.

D) Presentation of Findings

1) Met with Mr. Donald Beardsley of Land Use to verbally present and discuss the results of our assessment.
2) Prepared a map showing areas of geologic hazards and recommended locations for ground water exploration wells.
3) Prepared this written report.

GEOLOGIC HAZARDS ASSESSMENT

FINDINGS

Site Geology

In general, the hills on the property are underlain by bedrock, and the valley floor is underlain by unconsolidated alluvial sediments. Colluvial soil mantles the lower portions of slopes.

Bedrock Units

Bedrock underlying the ridges on the north side of the valley consists primarily of greenstone and sandstone of the Franciscan Complex of Jurassic to Cretaceous age, with large masses of younger serpentinite (Dibblee, 1973a and 1973b). Much of the bedrock mapped as sandstone is actually melange, a chaotic mixture of sandstone, greenstone, chert, shale, limestone, and other rocks in a sheared matrix (Williams, 1973). The bedrock underlying the ridges on the south side of the valley consists primarily of Franciscan greenstone.

Surficial Units

The alluvium beneath the main valley floor consists of interlayered, poorly sorted gravel, sand, silt, and clay deposited by water. The characteristics of the alluvium is discussed in greater detail in the "Ground Water Supply" section of this report.

Most of the lower slopes and small valleys on the property are blanketed by colluvial soil, a poorly consolidated, organic-rich soil formed by the deep weathering of bedrock. Under the influence of gravity, colluvial soil moves downslope and accumulates at the bases of slopes. Mechanisms for downslope movement include imperceptibly slow soil creep, rapid debris flow, and transport by surface runoff. Colluvial soil may be tens of feet thick on lower hillsides and along narrow valley bottoms.

Isolated deposits of shallow landslides are present within the colluvial soil. These landslides are slumps and earthflows which move relatively slowly. Three areas of abundant landslides are shown on Figure 2, Preliminary Site Assessment Plan, and discussed in the "Geologic Hazards" section of this report. No evidence of deep, bedrock landslides was found during this preliminary assessment of site conditions.

Geologic Structure

The regional geologic structure is characterized by young northwest-trending faults separating rock units of widely varying ages. The primary geologic structure on the property is a northwest-trending fault mapped beneath the southern side of the valley floor. This fault, named "the Hayes Valley fault" in at least two unpublished reports (Terrasearch, Inc., 1979a and 1979b), is interpreted to be an extension of the Ben Trovato fault zone (Bailey and Everhart, 1964; California Division of Water Resources, 1971; Dibblee, 1973b; Williams, 1973; Rogers and Williams, 1974).

In the vicinity of the property the fault has been mapped as displacing bedrock of the Franciscan Complex and as being concealed by alluvial deposits. The California Division of Water Resources (1971) reports that analysis of well logs suggests the fault extends southeastward across the southern part of the Santa Clara Valley and acts as a ground water barrier. Well log data indicate alluvium above a depth of 165 feet has not been greatly affected by movement along the fault (California Division of Water Resources, 1971).

Although the fault has not been zoned as being active or potentially active by the California Division of Mines and Geology (CDMG) under the Alquist-Priolo Special Studies Zones Act (CDMG, 1976 and 1982), we observed two short photolineaments on the floor of Hayes Valley. The presence of these photolineaments suggests the fault may have been active more recently than previously recognized. This fault and another approximately parallel fault on the north side of the valley were investigated in 1973 as part of an evaluation of the feasibility of constructing a water reservoir in Hayes Valley (W.A. Wahler & Associates, 1973). The report of that investigation concluded both faults are inactive. The activity of these faults will be discussed further in the "Geologic Hazards" section of this report.

Other faults have been mapped on and adjacent to the property as displacing Franciscan bedrock and separating Franciscan bedrock from serpentinite (Williams, 1973; W.A. Wahler & Associates, 1973; Rogers and Williams, 1974; Terratech, 1977b). Widespread faulting is common in bedrock of the Franciscan Complex and is interpreted as the result of ancient, inactive deformation.

Ground Water

Ground water is present primarily in the alluvium and will be discussed in the "Ground Water Supply" section of this report.

Seismic Setting

The active San Andreas fault is located 8 miles southwest of the site, and the active Calaveras fault is located 6 miles northeast of the site. Both of these faults have produced damaging earthquakes in the historic past. The Sargent-Berrocal fault, which is located 4 miles southwest, and the Coyote Creek fault, which is located 5 miles northeast, are both considered by some geologists to be active (Hay and others, 1980; City of San Jose, 1983).

Geologic Hazards

Our Preliminary Site Assessment Plan (Figure 2), shows the locations of areas of the property judged to be potentially susceptible to specific geologic hazards. Each potential hazard is categorized by degree of hazard - high, moderate, and low - depending on (1) the intensity of further investigation required to assess the affect of each potential hazard on the proposed residential development and (2) our interpretation of the likelihood that areas suitable for residential development can be identified through further investigation. The hazard ratings can be revised after a complete geologic investigation is performed.

Earthquake Hazards

Fault Rupture -- The two faults investigated previously (W.A. Wahler & Associates, 1973) present the only known potential for surface fault rupture on the property. Both faults were judged to be inactive, but photolineaments in alluvium on the valley floor suggest the faults may be active. The photolineaments are visible on aerial photographs taken in 1974 and 1986, along segments of the faults not investigated in 1973.

On Figure 2, zones along both faults are shown as areas of "high" hazard because (1) intense geologic investigation will be required to determine the locations of the faults and their degree of activity, and (2) no structures for human occupancy should be built across active or potentially active faults.

If the faults are found to displace alluvium on the property, it may be possible to determine their recency of activity by dating any overlying, undisplaced alluvial layers. If the faults are found to be active or potentially active, the fault traces can be located more precisely, and building exclusion zones can be established along them. Any recommended building exclusion zones are likely to be much narrower than the zones shown on Figure 2. Landscape areas along streets, and golf course fairways, are appropriate uses for zones along active faults.

Ground Shaking -- The intensity of ground shaking depends on factors such as earthquake magnitude, distance to the causative fault, depth to bedrock, physical characteristics of underlying soil and bedrock, and local topography. As in much of the San Francisco Bay area, maximum bedrock accelerations for the Hayes Valley property are expected to exceed 0.5g, half the acceleration of gravity (Greensfelder, 1974), for maximum credible earthquakes on the major active faults in the region. Earthquake hazards produced by ground shaking include damage to structures, and secondary ground failures such as landsliding, ground settlement, lateral spreading, and failures of stream banks.

On the Hayes Valley property, potentially liquefiable soils are the only ground-shaking hazard judged to require further investigation. Liquefaction occurs when ground shaking disturbs the structure of a loose, water-saturated, granular soil. Potential surface effects of liquefaction include sand boils (small, ephemeral springs that discharge water and sand at the ground surface), sudden differential settlements, and lateral spreading of the ground toward open faces such as stream banks.

On Figure 2, the entire floor of Hayes Valley is shown as being underlain by potentially liquefiable soils. This is judged to be an area of "low" hazard because (1) only standard geotechnical investigation techniques are expected to be necessary to evaluate the potential liquefaction hazard on the property and (2) it is likely that geotechnical investigation will reveal that only small areas of the valley floor are underlain by potentially liquefiable soils.

Landslides

As described previously, isolated shallow landslides are present in colluvial soil at scattered locations on the property. Because such landslides can be easily removed or stabilized during site grading, they are not shown on the Preliminary Site Assessment Plan (Figure 2). Three areas of abundant landslides, however, are present on the eastern part of the property. All of the landslides appear to be relatively shallow and to involve only soil. Two areas in the southeastern part of the property contain active landslides.

The three areas of abundant landslides are shown as areas of "moderate" hazard on Figure 2. Special landslide investigations will be required in these areas to determine the effects of landsliding on proposed development. All of the landslides may be suitable for stabilization through special engineering design.

Debris Flows

Since the unusually wet winter of 1982-1983, debris flows have been recognized as significant potential hazards on and below many slopes in the San Francisco Bay area. Debris flows are shallow, rapid, muddy landslides that occur with little or no warning during or within several hours after high-intensity rainstorms. Debris flows often originate in natural soil near the tops of, or along the flanks of, steep, narrow drainages or in fill on steep slopes. Unlike slow-moving landslides, which usually affect only the area immediately surrounding the ground failure, debris flows often travel hundreds of feet and impact areas well below the unstable hillsides on which they originate.

Many steep, narrow drainages are present on the Hayes Valley property. Hollowed-out areas at the heads of the drainages are interpreted as source areas of past debris flows, and colluvial fans at the mouths of the drainages are interpreted as the deposits of repeated debris flows. No evidence of recent debris flows, less than about 5 years old, was observed on the property, but several fresh debris flow scars are visible on the south-facing slope just outside the north-central part of the property.

In the southwestern portion of the property, steep, narrow drainages on the property present a potential hazard to adjacent properties. At present, two houses and a campground appear to be in or adjacent to the depositional areas of debris flows that could originate on the Hayes Valley property. Other potentially developable sites outside the property are located below potentially hazardous drainages on the property.

On Figure 2, potential debris flow hazard areas comprise the source area, torrent track, and approximate depositional area for each steep, narrow drainage. These are shown as areas of "high" hazard because debris flows can be extremely destructive. Further investigation may reveal that some of the drainages contain no accumulations of potentially unstable soil in their upper reaches and that little hazard is present in those drainages. Where a hazard is present, accumulations of soil can be removed from potential source areas, or debris channelling and containment facilities can be constructed at the mouths of the drainages.

Expansive Soils

Expansive soils contain high proportions of clays that have the capacity to absorb and release large amounts of water. During the rainy season, the soils swell as water is absorbed, and during the dry season they shrink as water is removed by evapotranspiration.

During our field reconnaissance we observed two large areas of dark brown to black, plastic clay with shrinkage cracks. This soil is likely to be highly expansive. Other areas of expansive soil may also be present on the property.

On Figure 2, the two conspicuous areas of potentially highly expansive soil are shown as areas of "low" hazard. Only standard geotechnical investigation will be required to assess the expansion characteristics of the soil, and the presence of expansive soil on relatively level ground or gentle slopes normally does not require modification of development plans. Nevertheless, special attention will be required during design and construction of structures and paving on expansive soils. Construction on expansive soils normally is more expensive than on non-expansive soils. For golf course planning it should be recognized that expansive soil is a poor growth medium for grass but a good base for water hazards.

Special Considerations

Serpentinite

A large area of the hills in the northeastern part of the property is underlain by serpentinite bedrock (see Figure 2). Most serpentinite in the region contains tiny veins of chrysotile, an asbestos mineral. Although the percentage of asbestos in local serpentinite usually is quite low, several recent construction projects in Santa Clara County have been delayed to permit evaluation of the health hazard of airborne asbestos during grading. Unless the asbestos content is unusually high, grading of the serpentinite should not involve any extraordinary measures to meet air quality standards.

CONCLUSIONS

1) From a geologic standpoint, the Hayes Valley property is generally suitable for the proposed low- and medium-density residential and golf course development.

2) Two faults mapped along the floor of Hayes Valley coincide with photolineaments that suggest the faults may be active or potentially active. Zones of "high" hazard for residential development along the faults (Figure 2) are likely to be narrowed, and may even be eliminated, after detailed investigation.

3) Some of the steep, narrow hillside drainages on the property may generate potentially destructive debris flows during the life of the proposed development.

4) Three areas of the property contain abundant shallow landslide deposits that may influence development plans. Other areas of the property contain isolated shallow landslide deposits that can be removed or stabilized during site grading. No deep, bedrock landslides are known to be present on the property.

5) The floor of Hayes Valley may be underlain by potentially liquefiable soil. This potential hazard is common to all alluvial areas in seismically active regions.

6) Two areas along the margin of the valley floor have surface soil that appears to be highly expansive and will require special attention during design and construction of building foundations and pavements. Other areas of the property also may have expansive surface soil.

7) A large area of the hills in the northeastern part of the property is underlain by serpentinite, which commonly contains asbestos. Special analyses may be required before grading is performed.

RECOMMENDATIONS

1) The entire area proposed for development should be investigated as part of a complete geologic and geotechnical investigation.

2) The geologic investigation should include a subsurface fault investigation to evaluate the location and activity of the two faults shown on the Preliminary Site Assessment Plan (Figure 2).

3) The geologic and geotechnical investigation should include evaluation of each potential debris flow source area above proposed residential sites to determine whether or not accumulations of potentially unstable soil are present. The report should include engineering recommendations for removing unstable soil or constructing debris control facilities at the mouths of hazardous drainages.

   A specialized attorney should be consulted about potential liability for future debris flows that may originate in the southwestern part of the Hayes Valley property and damage improvements on adjacent properties. We recommend debris flow deflection structures be constructed above existing offsite facilities in debris flow hazard areas. Owners of adjacent, potentially developable sites at the bases of steep drainages on the Hayes Valley property should be notified of the potential debris flow hazard.

4) During the geologic and geotechnical investigation, special attention should be paid to the three areas of abundant landslides shown on Figure 2, if development is proposed for

those areas. Special engineering designs are likely to be required for the two areas of active landslides in the southeastern part of the property.

5) If development is proposed in areas underlain by serpentinite, asbestos analyses of representative rock samples should be performed.

GROUND WATER SUPPLY ASSESSMENT

FINDINGS

Twelve pertinent reports were reviewed for this portion of the assessment. Two of the reports were from work previously performed by Terratech in this area. Five sets of aerial photographs were examined. An extensive field reconnassiance of drainage channels and the valley floor was conducted. Four well drillers - Tim DeLaGrange from DeLaGrange Well Drillers, Gilroy; Dave Maggiora from Maggiora Brothers Drilling, Watsonville; Tom Guardino from Water Well Specialists, Morgan Hill; and, Rob Chappel from Chappel Well Drilling, Gilroy - were contacted for pertinent information on areal ground water conditions.

Ground Water Quantity

Hayes Valley lies within the Llagas subbasin of the South Santa Clara Valley ground water basin as identified in the San Fransisco Bay Hydrologic Study Area. The Llagas subbasin, which is one of four subbasins that make up the South Santa Clara County basin, extends from Morgan Hill south to Gilroy. Ground water pumping supplies almost 100% of the water supply needs in the Llagas subbasin, and future demand is expected to exceed the limited amount of natural aquifer recharge. In an attempt to counterbalance the ground water overdraft, the Santa Clara Valley Water District, and other agencies, operate a number of artificial recharge facilities in the subbasin.

Ground water in the Llagas subbasin is generally unconfined, with local zones of confinement south of San Martin. Water level responses in wells that tap the same system are most affected by pumping if both wells lie within one of the local zones of confinement.

Average annual rainfall in Hayes Valley ranges from 22 inches at the eastern end to 28 inches near Watsonville Road at the west end of the valley. Near the western end of the valley there is a topographic saddle. Surface drainage to the east of this saddle makes up the watershed of the west branch of Llagas Creek, which flows through the middle of the valley. Surface drainage to the northwest and southwest is by Hayes Creek and Uvas Creek, respectively.

The hills surrounding the valley floor appear to be well drained toward the axis of the valley. At the time of our field reconnassiance in January 1988 there was no running water in any of the creek beds, only ponded water in a number of places in the creek beds. The vegetation growth in the creek beds appeared greener than the surrounding growth and is evidence of available moisture. Although there are seasonal springs and seeps on the property, the productive ground water is estimated to begin at about a depth of 30 feet below the ground surface. As far as we could determine, no exploration or testing for ground water yield has been done in Hayes Valley.

The Franciscan bedrock beneath Hayes Valley (see "Site Geology") would generally be expected to yield little ground water compared to the overlying alluvial soil. More significant quanities of ground water may be available in the bedrock if some of the fault zones (see Figure 2) prove to be conduits for ground water flow.

Unconsolidated materials overlying the irregular bedrock surface consist of deposits of clay, silt, and sand, with a predominantly clay topsoil. Drill hole logs (W.A. Wahler & Associates; 1973) indicate that below a depth of about 50 feet the alluvium is clayey gravel to very clean, sandy gravels with abundant ground water. That investigation determined that alluvial deposits extend to a depth of at least 100 feet. The consensus of local water well drilling contractors is that the thickness of the alluvium in the center of the valley could approach two hundred feet.

Ground Water Quality

The chemical quality of ground water in the Llagas subbasin is suitable for most uses. The predominant water type is a Calcium-Magnesium Bicarbonate, classified as moderately hard to hard.

Total dissolved solids (TDS) for the area at the eastern end of Hayes Valley ranges from 358 to 499 milligrams per liter (mg/l). The maximum allowable level for TDS under secondary drinking water standards is 500 mg/l.

The pH of ground water at the eastern end of Hayes Valley has been measured at 8.2. The recommended range for drinking water is 6.5 to 8.5. It should also be noted that highly alkaline irrigation water (pH greater than 9) may cause leaf damage to plants.

High nitrate concentrations may be present in the ground water beneath Hayes Valley. Nitrate concentrations in 1978, as measured in samples from three wells at the east end of the valley, range from 30 to 80 mg/l. Nitrate concentrations in the Llagas subbasin have been high for many years and commonly exceed the maximum contaminant level of 45 mg/l. About one third of the ground water wells in the San Martin area exceed the maximum contaminant level for nitrate concentration, with the average concentration being 40 mg/l.

It should be noted that there have been no documented cases of methemoglobinemia ("blue baby syndrome") in the South Santa Clara Valley ground water basin region. However, as a precaution, a few wells in the valley have been closed due to excess nitrates. The current practice of local water companies is to notify their customers of the potential problem, blend in waters containing lower nitrate levels, and recharge the ground water with imported water containing lower nitrate levels.

Bacterial contamination of ground water is a potential problem when wells are sited near septic tank/leach field wastewater disposal systems. However, due to the undeveloped nature of the property, this should not be of major concern.

CONCLUSIONS

1) The consensus of opinion is that an adequate potable water supply could be obtained from two to four wells drilled into and through the total thickness of alluvial material in Hayes Valley. However, it should be realized that there is a limited area of ground water recharge for this valley and there exists a potential for some degree of overdraft in dry years.

2) Although a well sited near the east end of the valley may yield water with an elevated concentration of nitrates, it is unlikely that wells drilled near the western and central portion of the valley would. It is our opinion that either blending of the extracted ground water or selective usage, such as irrigating the golf course with higher nitrate water, would solve this problem. The currently available treatment alternatives for removing nitrates, such as reverse osmosis, are not economically feasible.

RECOMMENDATIONS

Based on the findings and conclusions derived from this assessment, we recommend that the following items be investigated further if the property is purchased. These recommendations are presented in approximate order of decreasing priority.

1) Four exploration holes should be drilled at the locations marked on the accompanying map (Figure 2) to assess the actual subsurface water supply potential. Aquifer tests should be performed on the exploration holes to determine which locations would best be suited for production wells. The final well construction should be ten-inch diameter, as deep into water bearing materials as equipment and formation material allows.

2) As a follow-up to the geologic work relating to fault delineation, one or two exploration holes should be made into the fault zones to determine if they are indeed conduits for ground water.

ENVIRONMENTAL/TOXIC CONTAMINATION ASSESSMENT

FINDINGS

Site Use History

We examined eight sets of aerial photographs covering the subject parcel to learn as much as possible about historical site use and possible past sources of soil or ground water contamination. The photographs dated from 1939 to 1986. References for the photographs are presented in the "Aerial Photographs" section of this report.

In 1939 there appeared to be fewer than six buildings at each end of Hayes Valley. The succeeding photographs reveal a fairly steady progression in the number of structures in the area, especially along Watsonville Road. However, no additional structures were observed to be present in the valley other than those present today.

Observations revealed an areal land use history consisting of agriculture and cattle ranching. Although areas of reaped grasses were observed in the valley, it is our impression that little to no year-to-year cultivation farming has occurred on the property. Various neighboring parcels to the west and east appeared to be in row crop cultivation as well as grass growing. Year-round, intensive types of agriculture requiring greenhouses, such as flower growing, do not appear to be common for this area of Santa Clara County.

No signs of dumping or unusual ground discolorations were observed in the aerial photographs.

Research into Known Contamination

The second main task performed for this assessment was to determine if there is a known contamination problem on the property or in its general vicinity. Three reports were reviewed and three environmental regulatory agencies were contacted for this determination.

The three reports reviewed - Guzzardo and Associates; California Regional Water Quality Control Board, et. al., 1985; and California Department of Water Resources, 1980 - are unanimous in identifying an areal ground water quality problem with elevated nitrate concentrations. There is no mention in these reports of any toxic/hazardous waste contamination problem in the area of the subject property.

Inquiries were made to the following staff members of regulatory agencies: (1) Ms. Nora Kataoka and Dr. James Tang of the

California Regional Water Quality Control Board - Central Coast Region (RWQCB); (2) Mr. David Zozaya of the Santa Clara Valley Water District (SCVWD); and (3) Mr. Jim Blamey of the Santa Clara County Environmental Health Department. None of the people we spoke with were aware of any toxic contamination on this property or in the general vicinty. Once again, the only identified ground water quality problem was that of elevated levels of nitrate.

Concern with high nitrates is based on analysis of data from three wells at the eastern end of Hayes Valley (off-site) and various other wells in the Llagas subbasin. Since there are no wells on-site to test for nitrates, it is an extrapolation that the problem exists beneath the property. The 1980 nitrate levels in the three closest wells were 30, 76, and 80 mg/l. The drinking water standard is 45 mg/l. The general opinion on the source of the nitrate contamination of ground water is that a combination of cattle wastes, fertilizer use, and septic tank/leach field system discharges are to blame.

Visual Site Inspection

In order to assess current on-site conditions regarding the storage, use, and disposal of hazardous materials, we visually inspected the ranch buildings and the surrounding yard areas. In addition, through the course of our geologic and water supply work, almost the entire property has been subject to at least one reconnaissance.

The total amount of hazardous materials we observed being stored in the various barns and sheds of the subject site was small, certainly less than 100 gallons. The majority of these materials are paints and petroleum based lubricants and fuels. The storage practices appear to be adequate. We did not observe any leaking containers nor any signs of significant past leakage. There were no signs of dumping areas on the property.

There are numerous tanks of various size, shape and condition on the site. However, all of the tanks except for a small 500± gallon tank in the storage yard appear to have only been used for water storage. This latter tank, which is rusty but not perforated, was apparently used for underground storage of gasoline. According to Mr. Hughes, the tank had just recently been excavated and moved to its current (above ground) location. When in use, the tank had apparently been located adjacent to the north side of the access road, just west of the ranch house driveway. Mr. Hughes told us he did not notice any soil contamination around the tank when it was being removed. However, a representative from the County Environmental Health Department did not observe the removal and no soil samples were collected for laboratory testing.

CONCLUSIONS

1) Overall, the property appears to have been used in a "clean" manner in regard to hazardous materials and waste disposal.

2) Although it is probable that agricultural chemicals such as weed killers have been applied to areas on the site, we have no reason to believe that the concentrations applied were significantly higher than the normal practice of other Santa Clara County ranches. Our general experience with similar sites suggests that agricultural chemicals and their degradation products would only remain in very low concentrations in the soil. The concentrations at this site would probably be well below hazardous levels. Accordingly, we believe there should be little concern over agricultural contamination at this site.

3) Concentrations of nitrate above drinking water standards may be present in the ground waters beneath this site. However, this is a common condition in the rural areas of the County and with proper water management practices there should not be significant concern for development.

4) The former underground gasoline storage tank was not closed in accordance with County regulations. The tank itself is subject to the disposal requirements set forth by the California Department of Health Services (DHS). Although there is no evidence to suggest that subsurface contamination is present around the former tank location, some exploration and testing would be prudent.

5) The isolated spots of surface hydrocarbon spillage that can be found around the ranch are typically evidence of low to moderate contamination, generally limited to the upper several inches of soil, and rarely hazardous; particularly when mass grading (or burial under fill) occurs. The relative concern for surface spillage is about the same as that for agricultural chemicals, and less than the concern for the underground tank.

6) It should be reinterated that some of the native bedrock beneath this site may contain asbestos. Although the typical volumetric percentage of asbestos found in local serpentinite bedrock has been found to be low, some degree of hazard does exist when ripping and grading rock containing asbestos.

RECOMMENDATIONS

1) Explore the vicinity of the underground storage tank with a backhoe or drill rig and collect at least two soil samples for subsequent laboratory analysis. If little to no soil contamination is apparent during this exploration, ground water sampling and testing are probably not needed.

2) Arrange for the proper disposal of the gasoline tank and all other hazardous materials/equipment not to be used.

3) Obtain and analyze representative samples of serpentinite bedrock in areas where excavation is proposed. Assess the health risk and establish appropriate safe working procedures. Possible County grading requirements for capping the serpentinite should be anticipated.

4) Sample and analyze the ground water from each of the four proposed test wells for a range of inorganic and organic contaminants such as nitrates, general mineral, and agricultural chemicals.

Note: It may be desirable to perform the work described in Recommendation #1 before the close of escrow.

LIMITATIONS

This report and its conclusions have been provided in accordance with the principles and practices generally employed in the engineering geologic and environmental consulting professions. This is in lieu of any warranties, either express or implied.

Our conclusions have been based primarily on review of on-file geologic maps and reports and unpublished consultant's reports available in the office of the Santa Clara County Geologist and at the Santa Clara Valley Water District, conversations with others familiar with the site and its vicinity, study of aerial photographs, and a brief site reconnaissance. No field geologic mapping, subsurface exploration, sampling, or laboratory testing was performed.

Report prepared by:

TERRATECH, INC.

Elizabeth L. Mathieson
RG 4025, CEG 1249

Richard A. Burzinski

Eric R. Lautenbach
CE 42437

Reviewed by:

Wayne E. Ferree
CE 17902

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AERIAL PHOTOGRAPHS

Date	Agency	Type	Roll & Frame	Scale
10/20/39	U.S.D.A.	black & white	CIV 293-39 thru 41	1:20,000
3/6/50	U.S.D.A	black & white	CIV 9G-150 thru 152	1:20,000
7/25/53	U.S.G.S.	black & white	GS-YF 2-35 thru 37, 2-66 thru 68	1:23,600
9/28/63	U.S.D.A.	black & white	CIV 50D-180 thru 182	1:20,000
6/14/68	U.S.G.S.	black & white	GS-VBZK 3-50 and 51	1:30,000
4/24/70	U.S.G.S.	black & white	GS-VCMI 1-146 & 147	1:80,000
7/12/74	U.S.G.S.	color	1-SFB 12-101 thru 103, 12-152 thru 154	1:20,000
8/7/84	Aero-Geodetic Corp.	black & white	842670 1-2 thru 5 2-1 thru 2-5 3-1 thru 3-6 4-1 thru 4-6 5-1 thru 5-2	1:6,000
4/3/85	W.A.C., Oregon	black & white	85CA 7-194 & 195	1:31,680
6/30/86	Pacific Aerial Surveys	black & white	AV 2881 12-10 11	1:33,600

APPENDIX D

Hydrology and Drainage Study

Prepared by

Schaaf & Wheeler

November 1995

Lion's Gate Development

Hydrology and Drainage Study

Prepared for:

Hayes Valley Development Partners

November, 1995

Schaaf & Wheeler

CONSULTING CIVIL ENGINEERS

173-C N. Morrison Ave.

San Jose, CA 95126

(408) 297-4848

FAX:408-297-4855

LION'S GATE DEVELOPMENT

HYDROLOGY AND DRAINAGE

Existing Setting

The project site is located in the Llagas Creek watershed northwest of the City of Gilroy. Llagas Creek drains from the eastern slopes of the Santa Cruz Mountains and the western slopes of the Diablo Mountains in southern Santa Clara County south to the Pajaro river and Monterey Bay near Watsonville. The major tributaries of Llagas Creek are Little Llagas Creek, Madrone Channel, Coralitos Creek, San Martin Creek, Church Creek, and West Branch Llagas Creek. Llagas Creek and its tributaries drain a total of approximately 105 square miles. The major tributaries of the Pajaro River are Llagas Creek, Pacheco Creek, Santa Ana Creek, San Benito River and Salsapuedes Creek. The Pajaro River and its tributaries drain a total of approximately 1300 square miles. Watershed elevations range up 3500 feet above sea level.

The climate of the south Santa Clara Valley is similar to that of the San Francisco Bay area. Summers are warm and dry while winters are mild and moderately wet. Nearly 90 percent of the annual rainfall occurs in the late fall or winter months, with January normally being the wettest. The mean annual precipitation varies within the Llagas Creek watershed from a high of over 50 inches in the Santa Cruz Mountains to a low of 14 inches on the valley floor. The basin-wide average is approximately 20 inches per year.

Stream flows in Llagas Creek are regulated by Chesbro Reservoir. The reservoir is owned and operated by the Santa Clara Valley Water District. The reservoir has a total storage capacity of approximately 8,100 acre-feet. The reservoir is operated for water supply purposes, but does provide some incidental flood control benefit due to peak flow attenuation.

The upland areas of Llagas Creek watershed have soils developed on sedimentary rock, basic igneous rocks and serpentine rocks. The main soils are of the Los Gatos, Gaviota, Vallecitos and Haymen associations. They range in depth from shallow to deep, and are located on steep to very steep slopes. The vegetative cover includes grasses, oak, pine, brush and hardwoods. The infiltration rates of water in the upland areas is generally slow. The upland soils have been classified to have a high to very high erosion potential.

The upland portions of the watershed have very little development at this time, and the County General Plan calls for only limited development in the future with mostly open space. On the valley floor, most of the Llagas Creek channel and its tributaries have levees or perched channels with channel banks higher than adjacent areas on one side or both sides of the stream channel. Therefore, overflows from the channel would tend to flow away from and parallel to the channel.

Based on information from the Federal Emergency Management Agency Flood Insurance Study for Santa Clara County, there are extensive areas of flood plain from Llagas Creek and its tributaries. The most serious of these are within the City of Morgan Hill from West Little Llagas Creek, and in the City of Gilroy from West Branch Llagas Creek.

The Santa Clara Valley Water District and the Soil Conservation Service have completed a flood control project for the Llagas Creek watershed. The downstream reach from Bloomfield Road to the Ronan Channel has been improved to 100-year design standards and reach from the Ronan Channel to Route 101 has been improved to 10-year design standards. In addition, 100-year design channels were provided in urban areas in Morgan Hill and Gilroy. Improvements in Gilroy included diversion of West Branch Llagas Creek to the Ronan Channel and channel improvements upstream to Day Road. The project was designed to eliminate most flooding in Gilroy south of Day Road. The project has been constructed, and FEMA is in the process of changing the effective Flood Insurance Rate Maps.

The project site drains to two separate drainages. The majority of the site drains to the east to the West Branch Llagas Creek near Highland Avenue. The western portion of the site drains to the west to Hayes Creek near Watsonville Road. West Branch Llagas Creek discharges to the Ronan Cannel which joins Llagas Creek near Highway 152. Hayes Creek drains to Llagas Creek near Watsonville Road, upstream of Monterey Highway south of Morgan Hill.

The are no detailed flood plain studies for Hayes Creek. The area is designated as Zone D on the Flood Insurance Rate Map. Zone D is defined as an area of undetermined flood hazard.

The existing Flood Insurance Rate Maps for West Branch Llagas Creek do not include detailed flood plain studies upstream of Golden Gate Avenue. The stream channel on the project site is designated as Zone A, approximate 100-year flood plain. At Turlock Avenue, the flood plain is shown as approximately 300 feet wide along the channel north of Highland Avenue.

West Branch Llagas Creek has been restudied by FEMA to update the existing Flood Insurance Rate Maps. The draft work maps have been prepared and are in the review process. The revised maps are not expected to be effective until late 1996. The SCVWD is using the work maps as the best available information in the interim. The revised 100-year flood plain for West Branch Llagas Creek is significantly larger near Highland Avenue than the effective maps. The revised flood plain includes shallow flooding from the channel on the project site south of Highland Avenue, west of Turlock Avenue, and north of Highland Avenue west of Coolidge Avenue.

The hydrology for the revised flood plain study shows an estimated 100-year peak flow rate of 850 cubic feet per second for West Branch Llagas upstream of the overflows, upstream of Turlock Avenue. An estimated 400 cfs overflows Highland Avenue toward the south upstream of Turlock Avenue. An additional 355 cfs overflow from the channel toward the north upstream of Coolidge Avenue. The northern overflow crosses Coolidge Avenue north of the project and flows overland to the east and south to the West Branch Llagas Creek channel at Highland Avenue. The majority of the overflow to the south flows overland to the south and east and crosses Turlock Avenue to rejoin the West Branch Llagas Creek flood plain between Highland Avenue and Golden Gate Avenue. A portion of the overflow continues south along the west side of Turlock Avenue.

Potentially Significant Environmental Impacts

The proposed residential development on the project site will increase the amount of impervious area on the site and therefore increase the runoff from the site. Depending on the ground slopes on the site and the density of development proposed, the extent of the change can be significant. The overall effects on downstream flow rates are limited by the undeveloped hillside areas upstream on the site.

Based on the proposed development plan, the project would include a full 18-hole golf course and residential development in three separate areas. Twenty eight residential units would be in the hillside cluster south of Highland Avenue. An additional six units would be in a separate area north of Highland Avenue west of Coolidge Avenue. Five other residential units would be located on the north side of the new access road north of the golf course.

The hillside cluster residential development area would be served by storm drains which would discharge to an on-site lake. The overflows from the lake would discharge to West

Branch Llagas Creek upstream of Coolidge Avenue. In addition, there are approximately 73 acres of hillside areas upstream of the development area. Drainage from this area would also be collected by the storm drain system and discharge to the lake. The total area of the watershed draining to the lake would be 240 acres. The proposed lake would be approximately 20 acres.

The golf course would be located entirely within the West Branch Llagas Creek watershed which drains to the east. There would be no development in the western portion of the site which drains to the west to Hayes Creek. The West Branch Llagas Creek watershed upstream of Turlock Avenue is approximately 1060 acres or 1.66 square miles. The golf course development would include approximately 200 acres. The majority of the area would be landscaping and turf. The upstream hillside areas would not be affected. The existing creek channel would be maintained in its existing configuration as much as possible. The golf course development would include a new access roads, club house, parking areas, maintenance facility, and cart paths. The existing pond near the western end of the site would not be affected. A new pond would be constructed west of the existing pond to serve as an irrigation water reservoir and to detain runoff from the undeveloped area upstream. The new pond would include approximately 9 acre-feet of detention storage.

For evaluation purposes, the hillside cluster development, the area upstream of the existing pond, the area upstream of the new pond, and the area downstream of the ponds were analyzed as four separate watersheds. Discharge rates were estimated for the 10-year and 100-year storms for existing and project conditions. These discharges were estimated using the U.S. Army Corps of Engineers HEC-1 computer program, and the Soil Conservation Service curve number methodology. The Santa Clara Valley Water District design storm was used for the rainfall pattern and 24-hour rainfall. The storm pattern was extended to use 5 minute time increments, and adjusted to match the peak 5 minute and 10 minute rainfall ratios versus the 30 minute rainfall to fit the Morgan Hill intensity duration frequency curve. The calculated hydrographs from the upstream areas above the reservoir site were routed along West Branch Llagas Creek to Turlock Avenue using the Muskingum routing method. The undeveloped condition curve numbers were adjusted to provide an overall watershed flow rate for the 100-year storm which fit with the Santa Clara Valley Water District regional regression equations for undeveloped watersheds. The curve number and percent impervious were then adjusted for the developed watershed to predict the effects of development.

The existing pond was assumed to be full at the start of the storm and to have minimal effect on the flood hydrograph. The proposed golf course pond was assumed to be full to spillway elevation at the start of the storm, and to have a 10-foot wide spillway. The estimated storage capacity of the pond was 9 acre-feet with 3 feet of flow over the spillway.

The results of the hydrograph analysis show that the proposed golf course development would reduce the flow from the site to West Branch Llagas Creek. The estimated 100-year peak flow would decrease from 780 cubic feet per second to 765 cubic feet per second, a decrease of 2 percent. The 10-year peak flow rate would decrease from 375 cubic feet per second to 360 cubic feet per second, a decrease of 4 percent.

The golf course development would decrease the estimated peak runoff from the watershed for two reasons. The change from natural range land to irrigated turf would increase the percolation into the soil cover and decrease the runoff. The would occur because the irrigated turf maintains a dense grass cover which retains rainfall and reduces runoff. The natural range grasses tend to be sparse, with exposed dirt between grass clumps. In addition, the natural grasses are dry in the fall, sprout during the winter, and are cropped by grazing in the winter and early spring.

The proposed golf course pond would also act to reduce the estimated peak flow rate from the western portion of the watershed. The proposed detention storage would act to reduce the peak flow. The effect of the detention storage is limited by the drainage area above the lake. The watershed above the lake is 60 acres, or approximately 6 percent of the West Branch Llagas Creek watershed upstream of Turlock Avenue. The detention storage in the lake would reduce the estimated 100-year peak flow at the lake from 59 cubic feet per second to 39 cubic feet per second, a reduction of 20 cubic feet per second. However when routed downstream and combined with the larger watershed downstream, the detention storage reduces the peak by approximately 10 cubic feet per second. This is due to the difference in timing between the hydrograph from the upper watershed and the lower portion of the watershed. The peak flow from the upper watershed is delayed by the travel time along the creek channel and arrives after the peak from the lower watershed. Therefore the peaks do not add directly. The detention storage in the upper watershed acts to increase the timing difference of the upper watershed.

The proposed golf course grading would also include local detention areas to contain runoff from the golf course for water quality purposes. These would also act to reduce the runoff from the site, particularly for small storms. The effect of these detention area on larger storms would depend on the design and placement of each area and whether the upstream hillside areas would drain to the detention areas or directly to the creek. Therefore, the effects of potential detention storage on the golf course other than the larger pond were not considered in the hydrograph analysis.

The results of the hydrograph analysis show that the proposed hillside cluster residential development would significantly increase the peak runoff from the development site. The 100-year peak flow from the entire watershed would increase from 236 cubic feet per second to 301 cubic feet per second, an increase of 28 percent. The 10-year peak flow rate would increase from 120 cubic feet per second to 160 cubic feet per second, an increase of 33 percent. The increase in peak runoff is due to both the increased impervious area in the development, and the more efficient drainage system which collects runoff faster than the existing overland flow conditions.

However, the proposed hillside cluster residential development would include a pond, and runoff would be drained to the pond, then released to West Branch Llagas Creek. Only the proposed equestrian center in the southeastern corner of the area near Turlock Avenue would be below the pond elevation would drain toward Turlock Avenue. The equestrian center would be approximately 20 acres. There is no storm drain system along Turlock Avenue, but runoff flows along the road under existing conditions and flows overland to West Branch Llagas Creek near Golden Gate Avenue.

The proposed pond in the residential development would have a normal water surface elevation less than the top of bank elevation of West Branch Llagas Creek at the outfall from the pond. The outfall would have a flap gate to prevent high water levels in the creek from discharging back into the pond. The outflow from the pond would only occur when the water level in the creek is low. Therefore, the outflow from the pond would not contribute to the existing flood problems from the creek channel.

The proposed pond in the residential development would include an overflow spillway release for larger flood events, and an active detention storage volume between the normal water level and the spillway crest. Based on a preliminary design which includes 2 feet of active detention storage below the spillway crest and one foot of storage above the spillway crest, the proposed pond could contain approximately two-thirds of the total runoff from the residential development area and the upstream hillside area during the 10-year 24-hour design storm. The pond would release approximately 30 cfs over the spillway to Turlock Avenue during the 10-year storm. This would be significantly less than the existing condition peak flow rate of 120 cfs. For smaller flood events there generally would be no spill from the pond and runoff stored in the pond would be released to the creek after the high water levels in the creek have receded. The outlet to the creek would release approximately 20 cfs to drain the active storage volume of the pond in 24 hours after the storm.

During the 100-year 24-hour flood event, the total runoff to the lake would be approximately 125 acre-feet. With no outlet release to the creek during the storm, the pond would overflow to Turlock Avenue once the active storage has filled. The estimated overflow would be 140 cfs for the 100-year flood. The existing runoff from the site is estimated to be 236 cfs.

The only potential adverse effect of increased peak runoff from the hillside cluster residential development site would be to increase the peak flow in West Branch Llagas Creek downstream of the project. Due to the operation of the outlet from the pond, this could only occur once the high water levels in the creek have receded and the potential for downstream flooding has passed. Therefore, there should be no significant increase in downstream flooding. The low flows in the creek would continue for a longer time after a storm due to the releases from the detention pond. This should not be a significant impact.

The equestrian center area in the southeast portion of the project would not drain to the pond in the residential development area. Due to the site topography, there would be a berm between the equestrian center and the pond to contain the pond. The maximum height of the berm would be approximately 7 feet. The equestrian center would continue to drain to Turlock Avenue and overland to West Branch Llagas Creek. Because of the limited impervious area associated with the equestrian center, there should be no increase in runoff from the area after the project. In addition, the proposed equestrian center will include a detention pond or ponds for water quality purposes. These detention ponds would reduce the runoff from the site for normal rainfall events, but may not affect the larger 10- or 100-year flood events, depending on the design and placement of the detention areas.

Based on the proposed detailed study information for the revisions to the existing Flood Insurance Rate Map, the West Branch Llagas Creek would overflow to the south upstream of Turlock Avenue. For the 100-year flood, approximately 400 cubic feet per second would cross through the southern portion of the academy golf course and the northeastern portion of the hillside cluster residential development, in particular through the area of lots 12 and 13 on the site plan. This overflow crosses the site and Turlock Avenue to rejoin West Branch

Llagas Creek 500 to 1000 feet downstream of Highland Avenue. The overflow is designated as shallow flooding with an average depth of one foot. Grading for the residential lots in the overflow area could adversely affect the sheet flow through the area if the sheet flow is obstructed. Similarly, grading for the private road to access the project and landscaping along Turlock Avenue could affect the sheet flow across the site.

The proposed detailed study information also shows an overflow to the north from West Branch Llagas Creek upstream of Coolidge Avenue. For the 100-year flood, approximately 355 cubic feet per second would cross through the residential development sites north of Highland Avenue and west of Coolidge Avenue. The overflow would flow overland to rejoin West Branch Llagas Creek at the culvert under Highland Avenue. Part of the overflow is designated as shallow flooding with an average depth of one foot, and part as greater than one foot average depth with 100-year flood elevations shown. All six of the residential lots are within the proposed 100-year flood plain area. Again, grading for the residential lots and cul-de-sac in the flood plain could adversely affect the sheet flow if the sheet flow is obstructed.

Potential Mitigation Measures

The potential impact of the proposed residential development in the 100-year flood plain areas could be mitigated by balancing the grading within the 100-year flood plain. This would apply to the overflows from West Branch Llagas Creek to the south upstream of Turlock Avenue and to the north upstream of Coolidge Avenue. Fill areas for buildings would be balanced by cut areas to allow flood flows between the buildings. This procedure would generally be most effective in shallow flooding areas with limited building coverage. If the buildings cover a large percentage of the flood plain and are in deeper flood area, and effective balance between cut and fill can be difficult. For instance if a building obstructs 50 percent of the flood plain in 3 feet of flood depth, the remainder of the flood plain must be excavated 3 feet to balance the cut and fill. This would lead to an elevation difference of 6 feet between the building and the adjacent ground.

In the proposed project, the building densities will be very low with large residential lots. With building elevations 1 to 2 feet above existing grade and 2 to 3 feet or less above the new ground elevations. The developer has proposed this type of mitigation.

An alternative mitigation measure would be to provide additional channel capacity for peak flow rates in the existing West Branch Llagas Creek. Since the channel downstream is privately owned, several property owners would be involved. In addition, channel modifications would normally require permits from the Santa Clara Valley Water District, Department of Fish and Game, U.S. Army Corps of Engineers, and Regional Water Quality Control Board. The approval process would be very difficult without a full 100-year channel project. This would be outside the scope of the proposed project.

Another alternative mitigation measure would be to purchase flood easements from the affected downstream property owners. A flood easement would typically restrict the property owner from changing land uses until the flood hazard is removed. These can be very expensive and difficult to negotiate and enforce. This case would also be complicated by the fact that the easement would be to consider the potential increase in flood hazard due to the project, not the existing entire flood plain condition. This would be similar to trying to purchase a waiver of liability for increased flood damages.

The issue of diverting runoff from the hillside cluster residential development into West Branch Llagas Creek upstream of Turlock Avenue would be mitigated by the design of the on-site pond to provide detention storage, as noted above. The normal pond outlet to the creek would no flow during high water levels in the creek.

The spillway overflow from the residential development pond would flow overland to West Branch Llagas Creek during large flood events. This would contribute to the creek overflow which crosses the site from upstream of Highland Avenue. This occurs during existing conditions. Due to the operation of the detention pond the peak runoff from the residential area would be reduced to below the existing peak runoff. No additional mitigation should be required.

An alternative mitigation would include some type of new drainage facility from Turlock Avenue to West Branch Llagas Creek downstream of the site. This would eliminate the need for the proposed diversion of flow to the creek upstream of Turlock Avenue. The new storm drain or ditch would have to cross private property between Turlock Avenue and West Branch Llagas Creek or follow Turlock Avenue

Conclusions

The proposed project should be feasible without a significant adverse impact on the hydrology or flood plain conditions of the area. Based on the preliminary development plans for the project, it should be feasible to grade the residential development areas within the 100-year flood plain to allow sheet flow through the site. In addition, the golf course and golf course pond would reduce the peak runoff from the golf course watershed. This and detention storage in the hillside cluster development would allow low flows from the residential areas to drain to West Branch Llagas Creek without increasing the peak flow rates. For large flood events in which the creek would overflow, overflows from the residential area pond would contribute to the overland flow in the same way as existing site runoff. The detention storage in the pond would limit the contribution from the developed areas to less than the existing undeveloped condition runoff.

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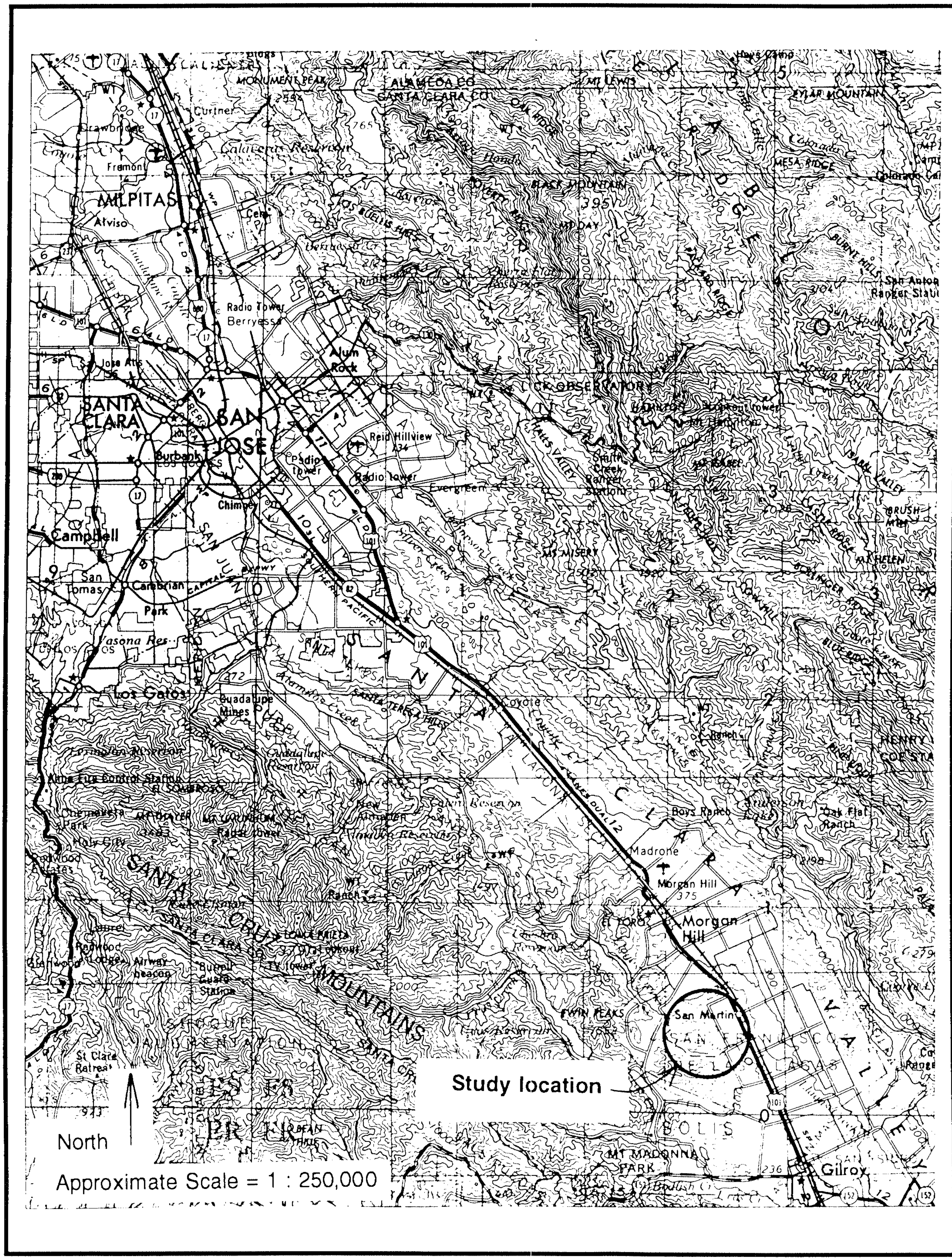
1. U. S. Department of Agriculture, Soil Conservation Service, Soils of Santa Clara County, 1968.

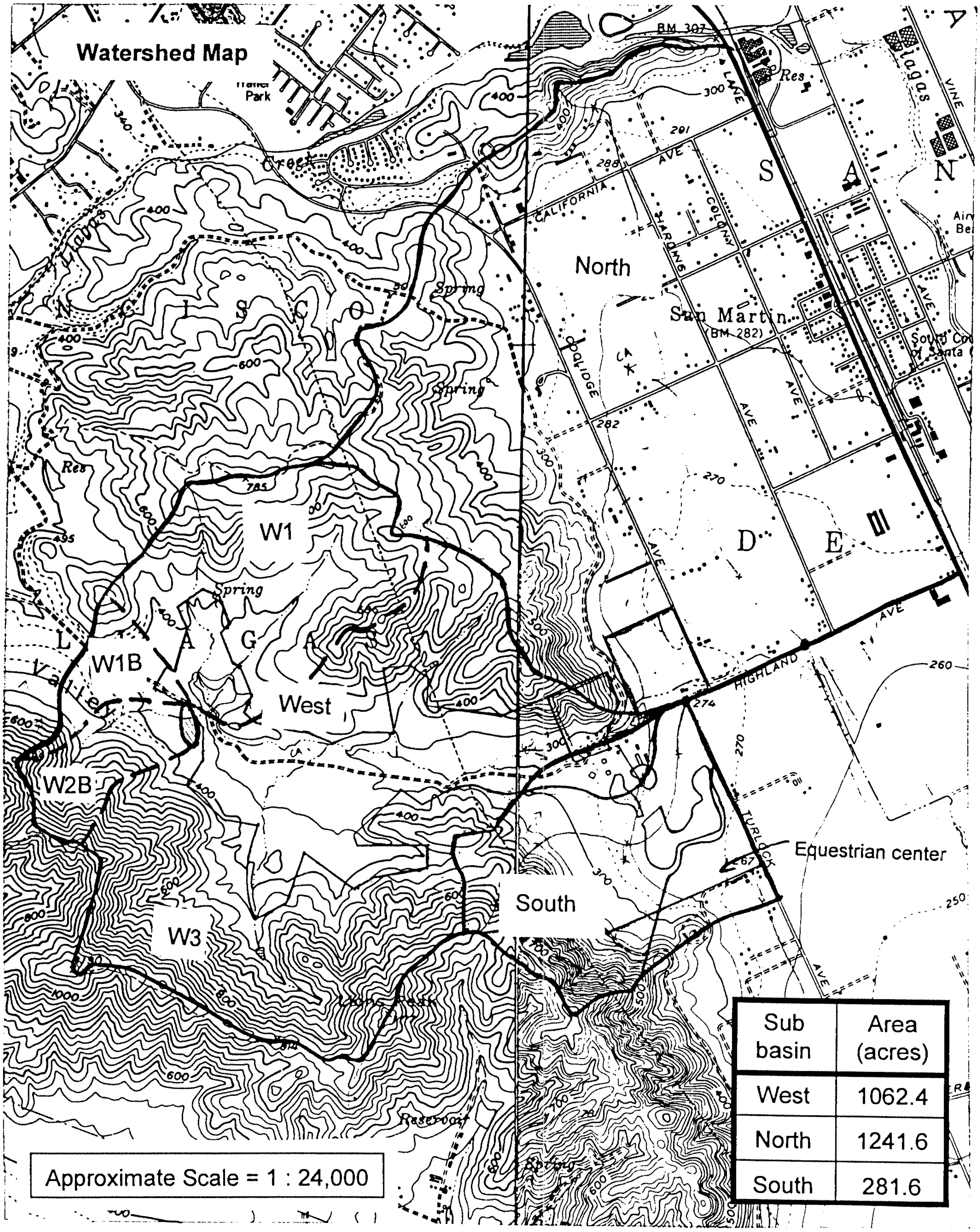
2. Federal Emergency Management Agency, Flood Insurance Study, Santa Clara County, California, Revised 1986.

3. U. S. Department of Agriculture, Soil Conservation Service, National Engineering Handbook, Section 4, Hydrology, 1985.

4. County of Santa Clara, Department of Public Works, Drainage Manual, 1966.

5. Santa Clara Valley Water District, Maps of Flood Control Facilities and 1% Flood


Study location
North
Approximate Scale = 1 : 250,000
MILPITAS
SANTA CLARA
SAN JOSE
Campbell
Los Gatos
Morgan Hill
San Martin
Gilroy
Evergreen
Coyote
Madrone
Alum Rock
Calaveras Reservoir
LICK OBSERVATORY
SANTA CRUZ MOUNTAINS



Sub basin	Area (acres)
West	1062.4
North	1241.6
South	281.6

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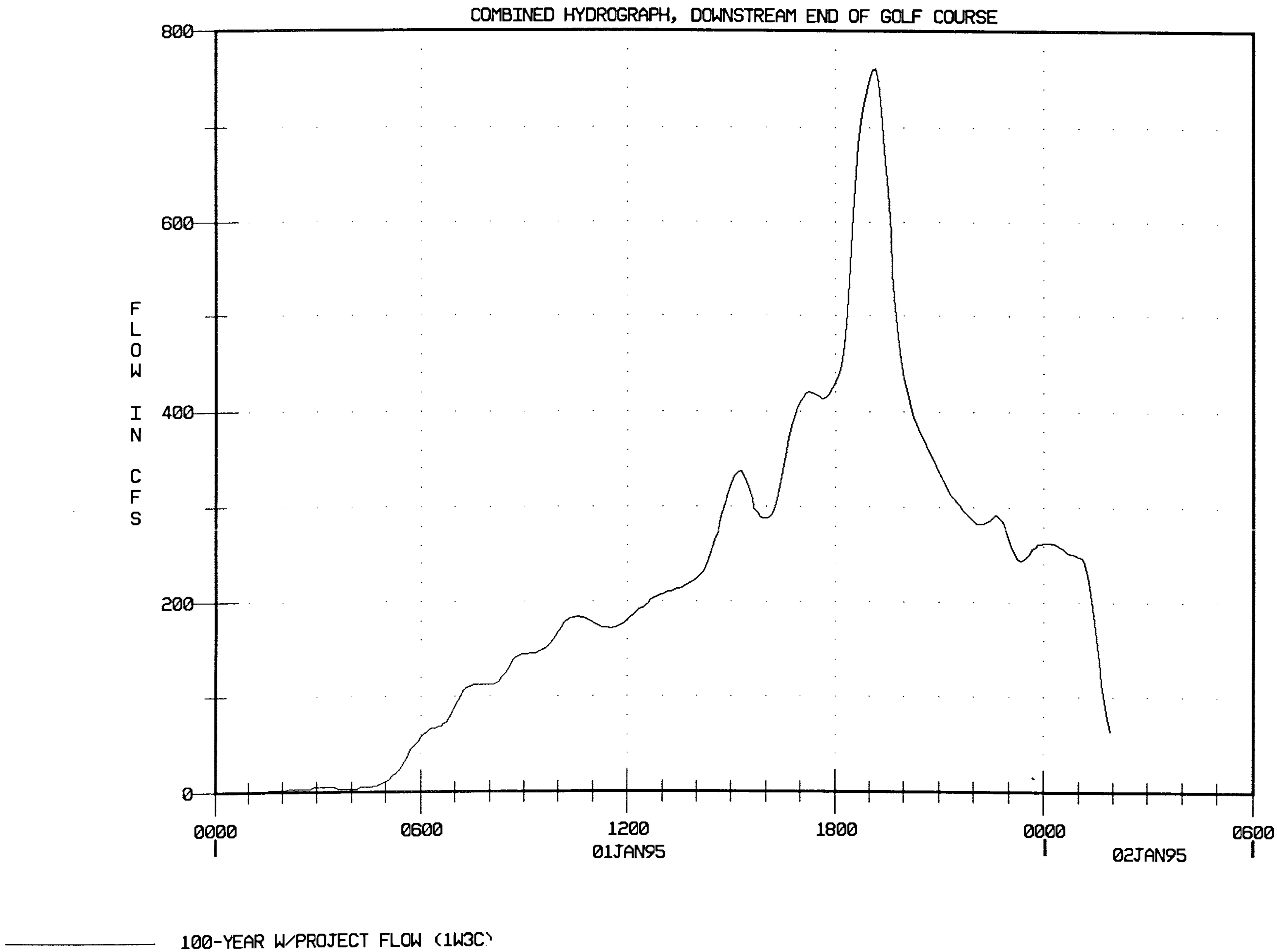

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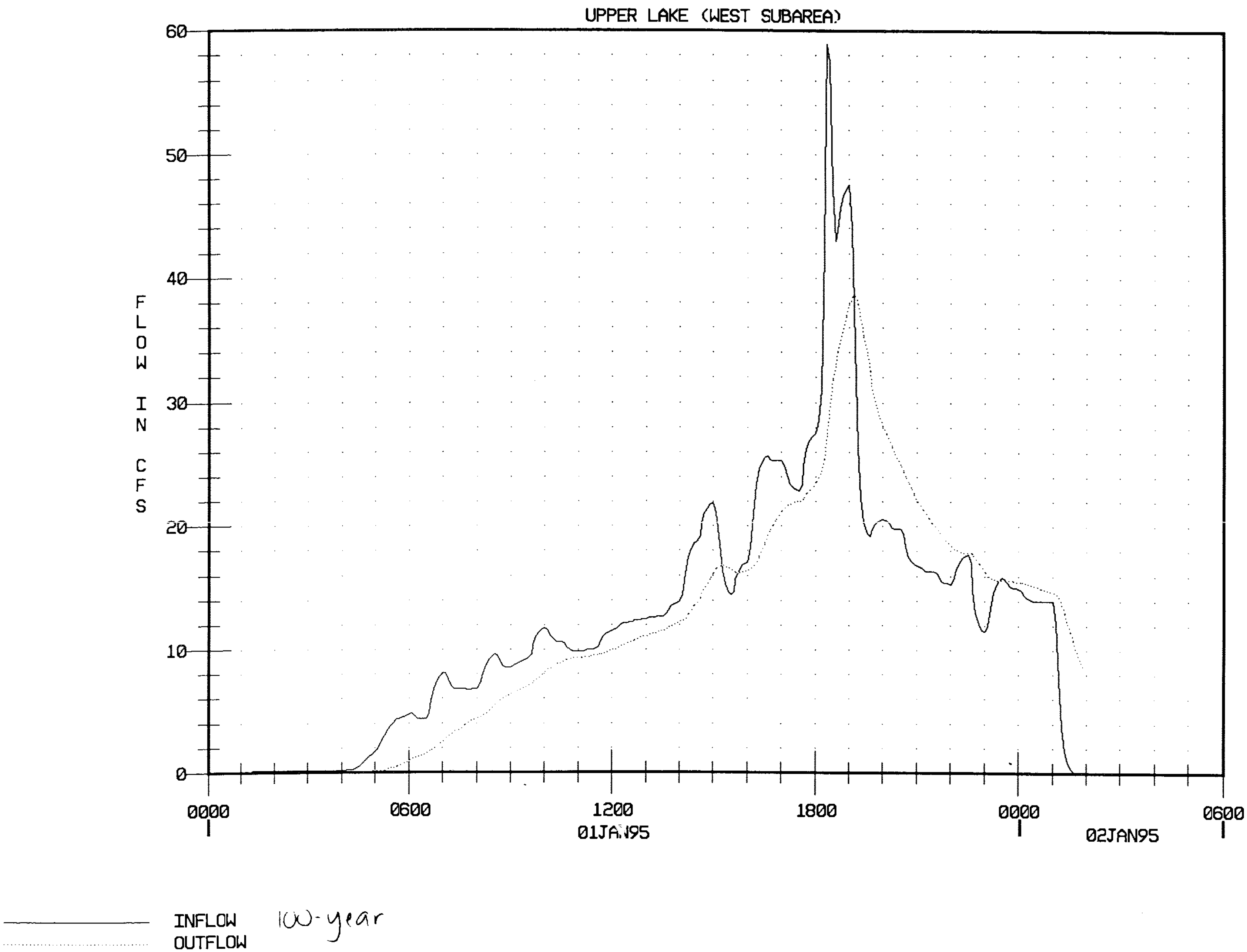

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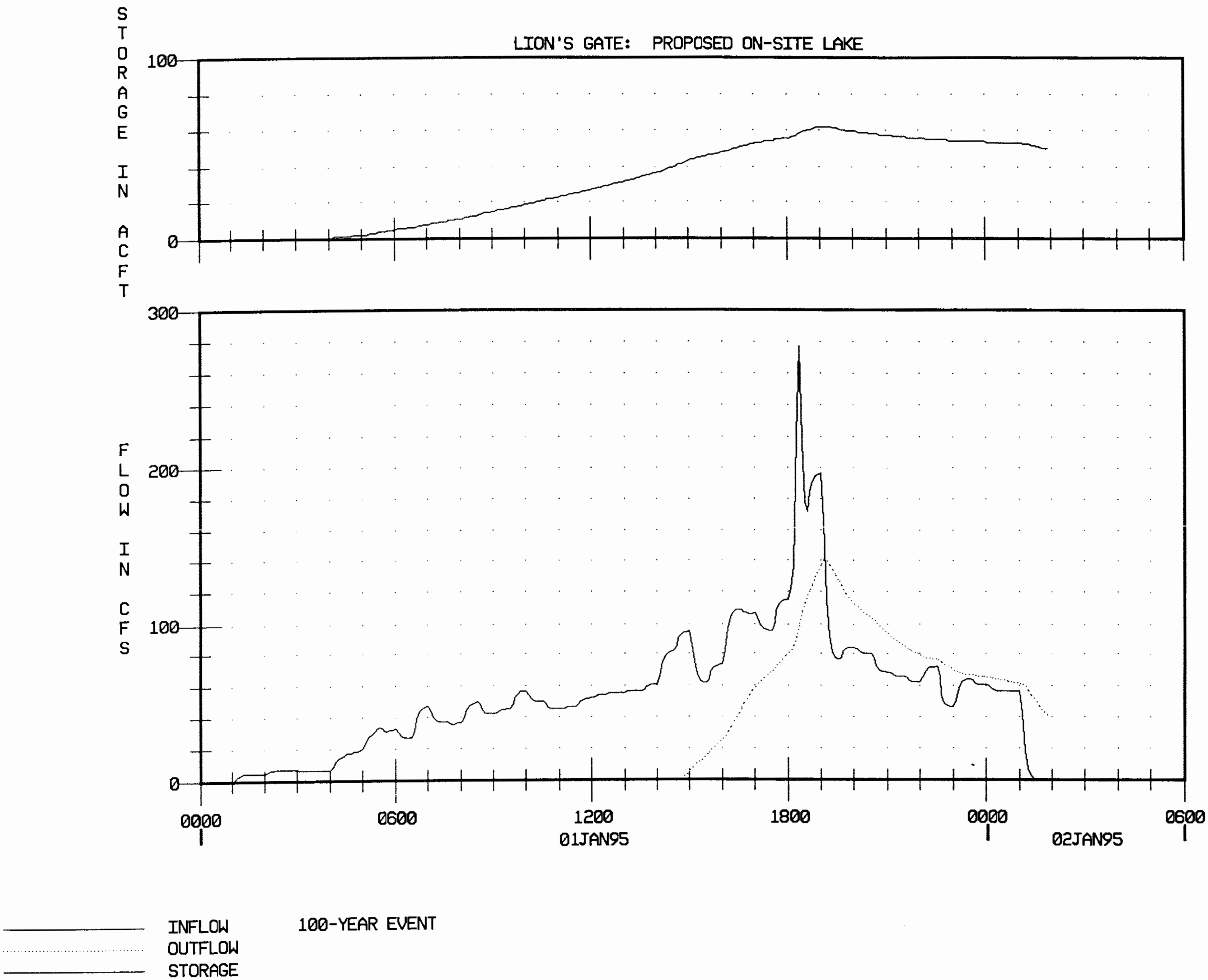

100-YEAR EVENT

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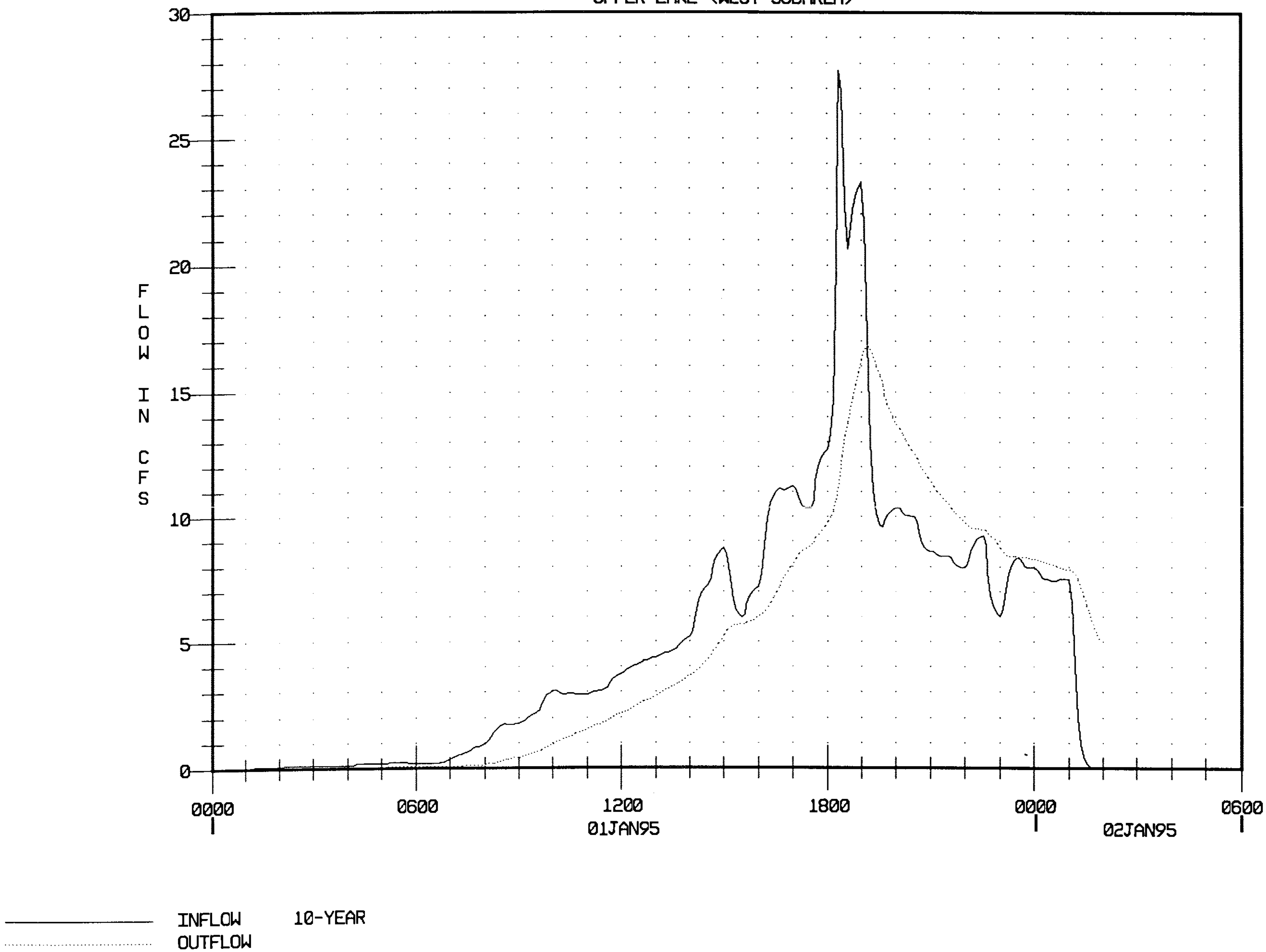
UPPER LAKE (WEST SUBAREA)



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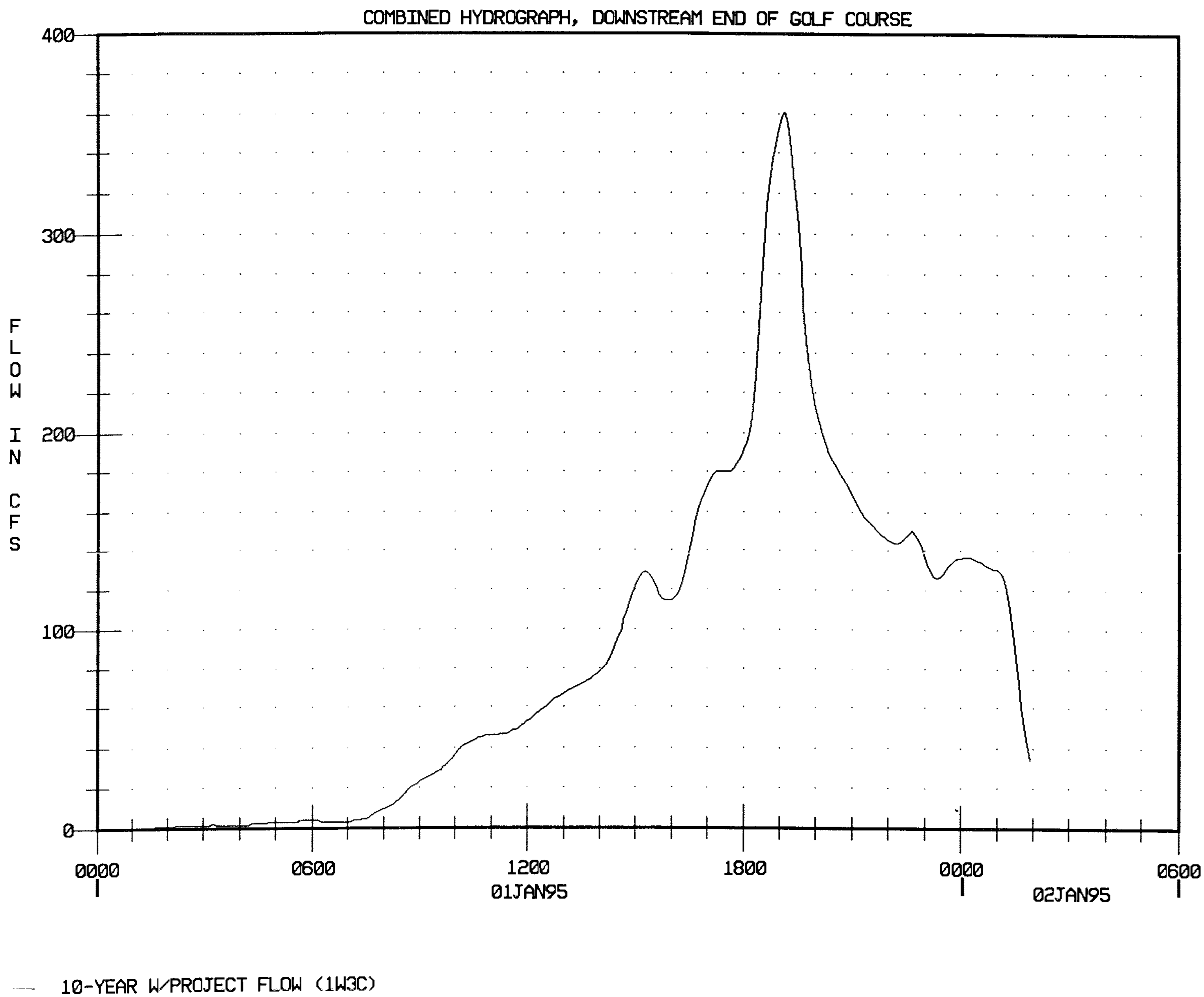

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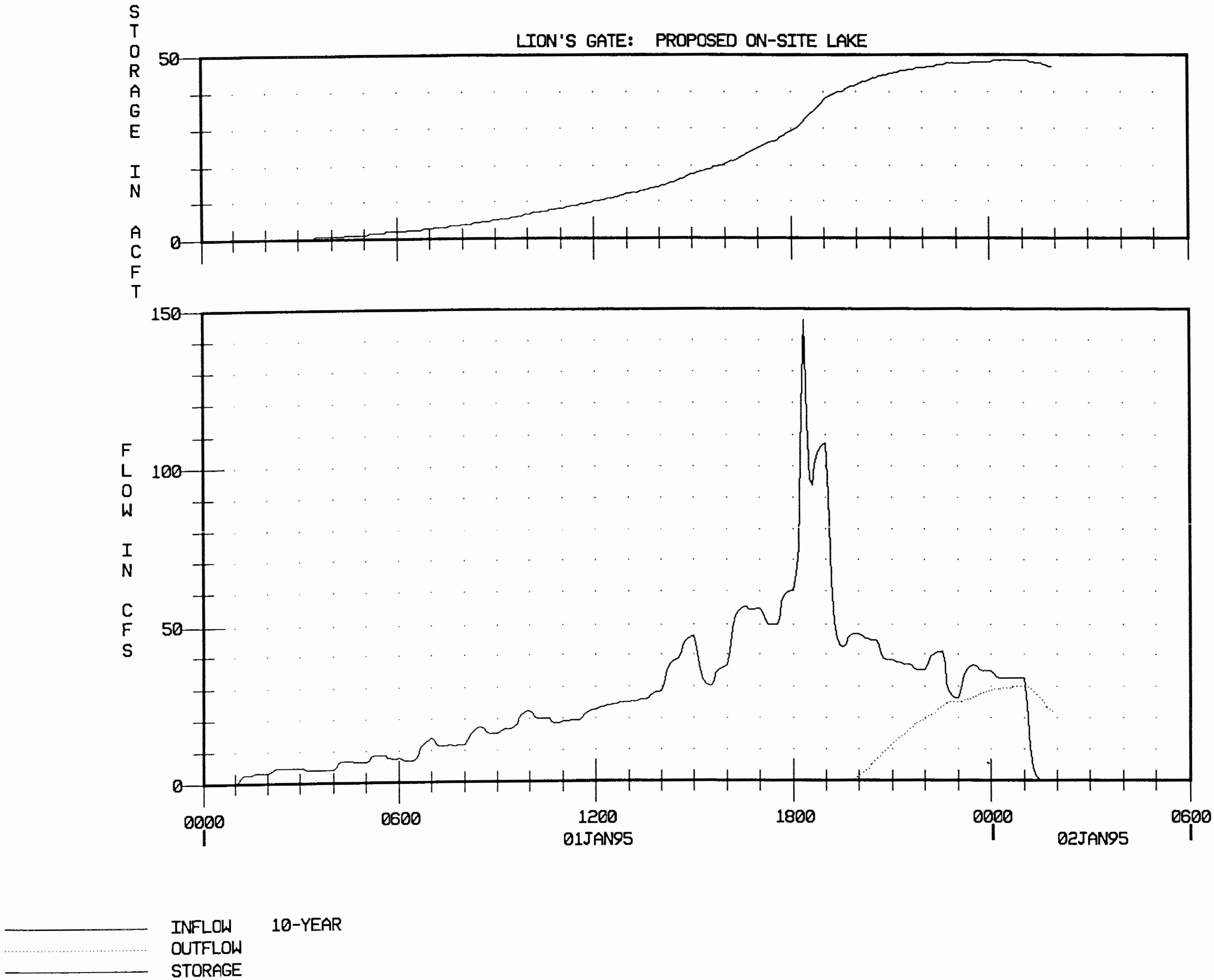


APPENDIX E

Golf Course Environmental Management Plan

Prepared by

Audubon Conservation Services

November 1995

ENVIRONMENTAL MANAGEMENT PLAN

LION'S GATE GOLF COURSE

Santa Clara County
Morgan Hill, California

AUDUBON
COOPERATIVE
SANCTUARY
SYSTEM

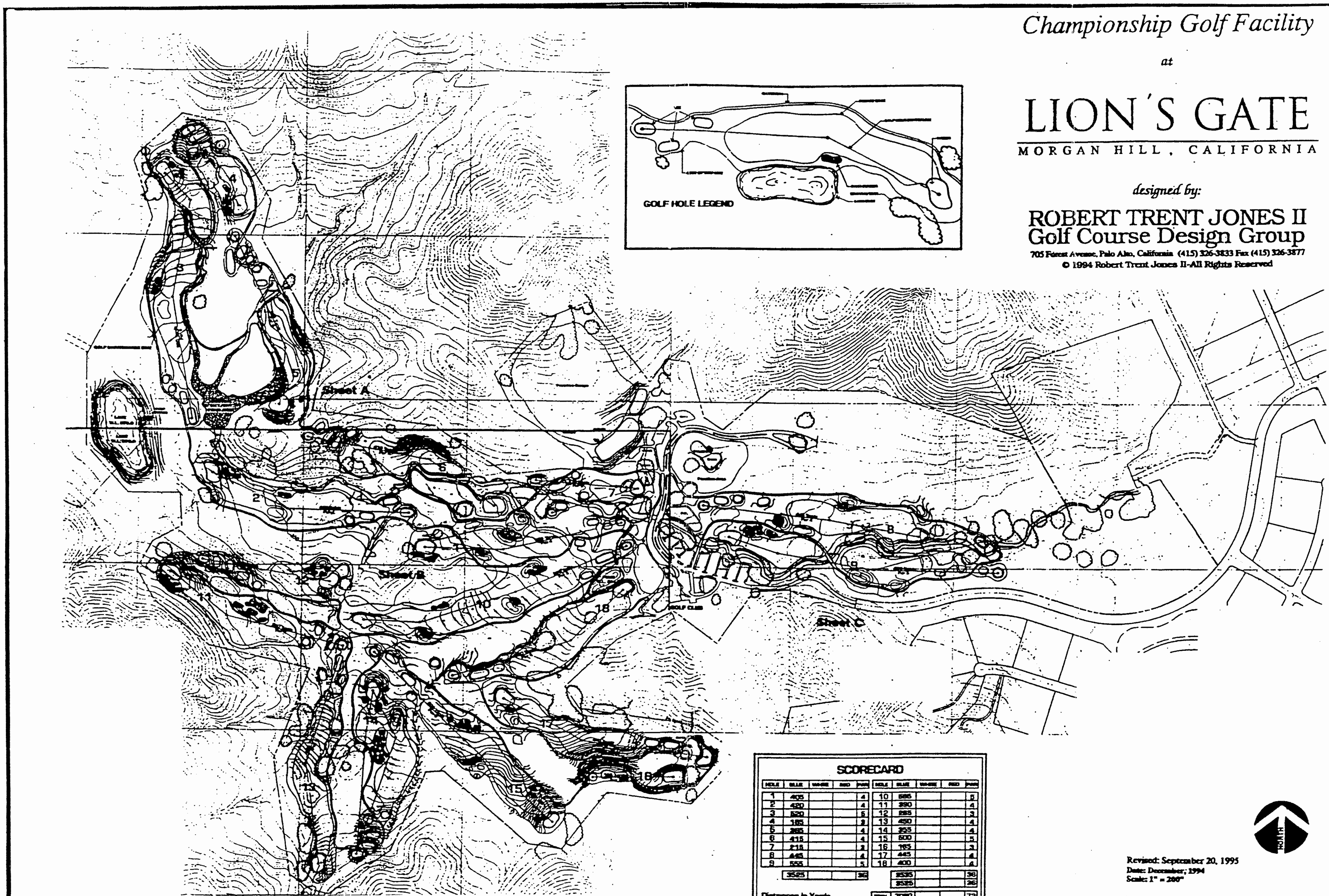


Figure 1. Site plan for Lion's Gate Golf Course, Santa Clara County, California.

CONCEPT OF BEST MANAGEMENT PRACTICES AND INTEGRATED PEST MANAGEMENT

Best Management Practices

Many turfgrass cultural practices could have an impact on the environment. Movement of nutrients and pesticides or soil erosion could negatively affect water quality if allowed to enter lakes or streams in an uncontrolled manner or in significant amounts. Through the use of Best Management Practices (BMPs) turfgrass management can coexist in harmony within a natural setting. The goals of BMPs are as follows: 1) to reduce the off-site transport of sediment, nutrients and pesticides; 2) to control the rate, method and type of chemicals being applied; and 3) to reduce the total chemical load by use of Integrated Pest Management. The use of BMPs to protect water quality can be affordable, easily implemented and effective pollution control practices. While distinct BMPs are not outlined for turfgrass areas, many of those suggested by the US Department of Agriculture, Soil Conservation Service (Bottcher and Baldwin, 1986) can be adapted for use in turfgrass management situations. In developing the cultural programs for use on the golf course the following BMPs were employed:

Aquatic filter ponds - utilization of ponds or basins or channels containing vegetation in order to filter or assimilate nutrients from drainage water. The ponds for irrigation reserve will serve to protect native surface waters.

Subsurface drainage - collect infiltrated surface water primarily from greens and reduce runoff and leaching. Collection, filtration and drainage into vegetative areas for additional filtration will control the potential release of nutrients and pesticides from the golf course.

Regulated runoff impoundment - Detention with associated filtration through plant material within the basin prior to discharge is used to reduce runoff quantity and nutrient and pesticide discharge.

Land absorption area - providing an adequate land absorption area for drainage or runoff filtration so that soil and plants absorb nutrients. Surface drainage on the golf course is filtered through turf areas. All drainage from impervious surfaces is directed into areas which have vegetative cover.

Grassed waterway or outlet - a natural or constructed waterway or outlet maintained with vegetative cover in order to prevent soil erosion and filter nutrients. Dry ponds and golf course fairways serve in this capacity.

Critical area planting - planting vegetation to stabilize the soil and reduce erosion and runoff. Turfgrasses are the premium choice of plants for this purpose. In out-of-play areas, low maintenance hearty species/cultivars have been selected for use.

Resistant crop varieties - use of plant varieties that are resistant to insects, nematodes, diseases, etc., in order to reduce pesticide use. Care has been taken in the selection of the turfgrass species and cultivars best adapted for the edaphic, climatic and traffic intensity conditions of this site.

Cultural control of pests - using cultural practices to partially substitute for pesticides. Details of the proper cultural practices including mowing, fertilization, irrigation, and supplementary cultural practices are included in this plan to take advantage of every aspect of cultural control of pest problems.

Soil testing and plant analysis - testing to avoid over-fertilization and subsequent losses of nutrients. All initial fertilizer recommendations will be based on soil testing and tissue testing. All subsequent fertilization programs will be finalized based on a minimum sampling program consisting of annual soil and quarterly tissue analyses.

Timing and placement of fertilizers - timing and placement of fertilizers for maximum utilization by plants and minimum leaching or movement by surface runoff. Every precaution in fertilization timing, including scheduling to avoid potential rainfall which could produce runoff and/or leaching, verification of application rate through proper calibration of equipment, and choice of materials will be employed by the golf course superintendent.

Slow release fertilizer - applying slow release fertilizers to minimize nitrogen losses from soils prone to leaching. All fertilization programs include the use of slow release nitrogen fertilizers.

Irrigation water management - determining and controlling the rate, amount, and timing of irrigation water application in order to minimize soil erosion, runoff, and fertilizer and pesticide movement. The irrigation system will be designed to have an average application rate below the infiltration capacity of the soil so that no surface ponding will occur and maximum efficiency of water percolation will occur. All irrigation will be based on a water balance method which takes into account plant water use as monitored by environmental conditions, soil drainage and natural rainfall (See 'Irrigation' and 'Water Management' Sections for details).

Biological control of pests - use of natural enemies as part of an Integrated Pest Management (IPM) program which can reduce the use of pesticides. While biological controls which provide effective pest management for turfgrasses are limited, whenever practical these will be included in the program. For example, parasitic nematodes, and bacteria/toxins for insect control are available as described in the 'Insect Control' Section.

Pesticide selection - selecting pesticides which are less toxic, persistent, soluble and volatile whenever feasible. All pesticides selected for use on this site have been screened for their potential to be sources of nonpoint pollution. Only materials which have a documented margin of safety have been included in the recommended list.

Correct application of pesticides - spraying when conditions for drift are minimal. Avoiding application when rain is forecast. Irrigating with appropriate volumes of water when specified. All of these conditions as well as proper calibration of equipment will be scrutinized at every pesticide application by the golf course superintendent.

Correct pesticide container disposal - following accepted methods for pesticide container disposal. This will be a routine practice under the supervision of the golf course superintendent.

Best Management Practices (BMPs) can effectively eliminate the risk of unwanted materials reaching environmentally sensitive areas. Every turfgrass management cultural practice and IPM strategy has employed those BMPs described.

Integrated Pest Management

Integrated Pest Management (IPM) is the use of information about turfgrass pest problems including environmental conditions which may precipitate these problems, and integrating these with turfgrass cultural practices and pest control measures to prevent or control unacceptable levels of pest damage (Ferrentino, 1990). The goal of IPM is to reduce reliance on any one form of pest control, such as chemical pesticide application, in order that all forms of control are applied as appropriate to control damage. Strategies for IPM have been employed for over 30 years. It is a preventive approach incorporating a number of objectives including the following: 1) development of a healthy turf that can withstand pest pressure; 2) judicious and efficient use of chemicals; 3) enhancement of populations of natural, beneficial organisms; 4) effective timing of handling pest problems at the most vulnerable stage, often resulting in reduced pesticide usage. It is an ecologically based system that uses biological and chemical approaches to control. The USDA and EPA currently have initiatives in place which target having 75% of the nation's agricultural land employing IPM methods by the year 2000.

Like BMPs, IPM strategies have been incorporated into every aspect of this plan and have taken into consideration the entire scheme of golf course operations as they relate to environmental impact. Incorporated into this approach are the following: 1) selection of the best adapted turfgrass species and cultivars for this area; 2) the use of proven cultural practices such as aerification, vertical mowing, topdressing, maintenance of proper soil nutrient levels, sound irrigation management and proper mowing techniques to produce a high quality playing surface; 3) a sound pesticide management program to control those pests that exceed a tolerance level for acceptable turf growth; and 4) monitoring of the turf and environmental conditions which may precede pest problems and for population changes in pest and beneficial organism populations.

Experience and training are important requisites to an IPM approach which focuses on six basic components as follows:

1) **monitoring** of potential pest populations and their environment;

2) **determining** pest injury levels and establishing treatment thresholds;

3) **decision making** develop and integrate all biological, cultural and chemical control strategies;

4) **educating** personnel on all biological and chemical control strategies;

5) **timing and spot treatment** utilizing either the chemical, biological or cultural methods;

6) **evaluating** the results of treatment.

One of the most critical components to IPM programs is monitoring. A well-trained and experienced golf course superintendent employs scouting to detect symptoms of pest problems on a daily basis. This approach coupled with compiling a site specific history, and consulting with other superintendents in the area and with specialists in turfgrass management make it a workable program. While economic advantages of IPM are marginal, the sociological and environmental consequences of judicious pesticide use is strong justification for implementation.

SITE DESCRIPTION AND EVALUATION

The site was visited to reconcile topographical maps and golf course design drawings on August 13, 1995. All wetland areas, natural woodland areas, open pasture areas and critical residential boundaries were inspected to detail their impact on golf course management practices.

Physical Setting. The Lion's Gate Golf Course site is located in Santa Clara County, California, in Hayes Valley. The property is enclosed to the west by Watsonville Road, to the north by low hills that separate the valley from the Santa Clara Valley, to the south by a ridge line that includes Lion's Peak, and to the east by Turlock Ave. The eastern portion of the property is currently a horse ranch, with the balance in cattle pasture planted to forage. The entire golf course proper will lie within Hayes Valley and is visible only by one residence. The acreage on which the golf course will be sited is currently in forage and has been grazed for 70 to 100 years. Cattle were present in the fields during the site visit.

Topography. Site topography follows a ridge and valley pattern along the east - west axis. West Branch Llagas Creek is an intermittent, predominantly wet weather, creek system located in the valley with the main channel at approximately 310 ft National Geodetic Vertical Datum (NGVD). The northern hills increase in elevation to approximately 686 to

785 ft NGVD and the southern ridge increases in elevation to approximately 890 to 1,100 ft NGVD. The greatest relief on the property is Lion's Peak which is 1117ft NGVD in the southern portion of the property, and the least relief appears to be 300 ft NGVD along the West Branch Llagas Creek in the valley floor. Site topography and it's impact on management practices has been evaluated for surface runoff.

Soils. The general soils mapping classifies the golf course areas as being primarily Los Robles clay loam (LrA, LrC depending on slope), Garretson gravelly loam (GbB), and Keefers clay loam (KeC2). Garretson soils are well-drained, medium textured underlain by sedimentary alluvium. Vegetation is annual grasses with a few scattered oak trees. The GbB soil at this site occurs on nearly level to gentle slopes, averaging 2 to 4 percent. Favorable rooting depth is very deep, runoff is slow, erosion hazard is slight. Depth to the water table is typically greater than 6 feet. Other characteristics are detailed in Table 1.

Keefer series soils consist of well drained clay loams with a gravelly heavy clay loam subsoil. The soils are moderately fertile and the average water holding capacity is 5 to 7 inches. Subsoil permeability is slow and the erosion hazard is slight to moderate with runoff slow to medium. Additional information is provided in Table 1.

Los Robles soils are well drained having moderately fine textured subsoils underlain by basic igneous rock alluvium. Vegetation is typically annual grasses scattered with large specimen oak trees. These well drained soils hold about 9 to 10 inches of water and the fertility is high. Erosion is not a problem and runoff is very slow.

Table 1. Selected soil characteristics at Lion's Gate Golf Course, Santa Clara County, CA.

Soil Series (Depth ")	Permeability in/hr	Available Water Capacity in/in	pH	CEC meq/100 g	Organic Matter %
Garretson					
0 - 10	2.0 - 6.3	0.12 - 0.14	6.1 - 8.4	5.0 - 10.0	0 - 2.0
10 - 60	0.6 - 2.0	0.10 - 0.14	6.1 - 7.8	10.0 - 15.0	0.5
60 -70	0.6 - 2.0	0.14 - 0.16	6.1 - 7.8	5.0 - 15.0	0.5
Keefer					
0 - 23	0.20 - 0.63	0.14 - 0.16	6.1- 6.5	-	0 - 2.0
23 - 38	0.06 - 0.20	0.12 - 0.14	6.6 - 7.3	-	-
38 - 60	0.20 - 0.63	0.14 - 0.16	7.4 - 7.8	-	-
Los Robles					
0 - 14	0.20 - 0.63	0.14 - 0.16	6.6 - 7.3	-	0 - 2.0
14 - 60	0.20 - 0.63	0.12 - 0.14	6.1 - 7.3	-	-

Surface Water. Three surface water features currently exist at the site. A report describing the jurisdictional wetlands on the Lion's Gate property commented that "...A network of intermittent and ephemeral streams flow from the higher elevations on the perimeter of the central valley into the West Branch of the Llagas Creek. The Creek has eight primary tributaries, four drain the hills north of the valley and four originate on the southern ridgeline. These tributary streams flow during winter and spring months for varying periods and are dry the remainder of the year" (LSA Associates, Inc. 1994). Several seeps occur in the project area where groundwater intersects the ground surface. These often occur near or directly adjacent to stream courses, but there are a few that occur on mid to upper slopes (LSA Associates, Inc. 1994). A man-made stock pond is located near the valley floor near the western end of the golf course location.

During and after construction, the existing pond and West Branch Llagas Creek system will remain. The existing pond will remain as part of the water features on the golf course and will be enhanced by additional created wetland areas. Additional ponds will be constructed for drainage detention and as water features throughout the property.

Ground Water. The soils at the golf course locations are variable with up to 95 feet of alluvial soils derived from the erosion of Franciscan bedrock materials forming the surrounding hillsides (ENGEO Inc. N1-3224-SI report). Boring on the property conducted in 1991 indicated a variable water table with depths ranging from 7 to 17 feet. This is favorable for chemical attenuation due to the slow permeability rate in the soils above the water table.

Climate. The following tables summarize site-specific climatic conditions related to growth of cool- and warm-season grasses. Cool-season grasses such as creeping bentgrass, perennial ryegrass and the fine fescues have an optimum temperature range for growth of 60 to 75 F. For warm-season grasses such as bermudagrass this temperature range is 80 to 95 F.

Temperature. Air temperature information on Gilroy and Los Gatos are presented in Tables 2 and 3 while general climate information related to growing conditions is presented in Table 4.

Table 2. Average monthly maximum and minimum air temperatures (F) at Gilroy, CA, 36 year record.

Temp	**Month**											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tmax[a]	59	64	66	72	78	84	88	88	86	79	67	60
Tmin[b]	36	40	42	44	47	51	53	54	52	48	41	36

[a] Tmax = Maximum monthly air temperature
[b] Tmin = Minimum monthly air temperature

Table 3. Average monthly maximum and minimum air temperatures (F) at Los Gatos, CA, 45 year record.

Temp	**Month**											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tmax	58	62	65	71	76	82	86	85	83	76	66	58
Tmin	38	40	42	43	47	51	54	53	52	48	43	38

[a] Tmax = Maximum monthly air temperature
[b] Tmin = Minimum monthly air temperature

Table 4. Climatic growing season information from Los Gatos, 40 year record.

January Average	**July Average**	**Maximum**	**Minimum**	**Last Frost in Spring**	**First Frost in Fall**	**Growing Season (days)**
47.6	68.2	109	21	Feb. 3	Dec. 16	316

Based on this information, performance of either cool- or warm-season grasses on a year around basis presents problems with heat stress (cool-season in summer) and the need for overseeding (warm-season) in the winter. This is especially true of grasses which are under the highest maintenance levels on greens, tees and fairways since grooming for the best quality of play is dependent on extremely low mowing heights.

Rainfall. Irrigation as a cultural practice is intended to supplement, not substitute for rainfall. Therefore an analysis of irrigation requirement must be made on rainfall annual averages and seasonal distribution. Precipitation data for Gilroy, Los Gatos and Morgan Hill are presented in Table 5.

Table 5. Precipitation data for Gilroy (36 years), Los Gatos (45 years) and Morgan Hill (30 years).

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
Gilroy	4.0	3.5	3.6	1.6	0.2	0.1	0.1	0.1	0.5	0.9	2.6	3.1	20.3
Los Gatos	5.2	4.4	3.9	1.7	0.4	0.1	0.1	0.1	0.3	1.1	3.0	4.5	24.8
Morgan Hill	4.3	3.0	2.6	1.6	0.3	0.1	0.1	0.1	0.3	0.9	2.1	3.5	18.9

An average between all of these sites which surround Hayes Valley is 21 inches. Therefore, precipitation must be supplemented with irrigation to provide adequate water for optimum turfgrass growth.

ENVIRONMENTAL CONSIDERATIONS

Best Management Practices

The quantity and quality of water from a watershed can be protected by appropriate watershed controls and management practices. Preventive and structural controls constitute the building blocks of a watershed protection program. Structural controls are capital improvements designed to remove, filter, detain, or reroute potentials contaminants carried in surface water. The most effective way to manage surface water is by using a comprehensive systems approach that includes integration of prevention practices and structural controls (Eaker 1994).

Through the use of an integrated system of preventative and control practices runoff can be effectively managed. This approach stresses optimum site planning and the use of more natural drainage systems, rather than traditional piped systems. Livingston (1991) suggests that a stormwater management system might be considered as a "Best Management Practices (BMPs) train" in which the individual BMPs are considered the cars. In most cases, the more BMPs incorporated into the system the better the performance of the treatment train. The first cars might include BMPs to minimize generation of runoff and pollutants and the final car could include retention in a reservoir (Eaker 1994).

Preventative measures include nonstructural practices that minimize or prevent the generation of runoff and the contamination of runoff by pollutants. Preventative measures are considered the 'first line of defense' in an integrated storm water management system. The preventative measures for use at Lion's Gate include land use controls and source prevention practices. BMPs suggested by the US Department of Agriculture, Soil Conservation Service (Bottcher and Baldwin, 1986) are outlined in this document in the section "Concept of Best Management Practices and Integrated Pest Management."

Pollutant removal efficiency is a function of three interrelated factors:

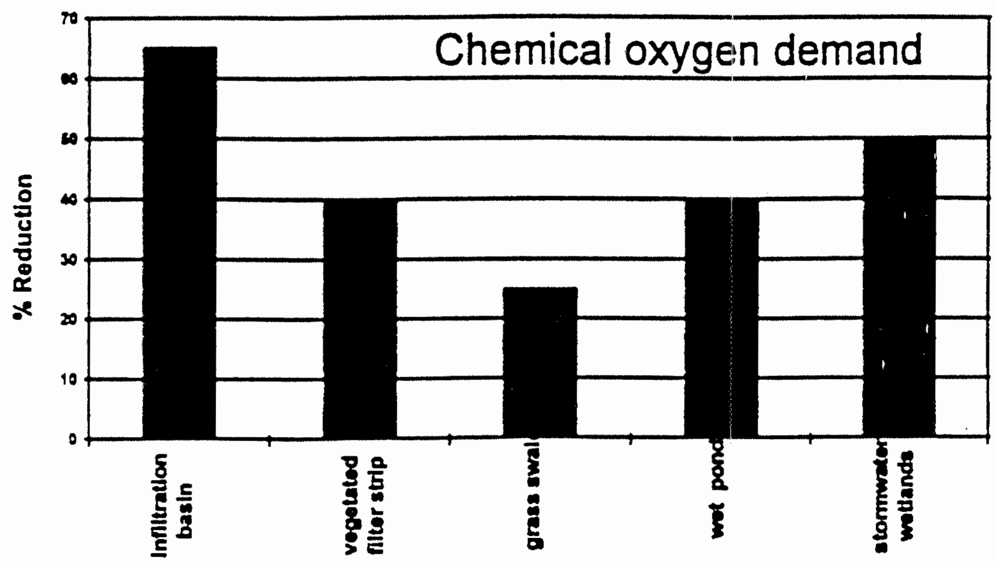
1. the removal mechanisms used by the BMP (which include physical, chemical, and biological processes),
2. the fraction of runoff treated by the BMP, and
3. the nature of the pollutant being removed.

BMPs that utilize settling and filtering processes are relatively effective at removing sediment and pollutants that are bound to sediment particles. Turf buffers are very effective filters. Turf density, leaf texture and canopy height are physical factors which restrain soil erosion and sediment loss by dissipating impact energy from rain and irrigation water droplets providing a resistance to surface movement of water over turf Ponds and infiltration BMPs can achieve 60 percent to 100 percent removal efficiencies for sediment. Infiltration BMPs are capable of similar removal efficiencies for sediment by are subject to clogging if sediment inputs are excessive, Wet ponds and extended-detention ponds with shallow marshes have a moderate to high capability for removing both soluble and particulate pollutants because they utilize settling and biological uptake.

Vegetative practices. Vegetative practices act as natures biofilters to reduce stormwater flow and pollution. These practices use the natural processes of infiltration, filtration and biological uptake to reduce flows and pollutant loadings. Filter strips, buffers and grassed swales are examples of vegetative practices. Effectiveness of the measures is shown in Fig 2.

Filter Strips. Filter strips are used to a great degree throughout Lion's Gate Golf Course. These areas are a minimum of 25 feet in width, but will be hundreds of feet wide in some locations. They are intended to treat stormwater runoff. Enhancing the effects of the filter strips are the preferred wooded area strips that surround the development. Each of these provides a method to disperse runoff and limit velocities. Stormwater is discharged into the filter in a thin, sheet flow to maximize infiltration, filtration and biological uptake by the vegetation.

Buffers. The most sensitive portions of water courses are the areas immediately adjacent to the water. Disturbance within and adjacent to watercourses can degrade water quality by increasing the availability and transport of pollutants. The retention of vegetated, undisturbed buffers along watercourses is, therefore, one of the most effective practices used to protect



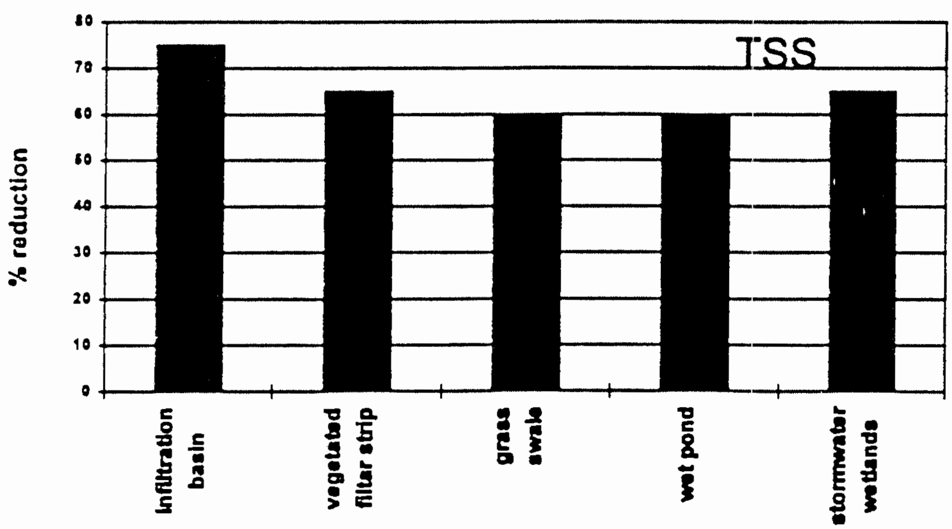


Figure 2. Relative effectiveness of Best Management Practices to protect surface waters. from US Environmental Protection Agency, *Guidance Specifying Management Measures For Sources of Nonpoint Pollution in Coastal Waters.* 1993.

water quality. Buffer areas will be a minimum of 25 feet in width. In areas where non-play buffers are less than 25 feet, roughs will be considered buffers.

Grassed Swales. Vegetated swales will be used to permit filtering and infiltration of stormwater. The grasses for these swales are to be of the water tolerant and erosion resistant type. These types of swales are to be used in gentle slopes where slower velocities will enhance the filtering and infiltration processes. The effectiveness of swales in reducing flows and pollutants is similar to filter strips.

Detention/Retention practices. Detention and retention practices provide an important link in the Best Management Practices "train" for golf courses.

Hydrologic Based Controls. The control of peak flow is a primary measure to minimize erosion and sedimentation problems in runoff. To this end the project will employ wet retention basins that will capture stormwater and limit release rates and serve as watershed protection devices. The stormwater storage provided on site will reduce peak flow levels (see Golf Course and Post Construction Effects- runoff, this section).

Wet retention ponds. Wet retention ponds are one of the most effective structural BMPs for protecting water quality. Wet ponds utilize a permanent water surface to achieve a high removal rate for sediment, nutrients, and metals. Aquatic plants and biochemical processes within the pond enhance the removal of nutrients, metals and other pollutants. Secondary benefits include recreation, aesthetics, and wildlife habitat. Pollutant removal efficiencies of wet ponds vary based on the pollutant of concern and the size of the permanent pool. The highest removal efficiencies are achieved in larger ponds where the ratio of basin volume to the volume of runoff from the average storm is greatest. Wet ponds are also effective in reducing peak discharges, downstream flooding and stream bank erosion.

Infiltration Controls. Infiltration controls are a general category of structural BMPs that maintain or enhance the ability of water to percolate through the soil profile. Infiltration generally improves water quality by allowing natural physical, chemical, and biological processes to remove pollutants. Pollutant removal in the artificial media or soil profile occurs through filtration, absorption and oxidation by soil microorganisms. Examples of structural infiltration BMPs include infiltration basins, infiltration trenches, dry wells, and porous pavement. It is recognized that the site's till soils preclude the effective use of infiltration for general stormwater control at this site.

No runoff from any impervious or pervious area within the project will be directly discharged into an environmentally sensitive area without filtration and/or detention. Maintenance practices will be conducted on a routine basis to ensure that the BMPs are operating as efficiently as possible.

Surface water and Golf Course Construction and Grow-in.

Concern with surface runoff is critical during construction and during the "grow-in" period when the bare soil and thin turf cover makes the site most vulnerable.

Construction. Golf course clearing will include installing erosion control barriers between the areas being cleared for fairways and the natural wetlands. These should remain in place after turf buffer strips are established until all cleared areas have adequate turf cover to prevent erosion. Turf buffer strips of at least 15 feet have been shown to improve water quality in polluted runoff (Doyle et al.,1977). The effectiveness of turf as a buffer is related to the fibrous nature of the turf root system and the architecture of the turf canopy. Buffer strips should be a minimum of 15 feet wide and fully established with a one-inch height of cut before removal of erosion barriers. As the turf matures, potential runoff problems will diminish.

Sodding is an effective mechanism to control runoff and erosion. On slopes greater than 15%, a 20-foot stabilization buffer will be established. The stabilization buffer will consist of a 4-foot wide strip of sod at the base, and then extending up-slope, a 6-foot seed bed, a second 4-foot sod strip, and a 6-foot seed bed. If "native" plants are to be used, hydroseeding/ hydromulching and/or erosion control mats will be used. Care will have to be taken during the grow-in phase with irrigation management to prevent runoff and sediment movement into wetlands areas and allow the buffer areas to adequately filter any possible surface nutrient/sediment movement.

Studies at the Pennsylvania State University and the University of Maryland have shown that for significant runoff to occur on turf areas with slopes up to 14%, rainfall or simulated rainfall had to exceed 3 inches/hour. Grassed areas are extremely effective in reducing soil losses compared to other cropping systems with measured soil losses of only 0.03 tons/acre on grassed areas with a slope of 16% on a silt loam soil. Additionally, any runoff from turf areas will be directed into a buffer area, vegetated sale, or other BMP for filtration, therefore there should be no negative impact on water quality in the wetlands areas.

Grow-in. Controls put in place during golf course clearing should remain in place after turf buffer strips are established and until all cleared areas have adequate turf cover to prevent erosion. Turf buffer strips are an integral part of maintenance of surface water quality (American Water Works Association 1991, Eaker 1994). Care will have to be taken during the grow-in phase with irrigation management to prevent runoff and sediment movement into wetlands areas and allow the buffer areas to adequately filter any possible surface nutrient/sediment movement.

Golf Course and Post Construction Effects

Surface Water. The main concerns with surface water and golf courses are that transport of sediments, nutrients and pesticides from more intensively maintained turf areas will impact surface water quality. The proposed Lions Gate Golf Course facility design makes it difficult for runoff contaminants to adversely affect surface water quality or associated wildlife because all runoff from impervious surfaces will be filtered through areas which have a vegetative cover. No runoff from the golf course areas will leave the golf course without being filtered through turf, or other vegetative buffer areas. All fairways and roughs adjacent to wetlands will be contoured so that all surface water movement will be retained within the golf course proper to allow for drainage and filtration through a grassed area or collected through the storm water management system. Fairways which do have drainage designed to flow from the fairways will have the surface flow directed into a rough or buffer area before entering any wetland area.

Controlled and uncontrolled discharge from surface drainage into naturally occurring wetland/conservation areas directly from the golf courses, landscaped areas, parking lots and roads will not occur. Post development drainage plans include filtration and dilution for all runoff. All storm water runoff from development property, roadways and the golf course will be directed into filtration areas, such as golf course fairways, and grassed swales before discharge into wetlands or surface waters.

Runoff. Surface runoff is created by a complex series of processes in response to rainfall. Soil, vegetative cover and slope are factors which interact to determine the amount of runoff which will occur under a given set of conditions. A runoff coefficient can be calculated for surface areas based on a ratio of the peak runoff rate to the rainfall intensity. Runoff coefficients for areas with turfgrasses frequently are evaluated at between 0.18 and 0.28 depending on soil texture. A similar evaluation for a street would be 0.83 (Jarrett, 1985). Studies at Pennsylvania State University (Watschke and Mumma, 1989) and the University of Maryland (Gross et al., 1990; Welterlen et al., 1989) have shown that for significant runoff to occur on areas that have a dense actively growing turf cover even on a 14 percent slope that rainfall or simulated rainfall had to exceed 3 inches/hour. Under California conditions the frequency of a rainfall event of this magnitude which will exceed a duration of 15 minutes is expected no more often than once every 50 years, a duration longer than 30 minutes occurs no more often than once every 100 years, and durations of one hour or longer to occur at estimates of more than 100 years (Jarrett, 1985).

Additionally, the Lion's Gate Golf Course development would reduce the flow from the site to West Branch Llagas Creek and would also act to reduce the estimated peak flow rate from the western portion of the watershed (Hydrology and drainage report, Shaaf & Wheeler, 1995). This report estimated discharge rates for the 10-year and 100-year storms for existing and project conditions using the US Army Corps of Engineers HEC-1 computer model and the Soil Conservation Service curve number methodology. The following is from page 4 of the report:

> *"The results of the hydrograph analysis show that the proposed golf course development would reduce the flow from the site to West Branch Llagas Creek. The estimated 100-year peak flow would decrease from 8 1 0 cubic feet per second to 785 cubic feet per second, a decrease of 3 percent. The 10-year peak flow rate would decrease from 375 cubic feet per second to 330 cubic feet per second, a decrease of 12 percent.*
>
> *The golf course development would decrease the estimated peak runoff from the watershed for two reasons. The change from natural range land to irrigated turf would reduce the average curve number for the area in the hydrologic model. This would increase the calculated loss of rainfall into the soil cover and decrease the runoff. The physical explanation is that the irrigated turf maintains a dense grass cover which retains rainfall and reduces runoff. The natural range grasses tend to be sparse, with exposed dirt between grass clumps. In addition, the natural grasses are dry in the fall, sprout during the winter, and are cropped by grazing in the winter and early spring.*
>
> *The proposed golf course pond would also act to reduce the estimated peak flow rate from the western portion of the watershed. The proposed detention storage would act to reduce the peak flow. The effect of the detention storage is limited by the drainage area above the lake. The watershed above the lake is 0.57 square miles, or approximately one-third of the West Branch Llagas Creek watershed upstream of Turlock Avenue. The detention storage in the lake would reduce the estimated 100-year peak flow at the lake from 310 cubic feet per second to 250 cubic feet per second, a reduction of 60 cubic feet per second. However when routed downstream and combined with the larger watershed downstream, the detention storage reduces the peak by approximately 15 cubic feet per second. This is due to the difference in timing between the hydrograph from the upper watershed and the lower portion of the watershed. The peak flow from the upper watershed is delayed by the travel time along the creek channel and arrives after the peak from the lower watershed. Therefore the peaks do not add directly. The detention storage in the upper watershed acts to increase the timing difference of the upper watershed.*

Turf Buffers. When conditions exist so that runoff does occur, grassed areas are extremely effective in reducing soil losses compared to other cropping systems. In a comparison of soil loss from conventional agriculture with soil loss from turf, measured soil loss from tobacco production (4210 lbs/acre) were 842 times higher than from turf areas (5 lbs/acre) even with a slope of 16 percent on a silt loam soil (Gross et al., 1987; Gross et al., 1990). Where polluted runoff from agricultural areas has occurred, establishment of turf buffer strips of only 15 feet have been shown to improve water quality (Doyle et al., 1977). Wauchope (1978) noted that in cases where water quality has declined due to agricultural practices leading to loss of nutrients and erosion, grass buffer strips placed between treated fields and surface waters have significantly reduced the problem. This is related to the architecture of the turf canopy and the fibrous nature of the turf root system. Turf density, leaf texture and canopy height are physical factors which restrain soil erosion and sediment loss by dissipating impact energy from rain and irrigation water droplets providing a resistance to surface movement of water over turf. Turfgrasses have an extensive fibrous root system with 80 percent of the root mass found in the upper 2 inches of the soil profile (Welterlen et al., 1989). Therefore it is a combination of the turf canopy and root mass which have a strong soil stabilizing effect.

Golf course design plans call for a minimum 25 foot buffer or rough area buffer of vegetation to prevent direct runoff from the golf course fairways and roughs into wetlands; thus, providing exceptionally good filtration. Therefore, buffering of surface water from more intensively managed turf areas greatly exceeds the 15-foot minimum previously noted. Within the roughs, specific restrictions have been placed on fertilizer and pesticide use (see sections on Agronomic Considerations and IPM). Within the rough area buffer, no pesticides will be used.

Nutrients and Pesticides. The major concern over contamination of surface waters from runoff focuses on nutrients and pesticides. From turf areas, the major concern over contamination of surface waters from runoff containing nutrients is for nitrates and phosphates.

Phosphorus. Phosphorus is unlikely to create problems except under very specialized conditions in ponds and streams. Even though the granular phosphorus fertilizer carriers are greater than 88 percent water soluble and totally water soluble forms exist for liquid application, the phosphorus becomes rapidly fixed within the soil profile and vertical movement in most soils is only 0.3 to 1.2 inches/year (Young et al., 1985). Possible phosphate movement due to soil erosion could be a point source of pollution in turf systems (Walker, 1990). However, these instances would be very site specific and nonexistent where BMPs are employed and runoff is retained to be filtered within the golf course. Besides the work previously discussed, recent research at Pennsylvania State University (PSU) by Watschke and Mumma (1989) found no sediment loss associated with runoff from turfed plots and observed phosphate losses which averaged only 0.5 lb/acre when runoff did occur. Their study was conducted on slopes ranging from 9 to 14 percent under intense precipitation simulations. Total phosphorus loss in surface runoff for the entire growing season from a tall fescue/Kentucky bluegrass turf was only 0.0178 lbs/acre (Gross et al., 1990). More recent work at PSU found that in runoff from creeping bentgrass and perennial ryegrass turf conditions phosphate loss was reduced compared to the initial concentrations in the irrigation water by up to 94%. Similarly, phosphate concentration in leachate from the same turf areas found up to a 77% reduction (Linde et al., 1994). This indicates the turf is acting as a filter to remove nutrients from the water source prior to runoff or leaching occurring. The most vulnerable time for phosphate to be lost is immediately following fertilization when excess irrigation or heavy rainfall would cause movement. This occurrence can be completely avoided by 1) not fertilizing when rain is predicted; and 2) making certain that fertilizer is irrigated to remove the material from the leaves into the soil immediately following application.

Nitrogen. Nitrate movement as surface runoff can also be minimized by management decisions. Research has shown that the total nitrogen loss from a fertilizer application can be reduced from 9.5 percent of the total amount applied using urea as the nitrogen carrier to 0.26 percent by changing to a slowly available carrier such as sulfur coated urea (Dunigan et al., 1976).

In the work conducted at Pennsylvania State University (Watschke et al. 1989; Watschke and Mumma, 1989), potential pollution problems from concentrated runoff under intense irrigation events was studied. Rainfall simulation of 6 inches/hour (greater than a 100-year rainfall event) was necessary for runoff to occur. Their initial work found that a 3-inch per hour rainfall simulation produced no runoff on turfgrass plots where proper site preparation prior to planting and optimum turf establishment had occurred, despite there being a slope ranging from 9 to 14 percent. At the 6 inch/hour rate, undiluted research plot runoff water quality remained high having nitrates below the 10 part per million (ppm) drinking water standard on 28 out of 29 sample dates after runoff rainfall simulation. In evaluations of the loss of nitrogen in surface runoff under nominal environmental conditions, Morton et al. (1988) found that surface runoff occurred on only two storm events on a Kentucky bluegrass turf in Rhode Island during 2 years of monitoring. Previous environmental factors (rainfall on frozen ground with snow cover and saturated soils from prior rainfall) helped generate the runoff. Nitrogen losses from these events were 0.089 and 0.356 lbs./acre or only 0.16 percent of that applied. Gross et al. (1990) observed that the loss of nitrogen in the surface runoff from a tall fescue/Kentucky bluegrass turf was only 0.12 lbs/acre for an entire growing season (0.05 percent of that applied) compared to 10.4 lbs/acre for tobacco, almost 90 times greater. Meisinger and Randall (1991) noted that nitrogen losses in surface runoff are usually small and depend on degree of soil cover, source of nitrogen applied, rainfall intensity immediately after application and soil properties. They also noted that the largest losses will occur when a soluble nitrogen source is applied to a bare soil and a significant runoff event occurs within one day of application. Linde et al. (1994) found that nitrate-N in concentrated runoff from experimental turfgrass plots never exceeded the drinking water standard of 10 ppm and there was actually a decrease of up to 96% in the nitrate-N found in runoff compared to nitrate-N found in the irrigation water. Similar results were found in the leachate with up to 80% of the nitrogen removed compared to amounts found in the irrigation water. Best Management Practices if implemented effectively can effectively eliminate problems associated with nutrient loss during runoff or leaching.

Pesticides. Movement of pesticides into surface water during runoff would depend on the chemical nature of the material, length of time between application and rainfall, and the volume and intensity of rainfall following application. Watschke and Mumma (1989) reported on the potential for surface movement of selected pesticides in undiluted runoff on research plots under an extremely high irrigation rate of 6 inches/hour. They monitored for pendimethalin (a commonly used preemergence herbicide); 2,4-D, 2,4-DP, and dicamba (commonly used postemergence herbicides); and chlorpyrifos (an insecticide). For pendimethalin and chlorpyrifos, no chemical was detected in any of the runoff on all 24 sample dates. These materials based on their chemistry become fixed in the soil after application and do not move. For 2,4-D and dicamba, the amounts in the concentrated runoff exceeded federal water standards on only 4 and 1 sample date out of 24, respectively, despite these materials being more water soluble and made as foliar applications. However, these levels were only found when runoff occurred within 2 days after application. They noted that under natural storm water runoff conditions and subsequent dilution outfall concentrations would be considerably less. Similar findings with 2,4-D applications were noted by Thompson et at. (1984). Under field conditions the greatest dislodgeable leaf residues of 2,4-D on Kentucky bluegrass were less than 4.5 percent of the total applied at time 0, immediately after application, indicating very rapid adsorption to the leaf surface and a strong affinity for adsorption. No dislodgeable residues were detected at 3 days after application. Hurto (1991) noted that the dissipation rate of foliarly applied pesticides depends on volatilization, plant absorption and photodecomposition. He summarized that research has found that less than 10 percent of the applied rate amount can be found as foliar residue the day after application and that within 1 to 3 days after application levels drop to between 1 and 3 percent. Careful attention to application timing with respect to rainfall and irrigation management can minimize removal of materials which could become nonpoint pollutants. Smith (1995) found that approximately 8% of the applied amount of a 2,4-D+mecoprop+dicamba herbicide application left treated plots due to runoff over a 25-day collection period. Eighty percent of this amount moved during the first irrigation event following application. Since only 6 hours are required after treatment for maximum efficacy, it was suggested that an irrigation 6 to 12 hours after application to wash the excess pesticide from the foliage into the thatch and/or soil would negate the possibility of runoff. Watschke and Mumma (1989) concluded that nutrient and/or pesticide concentrations in storm water and the impact on surface water would be considerably less than other urban pollutants not associated with well managed turfgrass areas.

Subsurface Drainage. The factors that protect surface water also form the basis for protection of subsurface waters. Several design factors will ensure that there is adequate on-site retention. The first one-half inch of surface runoff will be treated through use of BMPs.

The putting greens will drain through vegetated turf buffers of at least 25 feet in width and/or into water quality control basins, dry wells, or the irrigation pond. There will be grass-lined swales providing for a minimum of 25 feet of overland flow for filtration from these subsurface drainage collection areas before discharge, or discharge will be to drywells located at least 25 feet from a wetland. Where subsurface drainage cannot meet these criteria, filtration traps constructed of a sand/charcoal filter will be installed adjacent to the putting green.

Ground water. The factors that protect surface water also form the basis for protection of ground water. Kaldveer Associates reported that "Ground water levels have been reported to range from a depth of 13 to 20 feet in the main valley area after a heavy rainy season. However, these levels would vary with the season and the rainfall" (Kaldveer Associates, 1989).

Ground water is generally of good quality, with the exception of nitrate contamination (Nolte & Associates 1990). In 1978 - 1979, nitrate levels near the project site ranged from 30 to 80 mg/l; in January of 1988 nitrate concentrations were from 15-17 mg/l; and in January of 1990 concentrations were 27 - 34 mg/l. There report indicates that "Nitrate contamination commonly occurs in unconfined aquifers underlying areas of intensive agricultural activity, where excess applied fertilizer migrates to the ground water body either via deep percolation through the soil or by percolation from surface waters fed by agricultural runoff. The

California Department of Health Services (DHS) has established a primary maximum contaminant level (MCL) of 45 mg/l for nitrate." Careful management of nitrate, as described in the Agronomic Considerations of this document, will be required. Management along with effective implementation of Best Management Practices can effectively eliminate problems associated with nutrient loss during runoff or leaching (see above, Surface water, Nutrients and pesticides, nitrogen).

The depth to ground water and anticipated rates of soil infiltration and percolation, provide protection to ground water quality. Careful management of materials (as indicated in this management document) will also reduce the losses of pesticides and nutrients to groundwater.

To provide the maximum attenuation of nutrient and pesticide concentrations, surface waters are directed over turf areas, and buffers and into dry and wet detention basins as discussed above. Also, where subsurface drainage is installed, water should be discharged through a turf buffer area as described above. This is most critical with putting green drainage lines which may contain trace amounts of nutrients and pesticides.

Careful attention must be paid to the management of the golf course relative to selection and application of materials, and in monitoring for nonpoint losses. Management practices to reduce the potential for unwanted movement of materials, and a monitoring program to identify the success of the program are contained in subsequent chapters in this plan.

Soils. The general soils mapping classifies the golf course areas as being primarily Los Robles clay loam (LrA, LrC depending on slope), Garretson gravelly loam (GbB), and Keefers clay loam (KeC2). Garretson soils are well-drained, medium textured underlain by sedimentary alluvium. Runoff is slow and erosion hazards are slight on the Garretson and Los Robles soils. For the Keefer series, runoff is slow to medium and the erosion hazard is slight to moderate.

It is critical these soils be managed so that judicious use of irrigation minimizes percolation below the turf root zone which would be wasteful and present conditions for nutrient and pesticide leaching. The soil water holding capacity on site averages low to moderate. This requires that supplemental irrigation be used for turfgrass maintenance during periods of water deficit. While the seasonal variation noted in Table 2 is a guideline for irrigation volumes, under drought conditions moisture stress can occur in a matter of days under high solar radiation levels. Therefore, it will be imperative that constant attention to irrigation management be maintained.

Wetlands. An active wetland management program will be in place. This management program will be incorporated into the overall maintenance program for the golf course to ensure that course maintenance activities focus not only on maintaining golf turf quality and course playability but also on maintaining the health and functional characteristics of the existing wetland areas, wetland enhancement plantings, and the wetland buffer filter strips.

Critical elements of the wetland management plan include periodic monitoring, maintenance of proposed vegetative conditions, restoration or repair of damaged areas, and record keeping.

Monitoring. All wetland and watercourse areas on the site which are located within 100 feet of club facilities (i.e., golf play areas, the clubhouse, the maintenance facility, roadways, detention berms, parking areas) will be inspected twice annually: once in the winter and once in the fall. Inspections will focus on examining the condition of vegetation, the color and clarity of surface waters, and the condition of ground cover. In conjunction with the wetland inspections, the condition of vegetated buffer strips will be inspected for the presence of debris, the integrity of vegetative cover, and the existence of channels or other indicators of concentrated stormwater flow.

Maintenance of Vegetative Conditions. Vegetative conditions established during construction are to be maintained in the future. These conditions include the wetland area near the pond and the herbaceous composition of the buffer filter strips. Cut material will be hand removed from the wetlands. No machinery will be used at any time within the wetland areas of the site. The herbaceous cover of the buffer filter strips will be maintained by mowing at a frequency of twice per year: a vegetation height of approximately six inches will be maintained in the buffer filter strips.

Restoration and Repair of Damaged Areas. Observed damage to existing wetland topography and ground cover conditions will be remedied immediately. Such damage may include, but is not limited to, siltation, erosion, and compaction or trampling by golfers. Accumulated silts will be removed, eroded channels will be filled, and compacted areas will be raked. All such repairs will be conducted using hand tools only. Damaged ground cover vegetation will be restored by seeding or planting depending on the vegetation damaged. Channels which form within the buffer filter strips will be filled and immediately reseeded. If additional grading is necessary to prevent the reformation of the channel, such grade adjustments will be implemented to restore sheet flows. Additional level spreaders will be installed as necessary. Trash, golf balls, and other debris will be removed from wetlands and buffers when observed.

Record Keeping. An annual record of all wetland and filter strip inspections and remedial actions will be maintained as part of the maintenance records for the golf course. These records will include the dates of inspection, inspection findings for each wetland and filter strip location, a description of each remedial action taken, and the dates of such actions.

Maintenance of Surface Water BMPs. Maintenance is required to ensure proper functioning of the Best Management Practices implemented at the golf course.

Water Quality Basins (Infiltration types and Wet Ponds). To assure the long-term operation of the stormwater treatment facilities, a schedule of inspections and maintenance, will be maintained so that the structural devices are in good working condition.

1. Infiltration basins should be placed into operation after the watershed is grassed or revegetated to prevent the rapid accumulation of sediments in the basin. Erosion control measures will be in place during construction.

2. Inspections should occur monthly.

3. Inspections should examine differential settling of the embankment, cracking, erosion, seepage through embankment, or tree growth on the embankments.

4. Inspections should also observe accumulations of sediments and the vigor of the grasses lining the basins.

5. Inspections should be made of the control structure for debris removal on a twice annual basis.

6. Maintenance should be performed based upon the inspections noted above, and should include:

   a. Repair of embankments or structural repairs.

   b. Mowing to prevent tree and heavy shrub growth

   c. Debris and litter removal

   d. Erosion Control - increase upland erosion control practices if necessary

   e. Sediment removal - the clean-out frequency will depend on the sediment load, however, any sediment that prevent the proper vegetated growth in the basin should be removed with a rake to maintain root growth. Sediments over 5 inches should be removed as soon as practicable. In addition, if the porous nature of the basin is affected, the interior of the basin shall be tilled.

f. Underdrains shall be inspected to insure that they are operating. In some cases they may have to ve cleaned by conventional rooting methods.

Catch Basins. All site catch basins should be inspected regularly and cleaned on an annual basis. Sumps in any catch basin or other structure should be cleaned when the debris has filled the sump to 1/2 its capacity.

AGRONOMIC CONSIDERATIONS AND REQUIREMENTS

Golf Course Design and Post Construction Impact

Development plans include an 18-hole golf course designed by Robert Trent Jones II International around a theme which enhances the natural conditions of the site and maintains environmental integrity. The land use design and buffering of the golf course fairways and roughs at the edge of wetland and watercourses will ensure maintenance of water quality into these areas.

Surface Runoff. Surface runoff should be directed into buffer areas prior to discharge into any surface water. This will allow attenuation of sediment and nutrient loads and prevent degradation in water quality. See the section in this report on Surface Water and Golf Course Intersections.

Subsurface Drainage. Subsurface drainage will be directed into buffer areas for filtration purposes. This is most critical with putting green drainage lines which may contain trace amounts of nutrients and pesticides.

Soil Mixes and Modifications

Putting Greens. With the amount of play expected on today's golf courses, it is important that greens are constructed with surface and internal drainage that will maximize the playability even immediately after rainfall or irrigation. Construction techniques will ensure that surface runoff is directed to adjacent filtration areas and that materials which provide good drainage and resist wear and compaction will be utilized for construction of the playing surface. For this reason, the greens will be constructed based on a United States Golf Association method as detailed in "USGA Recommendations for a Method of Putting Green Construction" (USGA Green Section Record, 1993).

This method of construction is based on the principle of a perched water table. This unique system takes advantage of discontinuity within the soil profile which disrupts internal drainage until saturated conditions occur. By using a four inch layer of primarily one-quarter inch diameter gravel, overlaid with 18 inches of a specified high sand content intermediate and/or root zone mixture, water will be retained in the soil profile for turfgrass use without immediate drainage until saturated conditions occur. Materials which may have a propensity to move in the soil solution are held for maximum attenuation times and if trace amounts are transported under saturated flow conditions, maximum dilution within the soil profile will occur. The entire putting green is underdrained by a series of perforated pipes installed at the subgrade. These are spaced on no less than 15-foot centers and will have outflow directed to either a turf buffer and/or water quality basins, drywells, or the irrigation pond. Drain clean outs will be installed to provide access for maintaining adequate water drainage. This type of system affords the best approach to irrigation management and controlled discharge of excessive rainfall from the more intensively managed areas of the golf course.

Successful construction of a USGA green requires these specifications to be rigidly followed for five basic values which are used as criteria for recommending the root zone mixture. These values are percentages of total porosity; capillary (micro-) pore space which contributes to the water holding capacity; non-capillary (macro-) pore space which adds aeration porosity; saturated conductivity (water permeability); and organic matter content. In addition, particle size analysis and mechanical analysis are usually run as the percentage of sand, silt and clay as well as the different percentages of the sand fractions. These will determine how fast the soil will drain and its potential to resist compaction from traffic and wear. To meet the requirements, samples of materials to be used in construction will be sent to a qualified soil physical testing laboratory to determine the proper ratio for mixing of these materials to meet the standards listed in Table 6. Subsequent recommendations for pH adjustment of the root zone mixture and addition of fertilizers will depend on the final ratio of materials used and will be made based on chemical analyses of the mixture.

Table 6. Standards for physical parameters to meet the specifications for a green constructed to the USGA Green Section method.

Parameter	**Minimum allowed**	**Maximum allowed**
Total Porosity	35 percent	55 percent
Capillary Porosity	15 percent	30 percent
Noncapillary Porosity	15 percent	25 percent
Saturated Conductivity	6 to 12 inches/hr	12 to 24 inches/hr
Organic Matter Content	1 percent by weight	5 percent by weight
Particle size		
Medium & Coarse sands	60 percent	--
Fine sand	--	20 percent
Very fine sand	--	5 percent
Silt	--	5 percent
Clay	--	3 percent

Tees. Tees are the most trafficked areas on the golf course considering number of players and size. The higher height of cut on the tee surface provides a much deeper root system in the soil profile and imparts considerably better wear tolerance. Use of a modified soil mix for tees consistent with the greens is commonly done to ensure resistance to compaction. Typically tee areas are not as intensively managed as greens and the nutrient and pesticide requirements are lower. Surface runoff would be directed into adjacent fairways or other vegetative areas.

Fairways and Roughs. Soil modification of fairways and roughs is not practical since this encompasses a significant portion of the acreage involved with the golf course development. Soils will be disturbed during the construction process to ensure no hardpans or compacted areas interfere with rooting during establishment. Soil samples will be analyzed from as many locations as necessary once final grading begins so that pre-planting fertilization recommendations can be made.

Turfgrass Selection

Over the years extensive turfgrass breeding programs and research have resulted in grass varieties that are exceptionally well-suited for golf course turf. Cultivars selected for use at Lion's Gate Golf Course will be those that are efficient in water use and low in susceptibility to insects, disease and weed infestation. Recommendations have been made in consultation with the Agronomist of the Western Region for the US Golf Association Green Section, Mr. Pat Gross and with Mr. Skip Lynch, Technical Agronomist for Seed Research of Oregon who works extensively with golf courses in the western US.

The natural characteristics of the turfgrasses limit movement of pesticides and fertilizers into underlying soils and ground water. Thatch produced by the turf acts as an organic filter to chemically bind pesticides that might otherwise enter the local surface and ground waters. Producing a healthy turf, which is needed for a golf course, has the added benefit of immobilization and microbial degradation of pesticides retained in the thatch layer. In addition, turfgrass root systems are quite extensive and fibrous, and are able to adsorb and absorb applied pesticides that might penetrate the canopy and thatch and reach the roots. Thus, a healthy turf results in effective nutrient and pesticide retention and control.

Greens, Tees and Fairways. The following sections discuss turfgrass selections for greens, tees and fairways.

Greens. Creeping bentgrass (*Agrostis stolonifera*) as a blend of two or more improved cultivars such as Providence and SR 1020 (the blend name of Dominant), Crenshaw, Southshore, Putter and Pennlinks are recommended at a seeding rate of 1.25 lbs./1000 sq.ft. These newer varieties have been shown to have superior heat and disease tolerance. They have excellent texture, color and density.

Tees and Fairways. Will be seeded to perennial ryegrass (*Lolium perenne*). A blend of at least three improved cultivars will provide a quality playing surface yet have desirable characteristics as to insect and disease resistance which makes them an excellent choice for use in this location. Varieties should be chosen which have ranked well in the National Turfgrass Evaluation Program (NTEP) trials and which will provide genetic diversity for tolerance to disease pressure. All of the varieties selected should have a minimum of 85% endophyte enhancement provided by three different endophytes which will add biological resistance to disease and insect problems. Seeding rates should be 250 pounds per acre on fairways and 325 pounds per acre on tees.

Roughs and Rough Buffers. These will be seeded to a mixture of hard fescue (*Festuca longifolia*), chewings fescue (*Festuca rubra* ssp. *commutata*) and perennial ryegrass. The mixture recommended is 35% hard fescue, 25% Chewings fescue and 40% perennial ryegrass. All should have greater than 85% endophyte enhancement. This combination will perform well under a minimum of turf maintenance and have excellent disease and insect resistance. Seeding rate should be 200 pounds per acre. Overseeding in the fall may necessary on a periodic basis to improve stand density where thinning has occurred due to pest problems. Overseeding rates should be from 100 to 200 pounds per acre.

Naturalized and Non-play Areas. In the non-irrigated areas, a mixture of fine fescues and Molate fescue is recommended for low maintenance and to provide a naturalized aesthetic appearance. This mixture should be 35% hard fescue, 35% Chewings fescue; 20% blue fescue (*Festuca glauca)*; and 10% Molate fescue (*Festuca rubra*), a California native. These grasses are well adapted to dry-land areas and persist under little to no maintenance. A seeding rate of 175 pounds per acre is recommended.

Construction and Grow-In

Soil erosion is most likely to occur during the construction and grow-in phases of golf course development. The major pathway for phosphorus loss is soil erosion, because sediment is the carrier. Therefore, any technique effective in reducing soil erosion will also reduce phosphorus losses. Buffer strips, grass waterways, berms, sodding steep slopes and silt fences are examples of structural techniques for erosion control that will be used during construction and grow-in. Sodding rough and turf buffer areas is an effective mechanism to control runoff and erosion. On slopes greater than 15%, a 20-foot stabilization buffer should be established. The stabilization buffer will consist of a 4-foot wide strip of sod at the base, and then extending up-slope, a 6-foot seed bed, a second 4-foot sod strip, and a 6-foot seed bed or the use of hydroseeding/hydromulching and/or erosion control mats. This 20-foot sod stabilization buffers on slopes greater than 15% will greatly reduce problems associated with runoff. Other areas will be seeded at rates to ensure quick establishment.

Final plantbed preparation will ensure surfaces are reasonably free of large clods, roots and other debris that would interfere with sodding and seeding and subsequent maintenance operations. Initial pH correction, if necessary, and fertilization will be based on soil test recommendations and will be applied prior to planting. Care will be taken in fertilization because of the potential for runoff at this time. Lastly, the plantbed will be floated with a drag to be sure it is smooth and firm for planting.

Once the course has been planted, the future of the project will depend on how well it is grown-in and maintained. The objective of the grow-in program is the rapid establishment of a high quality turf cover to minimize water erosion and weed infestation.

The judicious use of water and fertilizer is essential for a quality turf cover. While areas must be kept continuously moist, they must not be kept excessively wet, to minimize the potential for erosion. Mulching may be necessary on some slopes for soil erosion control. On roughs and buffers where irrigation may not be available, a mulch might be used to preserve topsoil and provide favorable moisture conditions for seedling establishment.

The golf course superintendent and irrigation technician should be on hand when installation of the irrigation system begins. Since efficient water use and conservation of irrigation water are the responsibility of the superintendent and technician, they will need to become acquainted with the capabilities of the irrigation system. In addition, they will be in charge of the growing-in program.

Basic Growing-in Program

Watering. Planted areas should be kept continuously moist throughout the germination period of approximately three weeks. This means frequent, light watering rather than soaking the soil when it becomes dry. Water should not be allowed to puddle or run off the surfaces. After germination, watering frequency should be decreased with application volumes increased. This will ensure adequate soil moisture at depths to optimize root growth of the new seedlings.

Fertilizing. For seeded areas at three to four weeks after germination or sodding, or at the first mowing, apply a 2-1-1 or 4-1-3 ratio fertilizer at the rate of one pound of nitrogen per 1000 square feet (45 pounds per acre) with at least 50% of the nitrogen from a slowly available form such as IBDU, SCU or a polymer coated urea. Additional fertilizations will be necessary every 4 to 6 weeks on the seeded grasses until the turf has reached full cover. Once the course has matured, the objective becomes slower growth with good color, density, and playability.

Mowing. To help control weeds and promote lateral growth, mowing should begin when the grasses reach a threshold at 150 % of their mowing height. This will be approximately ½ inch for greens, 1.5 inches for tees, 2.0 inches for fairways and 2.5 inches for roughs.. Mowing at these heights should be done for the first 2 or 3 mowings and then the height maintained or reduced to optimum. This will encourage lateral spread, increase density, and maintain a fine texture. The mowing should be frequent enough so that no more than one-third of the top growth is removed at any one clipping.

Rolling. To provide a smooth, firm surface for future operation of mowing equipment and golf carts, all areas may need to be rolled a few times. The first rolling should be no sooner than when the grass is approximately 50 percent covered.

Developing Tee and Putting Surfaces. During the growing-in period tees and greens will need topdressing and rolling and perhaps aerifying and/or vertical mowing a number of times to produce smooth, true and firm surfaces.

Pest Control. The course should be inspected daily for pests. When control is necessary, follow label directions and precautions utilizing materials approved in this plan, and follow restrictions as defined in this plan.

GOLF COURSE CULTURAL PRACTICES

The primary cultural practices that produce and sustain a healthy turf are mowing, irrigation and fertilization. These three operations, alone or in combination, often cause changes in the root and canopy microenvironment which can have either a positive or negative result. Thus, it is essential that these practices are executed in a proper and timely manner to ensure turfgrass quality and playability. The best deterrent to weed, insect and disease infestation is a healthy turf. Thus, maintaining hearty grasses will minimize the need to apply fertilizers and pesticides.

Mowing

Mowing is the most basic maintenance operation on a golf course. Without regular mowing at the appropriate heights of cut, the course would become unplayable. With good mowing practices, density, texture, color, root development, wear tolerance and other aspects of turf quality are enhanced. Proper mowing practices also can reduce the amount of irrigation needed. Taller grass can have a significantly higher evapotranspiration rate and thus a greater need for water. Mowing grass too short stresses the turf which not only produces a need for more water, but can cause the weakened turf to be more susceptible to weed, insect and disease infestation. Recommended mowing practices are presented in Table 7.

Table 7. Recommended mowing practices for specific turf areas. Higher heights of cut are recommended especially during stress periods.

Mowing Practice	**Greens**	**Tees**	**Fairways**	**Roughs**
Height (inches)	5/32 - 1/4 (0.156 - 0.250)	3/8 - 5/8 (0.375 - 0.625)	1.5 - 2.0	2.0 - 2.5
Frequency	Daily	2 to 4 times per week	2 to 3 times per week	7 to 14 days
Clippings	Remove	Remove	Return	Return

Grass variety and turf use have the greatest influence on mowing height. Each turfgrass has a mowing tolerance range within which it can be expected to provide outstanding turf. The best approach is to use the highest mowing height acceptable for the various playing surfaces. However, if fast greens are required for tournament play, mowing can be lowered below recommended minimums for a short period of time. On the other hand, another possibility is to continue mowing at the higher height and double cut twice, as frequently this operation will produce the same green speed as the lower cut. In addition, during the summer months when stress is likely to occur, if the superintendent is satisfied with the green speed, do not lower the height of cut. If the players demand faster green speeds, try double cutting one or twice per week before lowering the height of cut. Additionally, rolling several times per week can improve speed without lowering the height of cut.

Mowing height and growth rate have the most influence on mowing frequency. As a "rule of thumb," mowing should be done often enough that no more that one-third of the leaf is removed at any cutting. Frequent mowing is best because it minimizes the effect on photosynthesis and helps maintain a high percentage of leaf surface which is necessary for healthy root development.

If mowing is scheduled at appropriate intervals and the grass clippings are dispersed uniformly, leaving the clippings on the fairways and roughs should cause no problem. Research has indicated that returning clippings to the surface does not greatly increase thatch buildup on turf that is properly managed otherwise. Clippings decompose rapidly thus returning some fertilizer and organic matter to the soil, and they also help conserve moisture and insulate the soil.

Clippings are always removed from greens and tees to prevent interference with the play. Collected clippings should be combined with a high carbon source (such as leaves) and composted. Compost can be mixed with sand for use as a topdressing or used as a soil amendment for renovation or other landscape projects.

Fertilizing

The most important aspect of a sound fertilizer program is to ensure that the nutrients applied do not end up in surface and/or ground water. Nitrogen and phosphorus are the elements most often associated with eutrophication of lakes and streams. Other nutrients do not seem to pose a problem to bodies of water. However, care must be taken so that nutrients do not enter wetlands or watercourses. Care must be taken around areas that drain to watercourses, especially around bunkers.

Excessive nitrate concentration could contribute to the ground water problem if it leached to the ground water (See water quality in the Irrigation Section below). Much of the nitrogen applied to golf courses is in the ammonium and nitrate forms. On sandy soils with low cation exchange capacity, some ammonium could leach directly. However, most is converted by soil microorganisms to nitrate provided there is good aeration and optimum soil pH. Important to the environment is that while nitrate is highly mobile, making it readily available for plant uptake, it also can be leached into the ground water. In a review of research on nitrogen fertilizers applied to turfgrasses (Petrovic, 1990) noted that nitrate-nitrogen concentrations in soil water leaching through the surface soil exceeded drinking water standards of 10 ppm only on sandy soils when one of the following conditions exist: 1) high levels of soluble nitrogen are applied, greater than 3 lbs. N/1000 sq.ft. at one time; or 2) very frequent (daily) irrigation is practiced coupled with application of water soluble nitrogen sources. Linde et al. (1994) and Harrison et al. (1993) found that under conditions which forced leachate from intensively managed plots the nitrate-nitrogen concentrations were consistently below the 10 ppm drinking water standard.

Minimizing nitrate movement is directly related to best management practices by efficiency in rate and timing of nitrogen inputs through choice of materials and efficiency in rate and timing of irrigation. Reports by Walker and Branham (1992) concluded that several management options are available to minimize or eliminate any threat to ground or surface water by 1) limiting irrigation to replacement of soil moisture; 2) using slow release nitrogen sources; 3) timing fertilizer applications in relation to active uptake; and 4) use of realistic nitrogen application rates. All of these factors when addressed should reduce or eliminate nonpoint source losses of nutrients from the golf course.

When a fertilizer is applied in excess of what the plant can use or when the turf is not actively growing due to inadequate temperatures, lack of water or light, or lack of an individual nutrient, etc., much of the application could be lost. For these reasons, before a fertilizer is applied, the limiting growth factors should be considered. In addition, only a fertilizer containing the nutrients in the correct form needed by the plant should be used and applied at the correct rate and frequency.

The first step, then, in arriving at a sound fertilizer program is to have the soil analyzed to determine pH, soil nitrogen reserves, calcium, magnesium, phosphorus, potassium, manganese, zinc and copper availability and balance. From this information a valid lime and fertilizer program can be developed with the assurance that excess nutrients will not be applied.

Nitrogen is the nutrient used by grasses in the largest quantities. Its function is to stimulate vegetative growth and provide the grass with green color. Nitrogen fertilization will be determined by color, density and rate of growth (clipping yields) of grass, tissue analyses, as well as soil nitrogen reserves. Interpretation of soil nitrogen analyses to exact amounts which are available to the plant is difficult. For this reason, nitrogen rates will be adjusted, but not solely based, on soil testing. Leaching of nitrate nitrogen can be safely regulated by making controlled applications (spoon feeding), using controlled materials (slow-release) or using a combination of these approaches.

Controlled applications can be made by using soluble fertilizers and applying the materials with sprayer that has been calibrated to put out an accurate amount of material per acre. The superintendent can personally control the rate and frequency of fertilizer application, and thereby reduce the tendency to apply excessive amounts of nitrate and ammonium forms of nitrogen on an infrequent basis.

Controlled materials, such as natural organic sources (Milorgranite, Ringer, Sustane, etc.), isobutylidene diurea (IBDU), methylene ureas (MU) and coated ureas (SCU, Polyon, Poly-S, Sulfurkote-II and others) are all slow-release (SR) nitrogen sources. They have the advantage of supplying a longer more uniform source of nitrogen, a lower salt index and reduced nitrogen leaching. By combining soluble nitrogen sources with the slow-release nitrogen products, availability can be extended to the grass without fear of nitrogen leaching into the groundwater.

Basic Fertilizer Program. Most turf species used on golf courses can be grown within a wide soil pH range. However, for optimum soil microbial activity and improved nutrient availability it is preferred to keep the pH in the 5.5 to 6.5 range. The following discussion gives a general outline of nitrogen, phosphorus and potassium applications on various playing surfaces. Also important is the maintenance of a calcium to magnesium ratio of 10:1. Turfgrass fertilization recommendations are included in Tables 8, 9 10, 11, 12, & 13.

Greens. If the soil test shows that either dolomite for soil pH correction and/or phosphorus are needed, they should be applied during the aerifying operation so that they can be worked into the root zone. The addition of potassium should be made in three to four applications per year and applied at the rate of ½ to 1 pound per 1000 square feet. Slow release sources of nitrogen should be applied at the rate of 0.5 to 1.0 pound per 1000 square feet or if a combination product consisting of a mixture of quickly and slowly available nitrogen sources is selected it should contain no less than 50% from a slow release source.

Tees. If phosphorus and dolomite are needed, the tee surfaces should be treated the same as the greens. Nitrogen and potassium should be applied at about a slightly lower rate than for the putting greens.

Table 8. General Fertilizer Applications on Greens and Tees (Pounds per 1000 square feet per year). Adjustments should be made based upon testing results and turf response.

Area	Nitrogen	Phosphorus	Potassium
Greens	6 to 8	2 to 5	3 to 5
Tees	5 to 7	2 to 5	3 to 5

Table 9. Suggested Fertilizer Schedule for Greens (Pounds per 1000 square feet per application). Adjustments should be made based upon testing results and turf response.

Nutrient*	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Total
Nitrogen	WS 0.5	WS 0.5	WS 0.5	WS 0.25		WS 0.25	WS 0.5	WS 0.5	WS 0.5	7.0
	SR 0.5	NO 0.5	NO 0.5	NO 0.25		NO 0.25	SR 0.5	SR 0.5	SR 0.5	
Phosphorus	0.25	0.25	0.25	0.25		0.25	0.25	0.25	0.25	2.0
Potassium	0.5	0.5	0.5	0.25		0.25	0.5	0.5	0.5	3.5

* Additional fertilizations may be necessary during Dec through Feb depending on environmental conditions.
WS = Water soluble; SR = Slow release; NO = Natural organic

Table 10. Suggested Fertilizer Schedule for Tees (Pounds per 1000 square feet per application). Adjustments should be made based upon testing results and turf response.

Nutrient*	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Total
Nitrogen	WS 0.5	WS 0.5	WS 0.5	WS 0.25		WS 0.25	WS 0.5	WS 0.5	WS 0.5	7.0
	SR 0.5	SR 0.5	NO 0.5	NO 0.25		NO 0.25	SR 0.5	SR 0.5	SR 0.5	
Phosphorus		0.25	0.25				0.25	0.25	0.25	3.0
Potassium		0.5	0.5	0.25		0.25	0.25	0.5	0.5	3.25

* Additional fertilizations may be necessary during Dec through Feb depending on environmental conditions.
WS = Water soluble; SR = Slow release; NO = Natural organic

Fairways. Dolomite and phosphorus applications would be based on soil test results and no individual application of nitrogen or potassium should exceed 40 pounds per acre with ½ the nitrogen from a slow release source.

Roughs. Roughs should be fertilized two times per year. Dolomite and phosphorus applications should be based on soil test results. Individual applications of nitrogen and potassium should not exceed 40 pounds per acre with ½ the nitrogen from a slow release source.

Table 11. General Fertilizer Applications on Fairways and Roughs (Pounds per acre per year). Adjustments should be made based upon testing results and turf response.

Area	**Nitrogen**	**Phosphorus**	**Potassium**
Fairways	200 to 350	45 to 135	100 to 200
Roughs	45 to 90	0 to 45	45 to 90

Table 12. Suggested Fertilizer Schedule for Fairways (Pounds per acre per application). Adjustments should be made based upon testing results and turf response.

Nutrient	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Total**
Nitrogen	WS 22.5	WS 22.5	WS 22.5				WS 22.5	WS 22.5	WS 22.5	
	SR 22.5	SR 22.5	NO 22.5				SR 22.5	SR 22.5	SR 22.5	
Phosphorus	22.5	18					18	22.5		81
Potassium	45	36					36	45		162

WS = Water soluble; SR = Slow release; NO = Natural organic

Table 13. Suggested Fertilizer Schedule for Roughs (Pounds per acre per application). Adjustments should be made based upon testing results and turf response.

Nutrient	Mar	Apr	May	June	July	Aug	Sep	Total
Nitrogen	WS 22.5						WS 22.5	90
	SR 22.5						SR 22.5	
Phosphorus	22.5						22.5	22.5
Potassium	30						30	60

WS = Water soluble SR = Slow release

Irrigation System

Based on average rainfall, supplemental irrigation will be needed to provide turf needs especially during the critical spring and summer months. Irrigation system design and operational strategy must fulfill all environmental requirements for protecting wetlands, surface water and ground water on and around the golf course. In addition, the irrigation system will be designed to meet the water requirements of the turf by supplementing natural rainfall. A state of the art irrigation system where irrigation is managed with computer control will be used. Irrigation will be based on measuring weather conditions as described in the section 'Water Management' below.

Irrigation Requirements

The gross irrigation requirement (GIR) of a turf is the amount of water necessary to meet the net irrigation requirement (NIR), plus losses from evapotranspiration, percolation and runoff. Assuming little carryover of soil water from month to month, which is reasonable particularly for shallow rooted turf, the NIR is essentially the difference between potential evapotranspiration (ETP) and effective rainfall: NIR=ETP-EF. ETP varies depending on wind speed, relative humidity and temperature. Additionally, turf performance when irrigated at some percentage less than ETP has been shown to be adequate depending on turfgrass species. This is known as the crop factor or K_C and is often estimated at 0.85 for cool-season grasses and between 0.60 and 0.85 for warm-season grasses. GIR=NIR x K_C/e where e is an application efficiency factor which primarily depends on wind movement, runoff potential, temperature, and irrigation system design and operation efficiency. This can range from 60 to 90 percent with 75 percent often used as an intermediate estimate.

Based on this information, a water balance approach to turfgrass irrigation requirements can be prepared as is presented in Table 14. Exact irrigation amounts in terms of acre-inches or acre-feet will be ultimately determined by the environmental demands. Irrigation volumes can be estimated for the facility by calculating total acreage for each type of grass and using the conversion of 325,829 gal/ac-ft or 27,152 gal/ac-in.

Table 14. Annual irrigation requirement on a monthly basis for cool-season grasses at Lion's Gate.

Month[1]	**Average Rainfall (inches)**	**ETP**[2] **(inches)**	**NIR**[3]	K_C[4]	**GIR**	**Annual Irrigation Requirement**[5] **(inches)**
Jan	4.3	1.2	0	.61	0	0
Feb	3.0	1.6	0.1	.64	0.06	0.1
Mar	2.6	2.6	1.3	.75	1.0	1.3
Apr	1.6	3.8	3.0	1.04	3.1	4.2
May	.3	5.1	5.0	.95	4.8	6.3
Jun	.1	5.9	5.9	.88	5.2	6.9
Jul	.1	6.6	6.6	.94	6.2	8.3
Aug	.1	5.9	5.9	.86	5.1	6.8
Sep	.3	4.8	4.7	.74	3.5	4.6
Oct	.9	3.0	2.6	.75	2.0	2.6
Nov	2.1	1.6	0.6	.69	0.4	0.6
Dec	3.5	0.8	0	.60	0	0
Total	18.9	42.9	35.7	-	31.4	41.7

1) Data for Morgan Hill
2) Evapotranspiration rates based on Synder et al., "Turfgrass Evapotranspiration Map, Central Coast of California", Cooperative Extension, University of California, Leaflet 21491, 1991.
3) Based on an effective rainfall of 50% of total rainfall.
4) Crop factors (K_C) from Gibeault et al. (1990).
5) Based on an irrigation system efficiency of 75% (0.75).
6) Total annual irrigation demand will be approximately 122 million gallons.

Water Management

Because of the many variables to consider, i.e., slope, soil types, rooting depth, etc., even with the most sophisticated irrigation system available, experience has proven, fine-tuning of the irrigation program by the golf course superintendent and irrigation technician is essential.

Knowledge of the water reserve in the root zone is a key input required for determining irrigation needs. On greens, approximately seventy-five percent of the root system may occur in the top four inches of soil. On tees, fairways and roughs the depth of rooting can vary from six to twelve inches, depending on how these surfaces are managed. Therefore, with knowledge of soil water storage, actual daily rainfall and calculated daily evapotranspiration (ET) information it is possible to determine when the available soil moisture is depleted and irrigation required. A weather station should be installed at the maintenance facility to record rainfall, solar radiation, air temperature, soil temperature, and relative humidity. This information will be used to carefully determine evapotranspiration demands and irrigation requirements.

There are more sophisticated soil moisture sensor devices which can actually cycle the irrigation system. Although these have limitations due to their being point sources of information, these could be employed if desired. However, they will not substitute for the superintendent and irrigation technician paying careful attention to detail over the differing soil and turf conditions on the course.

To insure there is always adequate moisture for growth and development, the amount of water to apply at each irrigation should be the depth required to replace that extracted by the turf since the last irrigation or rainfall. This is normally at 50% depletion of the soil water holding capacity in the irrigated zone. However, the amount of water to apply per irrigation must be increased because of irrigation application efficiency losses. Any additional irrigation would be a waste of water and could move nutrients and pesticides past the grass root zone.

Given the imperfect nature of any irrigation system, there is the possibility of different areas of the course being over watered, correctly watered and under watered. Therefore, only through careful study and trial and error can the superintendent and irrigation technician achieve the most appropriate balance, preferably on the drier side.

The best method of determining whether the proper amount of water has been applied is to determine the depth of water penetration following irrigation by coring with a soil tube. If water has not penetrated to the desired depth by six to eight hours after an irrigation, then the irrigation time should be increased. If water has moved well beyond the desired irrigation depth, then the irrigation time should be decreased.

To avoid runoff, the application rate must not exceed the soil infiltration rate. If necessary, the irrigation system can be cycled to ensure proper infiltration. In addition, one of the primary responsibilities of the golf course superintendent and irrigation technician will be to monitor the heads frequently to be sure all heads are operating properly and that no head is inadvertently applying water to an environmentally sensitive area.

Water Quality

Information about the proposed irrigation water source, the Twin Valley Water Company, indicates that the water contains high levels of nitrogen as nitrate (NO_3-N). Water analyses from January, 1995 indicated nitrate nitrogen in the range of 45 to 50 mg/l NO_3-N. These concentrations are similar to ground water nitrate concentrations at the site (see Environmental Considerations in this report). Ground water at the site will serve as a backup irrigation water source.

These concentrations of nitrate nitrogen in the primary and secondary water sources, could pose a problem to turfgrass. Based on the June, July and August irrigation requirement for cool-season grasses (Table 14) applications of water with these levels of nitrate nitrogen would result in between 1.1 and 2.2 pounds/1000 sq.ft. of nitrogen being applied. This is a critical period for turfgrass, temperatures and irrigation conditions make the turf stressed and prone to disease problems. Control of brown patch, a particularly devastating summer problem is exceptionally difficult under high nitrogen levels. An increase in brown patch may result in increased use of pesticides for control of the disease.

To avoid potential problems caused by excess nitrogen, the nitrogen loading from irrigation water has been factored into the fertilization program that is detailed in the previous section. Over fertilization with nitrogen should not occur.

The Lion's Gate Golf Course will serve as a biological filter for the irrigation water. The nitrates in the irrigation water will be used by the turfgrass in it's physiological processes. This will result in improving the quality of water being returned to the environment through percolation to the ground water, or surface flow to watercourses or ponds.

Supplementary Cultural Practices

To help develop and sustain quality turf, spiking, vertical mowing, aerifying, topdressing and rolling are used. These operations physically alter the plant's environment by removing and or relocating soil and organic materials or altering turf growth habit. Only when turfgrasses are actively growing should these cultural practices be performed.

Spiking. Spiking is most useful in breaking up surface compaction and improving moisture infiltration and gas exchange. In addition, it is useful in lifting the blades of grass before mowing to aid in preventing the turf from thatching.

Vertical Mowing. When done on a timely basis, vertical mowing can be used to remove mower induced grain on greens and reduce thatch. In addition, vertical mowing can be used to thin turf so that a better job of reel mowing can be done. Also, vertical mowing is used to separate the soil from aerifier cores and mix it with the sand used to fill the aerifier holes and topdress the playing surface.

Aerifying. The main purpose of aerification is to relieve surface compaction which in turn improves surface water infiltration, allows for good root penetration, provides for easier air exchange in the soil, improves nutrient uptake, removes excess thatch and increases turfgrass vigor. It should also be used to ensure adequate infiltration of runoff in roughs and buffers.

Aerification on putting greens is commonly followed with topdressing. If aerifying is done without topdressing with proper materials and developing a good turf cover, the soils could return to their original compacted state.

Topdressing. Topdressing aids in thatch decomposition, lessens grain development, stimulates new shoot growth, encourages stolon rooting and makes the ball roll true and faster. Although a small amount of thatch (1/4 - ½ inch thick) is desirable to provide a certain amount of resiliency, thatch is the greatest single limiting factor in the development of fast, uniform greens. Although topdressing does not prevent the development of stems and roots which contribute to that buildup, it does keep the thatch separated to prevent dense, compacted mats from forming. By mixing suitable topdressing materials with the organic material, layers as such, will not develop and will decompose faster. Also, topdressing with compost or a compost/topdressing mineral mix may aid in reducing the incidence of certain diseases. Work at Cornell University has found that monthly applications of topdressings composed of as little as 10 pounds of suppressive compost/1000 sq.ft. have been effective in suppressing diseases such as dollar spot, brown patch, *Pythium* root rot, *Typhula* blight and red thread. Reductions in severity of Pythium blight, summer patch and necrotic ring spot have also been observed on sites receiving periodic applications of compost (Nelson, 1992).

Rolling. New light weight self propelled rolling equipment has made rolling a viable practice for smoothing the turf surface and improving green speed and when used in the summer months allows a higher height of cut for improved stress tolerance while increasing green speeds. However, rolling more often than several times a week can lead to excess wear and compaction.

BASIC ANNUAL MAINTENANCE GUIDE

The following remarks supplement the Basic Annual Maintenance Guide on the following pages. It should be noted that this basic program will need to be adjusted and fine tuned by the superintendent based on specific situations.

1. **Soil Analysis**

   Sample representative greens, tees, fairways and roughs for analysis and recommendations. The primary purpose of soil testing is to insure a sound lime and fertilizer program based on nutrient availability and balance for good growth of the grass. A healthy plant is less susceptible to disease and other pests.

2. **Calibration of Equipment**

   All spreaders and sprayers must be repaired, if needed, and calibrated for proper distribution of fertilizers and pesticides.

3. **Mowing**

   With good mowing practices, density, texture, color, root development, wear tolerance and other aspects of turf quality are enhanced.

4. **Fertilizing**

   The fertilizer program will be based on soil test results for pH, soil nitrogen reserves, calcium, magnesium, phosphorus and potassium. Nitrogen fertilization will be determined by color, density and the rate of growth (clipping yields) of the grass as well as soil nitrogen reserves (as determined from testing). Interpretation of soil nitrogen analyses to exact amounts which are available to the plant is difficult. For this reason, nitrogen rates will be adjusted, but not solely based on soil testing.

5. **Irrigation Program**

   Each time water is applied, operate the system long enough to wet the soil to the depth of rooting. When greens are stressed, hand water or syringe during the heat of the day in addition to regular night irrigation.

6. **Spiking**

   This procedure is needed to relieve surface compaction and ensure good gas exchange (oxygen and carbon dioxide).

7. **Vertical Mowing**

   During the growing season, this operation is needed to reduce mower induced grain and thatch buildup, and to provide a smoother, faster putting surface on greens.

8. **Aerifying**

   Aerifying surfaces relieves compaction, increases soil and surface air exchange and improves fertilizer and water movement into the soil.

9. Topdressing

In addition to following aerification, topdressing should be applied once or twice per month during the growing season at the rate of one-quarter cubic yard per 1000 square feet. This practice not only helps control thatch, but also helps provide a smooth, true surface for mowing and accurate ball roll. Adding compost into the topdressing helps boost biological activity and may help with disease control.

10. Liming

Apply dolomitic limestone to any area where soil test results indicate a need.

11. Nematode Control

May be needed infrequently. A soil nematode analysis will determine population levels and suggest treatment.

12. Wetting Agent Applications

If localized dry spots appear on the greens, apply a good quality wetting agent and water immediately to prevent yellowing of the grass. During this period, use a wetting agent when applying a liquid fertilizer or pesticide unless the label states otherwise.

13. Raking and Edging Bunkers

Bunkers need to be raked daily and edged as necessary, as often as once per month during the peak turf growing season.

14. Weed Control

Monitor for the presence of weeds. If the population becomes so large that it effects the playing surface, use the appropriate herbicide. Also see Section on weed control in 'Specific Local Problems'.

15. Insect Control

Monitor daily for beetles, grubs, caterpillars and other insect pests. However, do not treat unless the pest is found, identified and present in damaging numbers as determined by the threshold level. Also see the section on insect control in 'Specific Local Problems'.

16. Disease Control

During periods when disease or conditions favoring a disease outbreak are prevalent, inspect the surfaces daily and treat only as necessary. Also see the section on disease control in 'Specific Local Problems'.

17. Overseeding

To improve stand densities on areas where traffic and/or pest problems may have caused a thinning of the turf.

BASIC ANNUAL MAINTENANCE GUIDE
Lion's Gate Golf Course

OPERATION	J	F	M	A	M	J	J	A	S	O	N	D	REMARKS
GENERAL:													
Soil Analysis		X						X					1
Calibrate Equipment		X						X					2
GREENS:													
Mowing	X	X	X	X	X	X	X	X	X	X	X	X	3
Fertilizing			X	X	X				X	X	X		4
Irrigating			X	X	X	X	X	X	X	X	X		5
Spiking				X	X	X	X	X	X				6
Vertical Mowing			X	X	X				X	X			7
Aerifying			X		X				X	X			8
Topdressing			X	X		X			X	X		X	9
Liming			X										10
Disease Control			X	X	X	X	X	X	X	X			16
Weed Control				X	X	X	X	X	X				14
Insect Control						X	X	X	X				15, 11
Wetting Agents						X	X	X	X				12

BASIC ANNUAL MAINTENANCE GUIDE
Lion's Gate Golf Course

OPERATION	J	F	M	A	M	J	J	A	S	O	N	D	REMARKS
TEES:													
Mowing	X	X	X	X	X	X	X	X	X	X	X	X	3
Fertilizing			X	X	X		X		X	X			4
Irrigating			X	X	X	X	X	X	X	X	X		5
Spiking				X		X		X					6
Vertical Mowing													7
Aerifying				X	X		X		X				8
Topdressing					X	X	X	X	X				9
Disease Control			X							X	X		16
Weed Control			X	X	X	X	X	X	X				14
Insect Control					X	X	X	X	X				15
Liming			X										10
Overseeding										X			17
FAIRWAYS:													
Mowing	X	X	X	X	X	X	X	X	X	X	X	X	3
Fertilizing			X	X	X				X	X			4
Irrigating			X	X	X	X	X	X	X	X	X		5
Aerifying				X		X		X					8
Disease Control				X					X	X			16
Weed Control			X	X	X	X	X	X	X				14
Insect Control					X	X	X	X	X				15
Liming			X										10
Overseeding									X				17

BASIC ANNUAL MAINTENANCE GUIDE
Lion's Gate Golf Course

OPERATION	J	F	M	A	M	J	J	A	S	O	N	D	REMARKS
ROUGHS:													
Mowing			X	X	X	X	X	X	X	X	X		3
Fertilizing				X						X			4
Irrigating			X	X	X	X	X	X	X	X	X		5
Liming						X							10
Overseeding									X				17
BUNKERS:													
Raking & Edging			X	X	X	X	X	X	X	X	X		13

INTEGRATED PEST MANAGEMENT

Integrated Pest Management (IPM) programs rely on six basic approaches for plant protection. These include the following:

1) *Regulatory* - using certified seed, sprigs and sod to prevent unwanted weed contamination;

2) *Genetic* - selecting improved grasses which perform well in specific areas and show a resistance to pest problems;

3) *Cultural* - following recommendations made for proper primary and secondary cultural practices which will maintain the turf in the most healthy condition and influence its susceptibility and recovery from pest problems;

4) *Physical* - cleaning equipment to prevent spreading of diseases and weeds from infected areas;

5) *Biological* - for a limited number of pest problems biological control can be used whereby natural enemies are introduced to effectively compete with the pest and reduce the need for chemical controls;

6) *Chemical* - pesticides are a necessary and beneficial approach to turf pest problems, but use can be restricted in many cases to curative rather then preventive applications, thus reducing environmental exposure. Pesticide selection must be based on effectiveness, toxicity to non-target species, solubility and persistence. Few pesticide applications will be made on a

regularly scheduled basis. Exceptions may include preemergence herbicides and fungicides used to control *Pythium*. Additionally, materials must be applied strictly in accordance with label instructions, at labeled rates, under appropriate environmental conditions (i.e. no spraying on windy days or when rain is forecast), with a low-volume sprayer to reduce the possibility of drift. Materials will be rotated for use on a particular disease or pest. This will deter the development of resistant strains of pests which may require more frequent and/or higher rates of pesticide applications.

Pesticide Selection - Information from Scientific Studies

The greatest potential for contamination of both surface and subsurface waters from pesticide application is the leaching of materials with percolating water. Pesticide contamination concerns are based on findings of several surveys which were conducted in the mid-1980s on drinking water wells and ground water sources which identified agricultural pesticides in the water (Nesheim, 1986; Rao et al., 1988). A number of factors determine the potential for pesticide movement and ground water contamination. Pesticide factors include reactivity with the soil, half-life, and time and rate of application. Soil factors also influence vulnerability with sandy soils low in organic matter having a greater tendency for problems. Soil pH and the presence of channels which may provide macropore flow also are factors influencing movement. The application site itself is also more vulnerable if it has a shallow depth to the ground water table, is in a particularly wet climate or extensive irrigation is practiced or if the pesticides are injected into the soil through the turf canopy (Anonymous, 1989). As part of the overall interaction of management practices, Weber (1989) has shown that plant water use will slow the leaching of pesticides and allow for more interaction within the root zone where material degradation is faster.

A review of specific studies which have investigated turf application of materials and monitoring for ground water problems have found no documented research where levels from currently labeled materials have exceeded acceptable limits. Findings from a study by Mitchell et al. (1976) in Delaware found that dicamba (a commonly used postemergence herbicide) leached in putting green soils, but only at a 100 parts per billion (ppb) maximum concentration which did not exceed drinking water standards of 210 ppb. A similar study by Gold et al. (1988) in Rhode Island showed that under home lawn application conditions, dicamba concentrations in the soil water exceeded 1 ppb in less than 10 % of the samples and were in the 5 to 10 ppb range in only 4 % of the samples. In this same study, concentrations of 2,4-D (also a postemergence herbicide) exceeded 1 ppb in only 4 % of the samples and in 83 % of the samples it was below detection limits. The conclusions from these studies were that the turf, due to its dense thatch layer and high soil organic matter content attenuated herbicide movement. The Rhode Island study concluded that the herbicide concentrations did not come close to exceeding drinking water standards at any time during the growing season.

An extensive study was conducted by the US Environmental Protection Agency on Cape Cod at four golf courses. This was in a hydrogeologically sensitive area with sandy soils, a high water table and intensively managed turf areas with a long history of pesticide use (over 30 years). They reported finding 8 pesticides and pesticide metabolites and two pesticide impurities in ground water (Cohen et al., 1990). Only chlordane/heptachlor, a banned pesticide formulation, was found in toxicologically significant concentrations. They concluded that there is not cause for concern about the use of the currently registered pesticides for which they tested (which included chlorothalonil, chlorpyrifos, 2,4-D, dacthal, dicamba, and isofenphos) on turf areas even in an area which exhibits many of the sensitivity factors previously discussed.

In a Florida study, ground water test wells on two golf courses in Palm Beach county were tested for 37 different pesticides. One of these wells was located between two putting greens where the highest incidence of pesticide use on golf courses typically occurs. Test results indicated that none of the chemicals targeted for detection were found in the water samples from the two golf courses (Kahler, 1990). Additional sampling has also found that no chemicals were detected in any of the water samples from the test wells (Jarrell, 1991, personal communication).

In a review of recently completed research, Kenna (1995) summarized the following findings: 1) the concentration of 2,4-D, mecoprop, dithiopyr and dicamba in soil leachate from research plots maintained under conditions similar to golf course turf was below 4 ppb;

2) less than 0.5% of the applied 2,4-D, mecoprop, dithiopyr, and dicamba was found in the leachate from a simulated USGA putting green over a 10-week period; 3) no chlorpyrifos or its first-order metabolite was detected in the leachate from simulated putting greens in greenhouse or field evaluations; 4) chlorothalonil and its first-order metabolite leached at a total of 0.2% of the amount applied; 5) under fairway conditions, only two of eight pesticides applied leached below four feet in the soil profile, dicamba and triadimefon. The detection levels of triadimefon were usually less than 10 ppb; 6) leaching of 2,4-D was very low in soils that contained some clay. However, up to 6.5% of the amount applied leached under sandy putting green soil conditions; 7) less than 0.1% of the carbaryl leached, regardless of the soil type; 8) as much as 98 to 99% of insecticides applied remained in the thatch layer while in most cases less than 0.1% of that applied was found in the leachate; 9) fenamiphos can be lost as its first-order metabolites at very high rates (17.7%) on a sandy soil profile; 10) on a poorly established turf under sandy soil conditions up to 60% of the mecoprop applied could leach. These studies summarize the need for being selective about pesticide choice, application, irrigation management and risk assessment where application is made in proximity to environmentally sensitive locations.

The turf itself has been shown to be an excellent attenuator of applied materials. Research at Ohio State University has focussed on the attenuating effects of turfgrasses on pesticides. They found that as long as 91 days after application > 90 % of the recoverable residues of phosphorus insecticides applied to a turf area remained in the thatch layer at the soil surface

(Niemczyk et al., 1988).

Additionally, the EPA has released results of a well water survey conducted over a period of two years. They tested 1,347 randomly selected wells for 126 pesticides and their metabolites. Among the materials used on turf, only atrazine, bentazon, simazine, and dacthal were found and only atrazine was occasionally found at levels above those considered minimal to protect human health (Kahler, 1990).

Balogh and Anderson (1992) summarized in an exhaustive literature review that the rate and timing of pesticide application in relation to precipitation/irrigation that produces runoff or leaching episodes is a critical management consideration. No pesticide application should be made when the possibility of rain is imminent. Materials which require water for activation are best watered into the soil with controlled irrigation. Based on this assessment, a well developed management plan, properly implemented, should provide the environmental enhancement desired with golf course development.

Pesticide Selection - Screening of Materials for Use at Lion's Gate Golf Course.

In order to prevent nonpoint pollution problems, close detail must be paid to management of pesticide applications. Numerous studies and summaries have focused on selection criteria for minimizing nonpoint movement of chemicals from turf sites. In order to determine if certain materials should be precluded from use at Lion's Gate Golf Course, even though they are registered by the US Environmental Protection Agency and the State of California and legal for use, a system of qualitative and quantitative models were used to evaluate all pesticides proposed for use on the landscape and golf course areas. From this evaluation, a recommended pesticide list was developed for each pest category for use in the Integrated Pest Management program.

Concerns over protecting water environmental quality from both a surface and ground water perspective involve addressing the following four factors:

1. conditions of the site;
2. properties of the soil;
3. properties of the pesticide; and
4. management practices.

Integrating all of these factors results in reduced probabilities for unwanted chemical movement.

Site conditions

Depth to groundwater and surface runoff potential are important considerations in protecting natural resources. According to Soil Conservation Service soil surveys groundwater is generally greater than 7 feet where the golf course will be constructed, and according to Kaldveer Associates "Ground water levels have been reported to range from a depth of 13 to 20 feet in the main valley area after a heavy rainy season." Attenuation of chemical concentration occurs through distance traveled and the medium over which water must move (e.g., turf and thatch layers). Also, soils have an organic carbon content of up to 2% in the top 18 inches. This should further attenuate pesticide movement. Additionally, by timing pesticide applications to periods when no immediate rainfall is expected, or by selecting materials which have a low propensity for leaching and a short half life, water quality can be protected. Surface water is protected by the many mechanisms that have been discussed throughout this plan (e.g., vegetative swales, buffers, locations of golf holes away from natural resources).

Soils

Soil texture, permeability, water holding capacity, pH and organic matter content are important considerations for pesticide selection. Texture and permeability will greatly affect how fast water percolates through the soil profile. However, this will change with the maturity of the turf area. Current research at North Carolina State University has found that permeability can decrease by as much as 66 percent during a period of very active turf growth due to the influence of the root system on soil drainage (Peacock, unpublished data). This is advantageous from a pesticide application viewpoint in that it slows percolating water movement allowing longer times for material degradation to occur. Organic matter content influences soil water holding and ion exchange capacity. As the organic matter content increases, the soil can hold more water, reducing percolation, and adsorption capacity increases holding pesticides in the root zone favoring microbial degradation (Weber, 1990). Turfgrasses are strong soil builders, adding organic matter to the soil over time due to root and/or shoot growth. Soil pH also affects the sorption of basic and acidic pesticides and it affects microbial activity favoring breakdown of materials.

Pesticide properties

Much of the propensity for pesticide movement in the soil solution is based on the chemical properties of the materials. Those which are highly soluble in water are more prone to leaching. Many materials are adsorbed to the soil, primarily to the organic matter component. A few are volatile and are lost as vapors. All of these properties are considered in the degradation rate, how fast the materials are broken down in the environment after they have been effective for the pests targeted at application. Weber (1990) noted that in order for a pesticide to contaminate ground water, the chemical must move through the soil faster than it degrades. One index of pesticide leaching is the soil binding of the material to the organic matter (organic carbon) fraction. This is indicated by a Koc value for each chemical. An index of how fast degradation occurs is the length of time required for 50 percent of the material to disappear. This is the half-life or $T_{1/2}$ value of the compound. These Koc and $T_{1/2}$ values will change for each soil type. However, "mean" values have been determined and can be used to assess which materials might be the most sensitive as to leaching potential. An additional factor involved is application rate. Pesticides which are applied at low rates are more favorable since the quantity of parent compound to be degraded is smaller.

Management practices

Application methods, pesticide rates and application timing must be critically evaluated to protect water quality. A qualified golf course superintendent, trained and licensed to properly apply materials, in consultation with agronomic specialists who are aware of and sensitive to local environmental conditions should be able to provide the margin of safety required for wetlands and water quality protection.

A number of qualitative and quantitative analytical models have been developed to evaluate the site for the factors previously mentioned. While none of these provide an absolute guarantee as to protection of environmental quality, they can determine the degree to which care must be exerted through management skills.

Models

Several models were used in assessment of pesticides for use at Lion's Gate Golf Course. The first models used were screening models that use chemical and site information to determine potential to leach or be lost through surface runoff. Leaching was assessed with GUS model (Gustafson 1989), the PLP model (Warren and Weber 1994), and SCS rating model (Goss 1991, Wauchope et al. 1992). Several screening models were run to obtain as much information as possible for each chemical. Surface runoff was assessed with the SCS rating model. There are few screening models for surface runoff. Appendix A (Tables 1 - 8) contains results of the analyses of pesticides using these screening models.

Materials were selected for evaluation based on their known performance under field situations. All are currently registered in California and listed in the University of California IPM Pest Management Guidelines for Turfgrass (Publication 3365-T).

Selection Criteria

Selection for each pesticide was based on the following steps which are shown in Figure 3:

1. Step wise models were used to evaluate pesticides based on their chemical characteristics and site conditions. Step wise models (as in the California Pesticide Contamination Prevention Act; Deubert 1990; GUS model, Gustafson 1989; Augustijn-Beckers et al. 1991; SCS Ranking in Goss 1991; Warren and Weber 1994) provide a series of 'if-then' situations

to evaluate pesticides. These models are often used to identify potential exposure of the pesticides to the environment and non-target organisms in surface runoff and subsurface leaching.

2. The levels of potential exposure of a pesticide through surface runoff and subsurface leaching were determined from these step-wise models.

3. The level of risk associated with exposure is then evaluated with toxicity data to determine the potential hazard that exposure to a pesticide can cause. Aquatic toxicity was the primary environmental focus because aquatic organisms are unable to move from sources of contamination, and thus have a high degree of susceptibility. Decision criteria are given in Table A7. Pesticides were eliminated or use was restricted based on this analyses, or further analyses were conducted as in number 4, below.

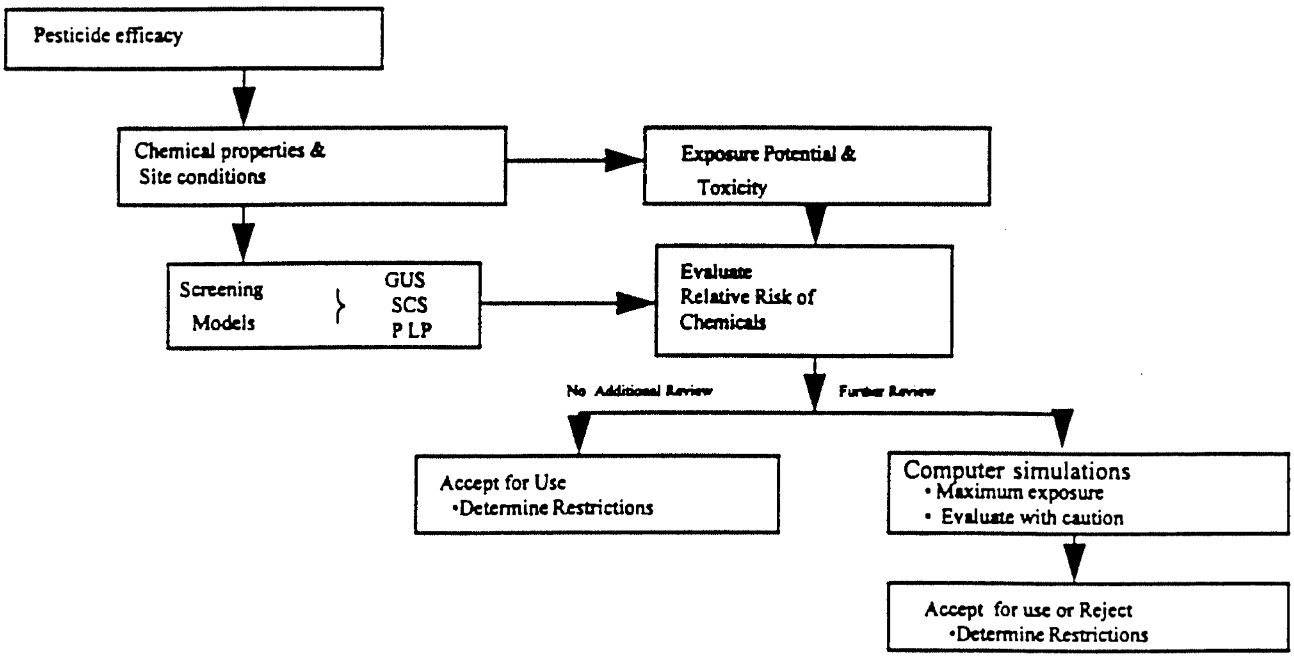


Figure 3. Pesticide Risk Assessment Model

4. Pesticides that have the potential to move through the environment were further evaluated with computer simulation models. Surface water and leaching movement was modeled with the model Simulator for Water Resources in Rural Basins -Water Quality (SWRRB-WQ). SWRRBWQ is a model that uses GLEAMS pesticide fate component, CREAMS daily rainfall hydrology model, and SCS technology for estimating peak runoff rates and newly developed sediment yield equations to simulate hydrologic and related processes in rural basins (Williams et al 1985; Arnold et al. 1989; Arnold and Williams 1994). This model was

developed for row crop agricultural and has not been fully evaluated for turf situations. However, research has found that the model over predicts actual field observations for leaching of pesticides. Therefore any error would be conservative in comparison.

Scenarios for pesticide use for pesticides modeled with SWRRBWQ were developed. These represented worst case scenarios for pesticide use at the golf course; that is, the greatest amount of material was applied to the total acreage of the golf course, and all at the same time.

Estimated concentrations of pesticides, in surface runoff and subsurface leaching, from the computer simulations were compared to LC_{50}s to determine relative risk to aquatic organisms (Table A8).

The restrictions for pesticide use based on this modeling are listed in Table 15. For each pesticide, the type of model exercise conducted, and the resultant restrictions are given. All the data for these decisions are given in Appendix A, Tables 1-8.

Restrictions are given in Table 16. Restrictions for use were based on the risk ratio that was estimated by dividing the environmental concentration predicted in the simulation modeling by the LC_{50} * 0.1. A number greater than 1 presumes risk and the use and management were adjusted accordingly.

Table 15. Restrictions for Pesticide use based on modeling exercises, and results of the analysis. See Appendix A for data, decision criteria, and details of results.

Pesticide	Model Exercise	Results
Fungicides		
captan	Simulation	No further action,OK for use
chlorothalonil	Simulation	Restrictions, based on model results for surface water
fenarimol	Simulation	No further action,OK for use
fosetyl-Al	Screening	No further action,OK for use
iprodione	Simulation	No further action,OK for use
mancozeb	Simulation	No further action,OK for use
maneb	Simulation	No further action,OK for use
metalaxyl	Screening	No further action,OK for use
PCNB(quintozene)	Simulation	Restrictions, based on model results for surface water
thiophanate-methyl	Simulation	Restrictions, based on model results for surface water
thiram	Simulation	No further action,OK for use
triadimefon	Simulation	No further action,OK for use
vinclozalin	Screening	No further action,OK for use
Herbicides		
2,4-D	Simulation	No further action,OK for use
MSMA	Screening	No further action, use
benefin	Simulation	No further action,OK for use
bensulide	Simulation	Restrictions, based on model results for surface water
bentazon	Screening	No further action, use
dicamba	Screening	No further action, use
glyphosate	Simulation	No further action,OK for use
mecoprop	Screening	No further action,OK for use
oxadiazon	Screening	No further action,OK for use

Pesticide	Model Exercise	Results
oryzalin	Simulation	No further action,OK for use
pendimethalin	Simulation	No further action,OK for use
triclopyr	Simulation	No further action,OK for use
trifluralin	Simulation	Restrictions, based on model results for surface water
Insecticides		
acephate	Simulation	No further action,OK for use
carbaryl	Screening	No further action,OK for use
chlorpyrifos	Simulation	No further action,OK for use
ethoprop	Simulation	Restrictions, based on model results for surface water
fluvalinate	Simulation	No further action,OK for use
trichlorfon	Simulation	Restrictions, based on model results for surface water & ground water
Nematicides	Screening	
fenamiphos	Simulation	Restrictions, based on model results for surface water & ground water
Plant Growth Regulators		
cimectacarb	Screening	No further action,OK for use
paclobutrazol	Screening	No further action,OK for use

Pesticide Restrictions

Based on the results of the screening models and the simulation models, restrictions were placed on the use of certain pesticides on the golf course. All drainage areas within the golf course have restrictions on the use of the pesticides in Table 16.

Table 16. Restrictions for use of pesticides. Acreage is given as the percent of total area of greens, tees, fairways and roughs; rate is in pounds active ingredient per acre. Spot treatment will be used when possible.

Pesticide	Applications per year	rate	Restrictions
Insecticides			
Ethoprop	1	5	Not used on greens and tees. No more than 20% of the acreage treated at any one time.
Trichlorfon			Not used
Fungicides			
chlorothalonil	5	8.9	Greens and tees only. A 30 day waiting period between applications.
PCNB	2	33	Greens and tees only. A 21 day waiting period between applications.
thiophanate-methyl	5	2.8	Greens and tees only. A 10 day waiting period between applications.
Herbicides			
Bensulide	2	10	Application to no more than 25 acres
Trifluralin			Not used
Nematicides			
Fenamiphos	1	10	Used on greens only.

SPECIFIC LOCAL PROBLEMS

As a component of IPM, the golf course superintendent must make decisions about pest problems and develop control recommendations including the judicious use of pesticides. Figure 4 is a suggested flow chart for decision making based on IPM strategies. Strategies include identifying an anticipated pest complex, the interrelationship of disease infection and expression of symptoms, noting temperature ranges when diseases are most active, using environmental models of insect and disease development and identifying timing for optimum insect and weed control. As part of the strategy, pesticides approved based on the screening previously noted in this plan are suggested for use with each specific pest. Additional pesticides may be included to the recommended lists as they are registered for use in California and after they have been subjected to risk assessment analysis.

Disease Control

Disease control is discussed in terms of disease control and then guidelines for disease management. Disease incidence is closely linked to environmental factors, primarily temperature, humidity, and amount of sunshine. The temperature ranges which favor development and growth of turfgrass pathogens as well as leaf wetness duration, which affects disease development are given in Table 17. As part of the IPM strategies, logging

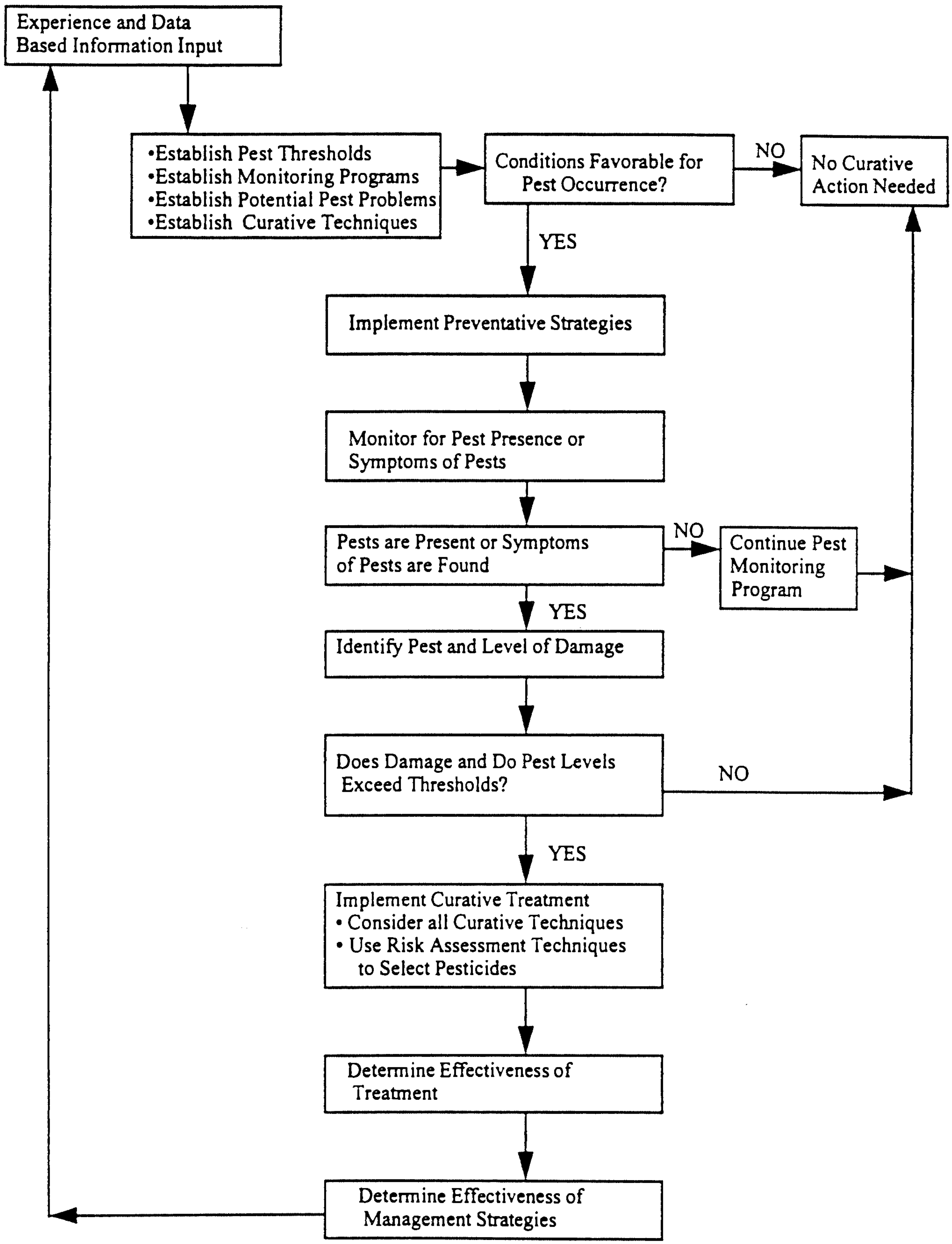


Figure 4. Integrated Pest Management Flow Chart

Table 17. Temperature Ranges and Leaf Wetness Exposure for Turfgrass Disease Development.

DISEASE	PATHOGEN	TEMPERATURE OPTIMUM (°F)	LEAF WETNESS (hrs)
Anthracnose	*Colletotrichum graminicola*	>78	>10 for several days
Curvularia	*Curvularia* spp.	>85	>10 for several days
Dollar spot	*Sclerotinia homeocarpa*	60 - 80	>10 for several days
Fusarium patch	*Microdochium nivale*	40 - 60	>10 for several days
Leaf spot	*Bipolaris sorokiniana*	>80	>10 for several days
Necrotic ring spot	*Leptosphaeria korrae*	59 - 82	unknown
Powdery mildew	*Erysiphe graminis*	59 - 72	not essential
Pythium blight	*Pythium* spp.	74 - 93	>10 for several days
Pythium root rot	*Pythium* spp.	32 - 50	-
		or 70 - 90	-
Red thread	*Laetisaria fuciformis*	40 - 70	>10 for several days
Rhizoctonia blight	*Rhizoctonia* spp.	70 - 90	>10 for several days
Rusts	*Puccinia* spp.	68 - 86	More prominent in drought stress
Spring dead spot	*Leptosphaeria korrae*	50 - 55	-
Stripe smut	*Ustilago striiformis*	50 - 68	Evident even during drought
Summer patch	*Magnaporthae poae*	83 - 87	-
Take-all patch	*Gaeumannomyces graminis*	Cool temps.	-

of daily temperature, relative humidity and leaf wetness information will be critical to note when disease development is favored. While this approach is helpful for many diseases, there are several in which infection and expression of symptoms are distinctly different (Figure 5). Hours of leaf wetness indicate a strong relationship to disease development (Figure 6). Removing dew clinging to the foliage can help reduce the incidence of disease. Fungicides which are approved based on the selection guidelines previously noted are listed in Table 18.

Figure 5. Interrelationship between disease infection and symptoms.

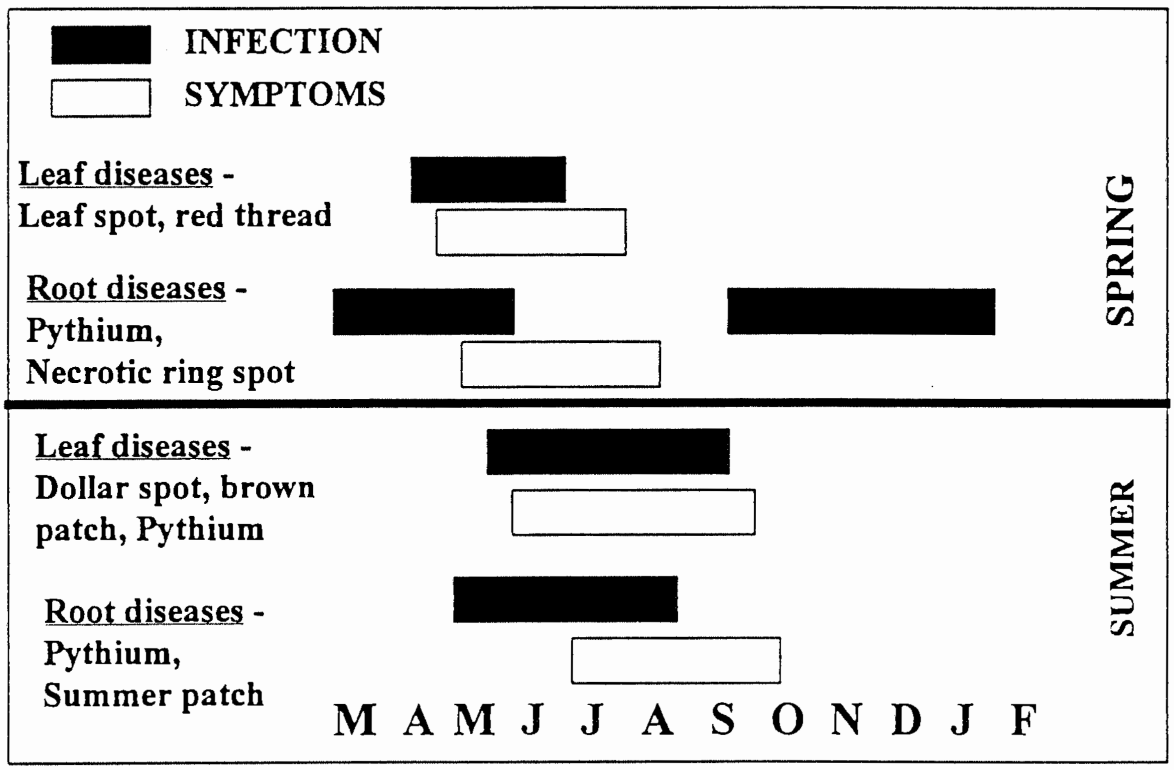
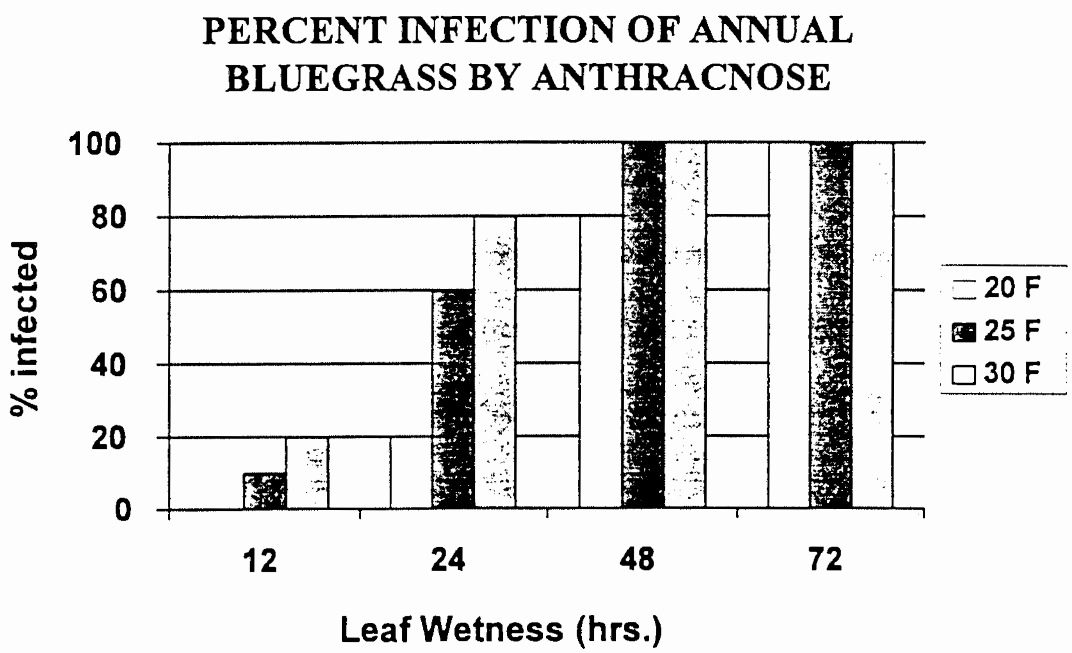


Figure 6. Relationship of disease infection to leaf wetness.



The following information is provided on specific diseases as a guide to those most prevalent on the turf species selected for use at Lion's Gate Golf Course. Information on integrated cultural components which favor development of disease incidence is noted. This does not preclude additional disease problems nor does it indicate that the turf will be under pressure from all of these pest problems during any one growing season.

Anthracnose (*Colletotrichum graminicola*) - Avoid nitrogen deficiency and keep potassium and phosphorous in balance. Do not fertilize during periods of high temperature. Avoid compaction and limit thatch.

Curvularia (*Curvularia* spp.) - Limit summer nitrogen applications. Disease is favored by high temperatures and adverse growing conditions. Enhance drying of turf. Control thatch levels.

Dollar Spot (*Sclerotinia homeocarpa*) - Favored by low nitrogen levels and drought conditions. Use of several natural organic fertilizers/composts has also been shown to reduce incidence by up to 45% (Nelson, 1990). This disease is slow to develop and cause damage, therefore daily scouting during the months which favor disease development should preclude treatment except on a curative basis.

Fusarium Patch (*Microdochium nivale*) - Avoid high nitrogen in late summer. Maintain adequate phosphorus and potassium levels. Enhance drying of turf.

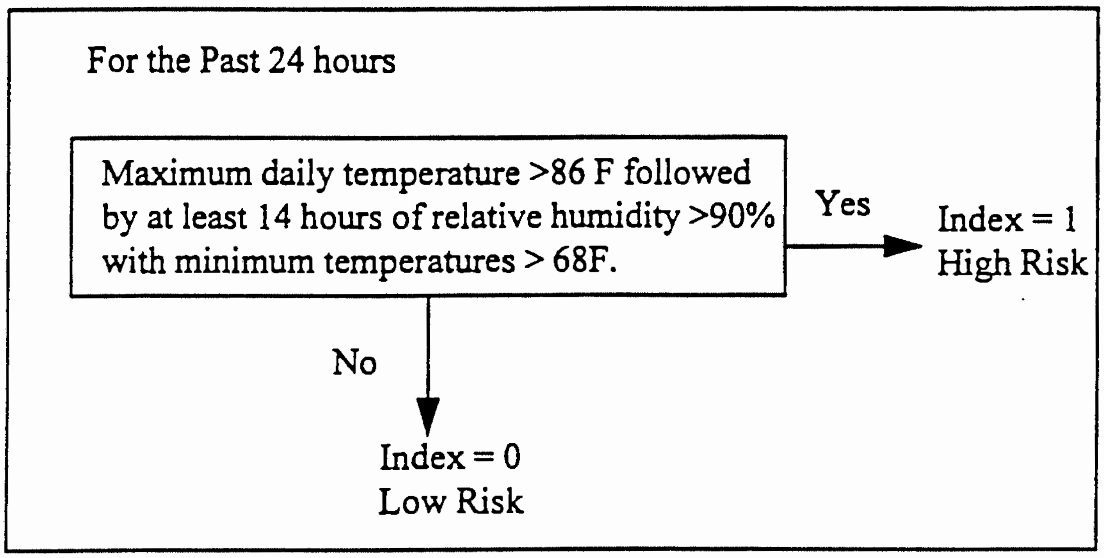
Leaf Spot (*Bipolaris sorokiniana*) - Avoid high nitrogen rates, especially during summer. Avoid night time watering.

Necrotic Ringspot (*Leptosphaeria korrae*) - This disease occurs in cool-wet weather and is most severe with excessive nitrogen fertilization and over- or under-watering. Disease is severe on compacted soils. Therefore, this is an exception to scouting and spot treatment approach in that a preventative strategy must be employed on areas with a history of disease development.

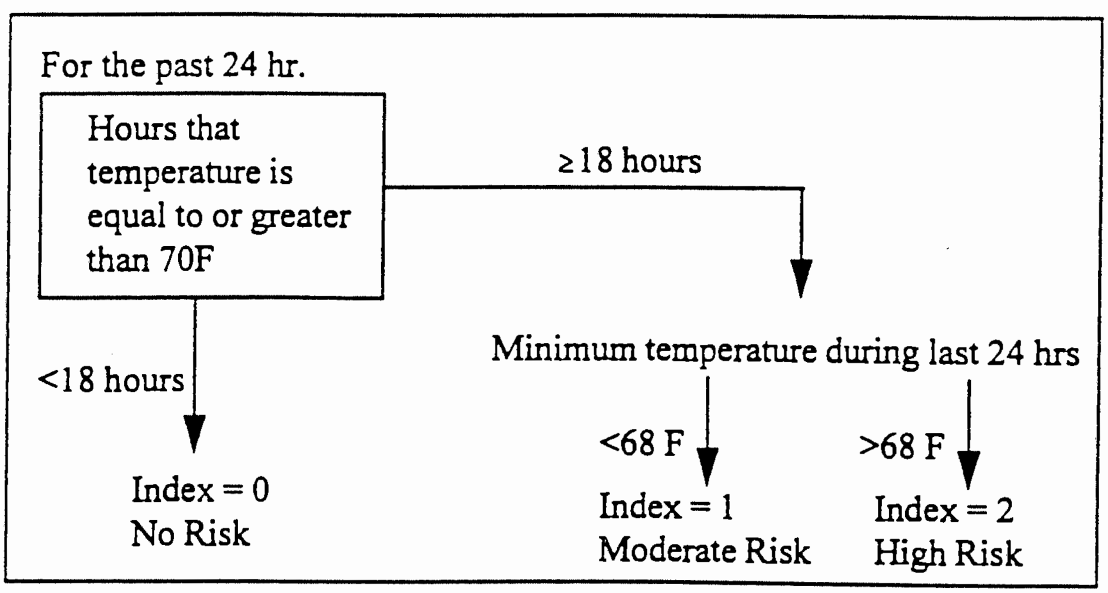
Powdery Mildew (*Erysiphe graminis*) - Disease is severe under high nitrogen levels. Maintain high levels of potassium. Enhance air circulation to hold down humidity.

Pythium Blight (*Pythium* spp.) - This is a rapidly developing and devastating disease. It is favored by excessive nitrogen fertilization and very wet and hot weather. An attack can result in the death of an entire green, tee or fairway in a matter of hours. Because of the severity, a preventative approach is taken during weather conditions which favor disease development. Several models have been developed which aid in determining when conditions are favorable for disease development. They include the following:

PYTHIUM BLIGHT FORECAST MODEL - Hall et al.



PYTHIUM BLIGHT FORECAST MODEL - Nutter et al.



Pythium Root Rot (*Pythium* spp.) - Provide good drainage. Avoid over watering.

Red Thread (*Laetisaria fuciformis*) - Maintain balanced fertility. Avoid nitrogen deficiency.

Rhizoctonia Blight (*Rhizoctonia* spp.) - Controlling thatch levels and avoiding excess nitrogen will aid in controlling disease incidence. Use of several natural organic fertilizer/composts in the fertilization/topdressing programs have been shown to reduce the incidence of brown patch by up to 75% (Nelson, 1990). Daily scouting during periods of warm weather is highly recommended. A model for predicting brown patch based on temperatures and humidity is given as follows:

A *RHIZOCTONIA* BLIGHT FORECAST MODEL
Basic forecast model requires:

- > 8 hours of relative humidity > 95%;
- minimum air and soil temperatures of 62 and 58 F, respectively;
- Leaf wetness duration > 9 hours or > 0.5 inch precipitation also is required.

Average accuracy of 87% in predicting incidences.

Rusts (*Puccinia* spp.) - Avoid excessive nitrogen or irrigation. Disease is more severe on turf subjected to drought stress, low mowing, or poor air circulation.

Stripe Smut (*Ustilago striiformis*) - Avoid drought stress. Maintain balanced nutrition. Keep thatch under control.

Summer Patch (*Magnaporthae poae*) - Over fertilization with nitrogen and excessive irrigation increase the likelihood of disease development. Ensure adequate drainage. Damage to the plant occurs in April and May, prior to symptom development (Figure 5). A preventative fungicide program is suggested on areas with a history of Summer Patch.

Take-all patch (*Gaeumannomyces graminis* var. *avenae*) - Maintain adequate fertility. Improve soil drainage and/or avoid over watering.

Guidelines for Disease Management

No annual fungicide program can, nor should, be developed for this golf course. Several disease problems previously identified can only be treated by a preventative approach. However, following sound cultural programs, practicing routine scouting and monitoring of turf and environmental conditions will minimize the need for excessive preventative and curative applications. Appendix III provides examples of IPM field report forms and summary reporting forms for pesticide use at the golf course.

The following guidelines under which disease management by use of fungicides may be initiated are provided for each area of the golf course for specific diseases:

Dollar Spot - On greens and tees, curative treatment upon detection of any incidence. On fairways, treatment upon detection of 2 or more incidences which are greater than 0.5 inch diameter per square foot. In roughs, only when incidences with a diameter greater than 0.75 inch exceed 4 to 6 per sq.ft. and weather conditions are favorable for further disease development per Table 17.

Leaf Spot - On greens and tees, curative treatment upon detection of any incidence which is forming patches or thinning the turf. On fairways, when incidences of patches exceed 2 to 3 per sq.ft. or when the turf appears to be thinning. In rough, only when incidences appear to be thinning the turf.

Necrotic Ringspot - Preventative treatments must be applied to greens and tees which have a previous history of infection when cool-wet weather occurs. On fairways and roughs, treatment should occur upon detection of any incidence.

Pythium Root Rot and Pythium Blight - Upon detection of any incidence on any area. This disease is easily spread if in the blight stage. The root rot form is exceptionally damaging since it requires long recovery periods.

Rhizoctonia Blight - On greens and tees, curative treatment upon detection of any incidence. On fairways, treatment upon detection of 2 to 3 incidences which are 2 to 4 inches in diameter per 100 sq.ft. of area. In roughs, only when incidences exceed 4 to 6 per 100 sq.ft. and are 4 to 6 inches in diameter and weather conditions are favorable for further disease development per Table 17.

Summer Patch - Curative on any area where incidence is noted. Preventative on areas which have a previous history in April and May, prior to symptom development (see Figure 5).

Table 18. Fungicides+ recommended for control of specific turfgrass diseases at Lion's Gate Golf Course.

Disease	Greens	Tees/Fairways	Roughs
Anthracnose	chlorothalonil, fenarimol, mancozeb, thiophanate-methyl, triadimefon	none	none
Curvularia	captan, chlorothalonil, iprodione, maneb, mancozeb, thiram	none	none
Dollar Spot	chlorothalonil, fenarimol, iprodione, mancozeb, thiophanate-methyl, thiram, triadimefon, vinclozolin	fenarimol, iprodione, triadimefon, vinclozolin	fenarimol, iprodione, triadimefon, vinclozolin
Leaf Spot	captan, chlorothalonil, iprodione, maneb, mancozeb, thiram	captan, iprodione, maneb, mancozeb, thiram	captan, iprodione, maneb, mancozeb, thiram
Necrotic Ringspot	none	none	none
Powdery Mildew	fenarimol, triadimefon	fenarimol, triadimefon	fenarimol, triadimefon
Pythium Blight	fosetyl-Al, metalaxyl	fosetyl-Al, metalaxyl	fosetyl-Al
Pythium Root Rot	fosetyl-Al, metalaxyl	fosetyl-Al, metalaxyl	fosetyl-Al
Rhizoctonia Blight	captan, chlorothalonil, fenarimol, iprodione, mancozeb, thiophanate-methyl, thiram, triadimefon	captan, fenarimol, iprodione, mancozeb, thiram, triadimefon	captan, fenarimol, iprodione, mancozeb, thiram, triadimefon
Rusts	none	maneb, mancozeb, triadimefon	none
Stripe Smut	captan, fenarimol, thiophanate-methyl, triadimefon, thiram	none	none
Summer Patch	none	none	none
Take-all Patch	fenarimol, triadimefon	fenarimol, triadimefon	none

+ All materials must be applied at rates and under conditions prescribed by the label.

Insect Control

Insect problems at this course will be minimal, primarily root feeding grubs and lepidopteran larvae. Routine scouting and sampling of turf for adults, larvae and grubs can isolate areas of concern and target control measures. Several nonchemical treatments of parasitic nematodes and bacteria for insect control are available. However, they often do not give the degree of consistency, reliability and versatility and are proven ineffective in many circumstances (Potter, 1993). However, they should be incorporated into the strategies for insect control in order to provide as much of a nonchemical approach as possible. Suggested thresholds before chemical treatment is necessary are given in Table 19 have been adapted from Hellman (1992), Bhowmik et al. (1991) and Villani (1992) and Watschke et al. (1994).

Table 19. Suggested thresholds for treatment of insect problems at Lion's Gate Golf Course.

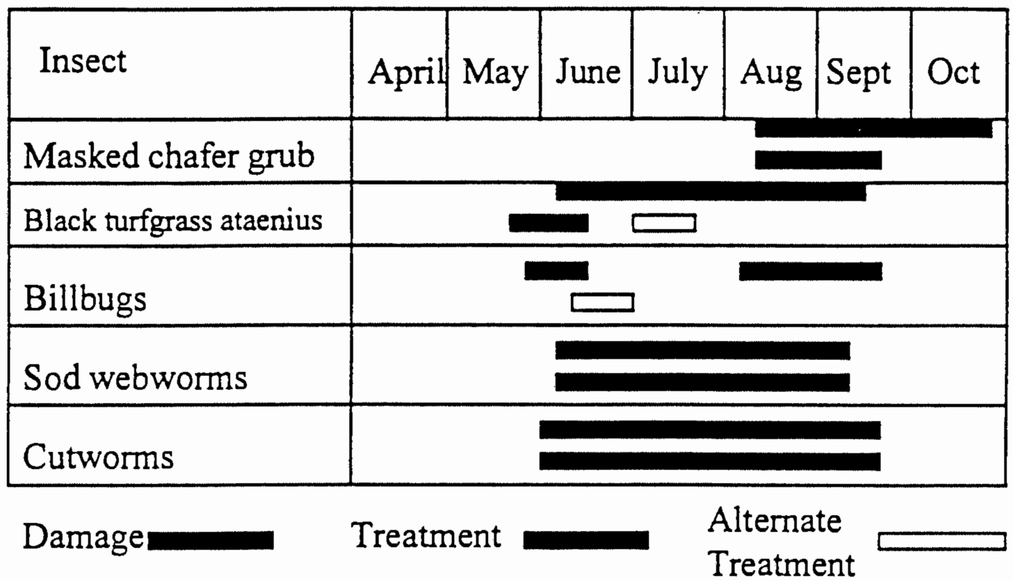
Insects	Greens/Tees #/sq.yd.	Fairways/Roughs #/sq.ft.
Grubs - Masked Chafer	4	4 to 6
Billbug	1	1
Black turfgrass Ataenius	5	40
Cutworm and Armyworms	1	1
Fiery Skipper	1	1
Lucerne Moth and Sod Webworm	2	2

Billbugs (Phoenix billbug: *Sphenophorus phoeniciensis;* Hunting billbug: *S. Venatus vestitu).* Drought stressed turf is more susceptible. Adult insects may be found in turf areas by use of a pyrethrum or detergent test. Fine-whitish sawdust-like larval excrement (frass) may be observed on the soil surface. Thresholds are listed in Table 19. The parasitic nematode for biological control *Steinernema carpocapsae* is usually more effective on soil which has previously been fumigated. Insecticides which are approved based on the selection guidelines previously noted are listed in Table 20, and approximate timing of damage and treatment are given in Figure 7.

Black Turfgrass ***Ataenius*** (*Ataenius spretulus*). More prominent on stressed bentgrass or bentgrass/ryegrass mixtures. Damage often mimics drought stress. Foraging mammals such as raccoons also may indicate a problem. For short-term control the parasitic nematode *Steinernema carpocapsae* can be effective. Insecticides which are approved based on the selection guidelines previously noted are listed in Table 20.

White grubs (*Cyclocephala hirta; C. pasadenae*). Several species have larval forms as white grubs that feed on the turfgrass roots at the soil/thatch interface. They can be extremely destructive, especially in the advanced larval stage. The key to successful control is identifying threshold levels and treating when larvae are in the earliest stages. Timing of insecticide application should be when larvae are still active at the soil surface. Adult activity

Figure 7. Recommended timing of insecticide applications for optimum efficacy.



generally occurs from mid-June to July. Optimum timing for treatment is 3 to 4 weeks following peak adult activity. The parasitic nematodes *Steinernema glaseri* and *Heterorhabditis bacteriophora* can effectively control masked chafer larvae. Insecticides which are approved based on the selection guidelines previously noted are listed in Table 20.

Cutworms and Armyworms (Black cutworm: *Agrotis ipsilon*; Variegated cutworm: *Peridroma saucia*; Armyworm: *Pseudaletia unipuncta*; Granulate cutworm:*Feltia subterranea*). Cutworms and armyworms are active from mid-March to October. Aeration holes are often occupied by larvae which feed at night. A pyrethrum or detergent test can be used to determine threshold levels. Biological control by *Steinernema carpocapsae* can be a valuable control. *Bacillus thuringiensis* is most effective against sod webworms and should be

Table 20. Insecticides + approved for control of specific turfgrass insects at Lion's Gate Golf Course.

Insect	Greens	Tees/Fairways	Roughs
Black turfgrass Ataenius	carbaryl, chlorpyrifos, *Steinernema carpocapsae* (Biological)	carbaryl, chlorpyrifos, *Steinernema carpocapsae* (Biological)	carbaryl, chlorpyrifos, *Steinernema carpocapsae* (Biological)
Bluegrass billbug	*Steinernema carpocapsae* (Biological)	*Steinernema carpocapsae* (Biological)	*Steinernema carpocapsae* (Biological)
Masked Chafer grubs	carbaryl, chlorpyrifos, *Steinernema glaseri, Heterorhabditis bacteriophora* (Biologicals)	carbaryl, chlorpyrifos, *Steinernema glaseri, Heterorhabditis bacteriophora* (Biologicals)	carbaryl; *Steinernema glaseri, Heterorhabditis bacteriophora* (Biologicals)
Cutworms and armyworms	acephate, carbaryl, chlorpyrifos, fluvalinate; *Steinernema carpocapsae, Bacillus thuringiensis* (Biologicals)	acephate, carbaryl, chlorpyrifos, fluvalinate; *Steinernema carpocapsae, Bacillus thuringiensis* (Biologicals)	carbaryl; *Steinernema carpocapsae, Bacillus thuringiensis* (Biologicals)
Fiery skipper	carbaryl, chlorpyrifos, *Steinernema carpocapsae, Bacillus thuringiensis* (Biologicals)	carbaryl, chlorpyrifos, *Steinernema carpocapsae, Bacillus thuringiensis* (Biologicals)	carbaryl, *Steinernema carpocapsae, Bacillus thuringiensis* (Biologicals)
Lucerne moth and sod webworms	acephate, carbaryl, chlorpyrifos, fluvalinate; *Steinernema carpocapsae, Bacillus thuringiensis* (Biologicals)	acephate, carbaryl, chlorpyrifos, fluvalinate; *Steinernema carpocapsae, Bacillus thuringiensis* (Biologicals)	carbaryl; *Steinernema carpocapsae, Bacillus thuringiensis* (Biologicals)

+ All materials must be applied at rates and under conditions prescribed by the label.

considered for armyworm control only when they are in the first or second instar. Insecticides approved based on the selection guidelines previously noted are in Table 20.

Fiery Skipper (*Hylephila phyleus*). Skipper larvae feed May through September. Keep thatch to a minimum to eliminate larval habitat. Use pyrethrum or detergent test to determine thresholds. Biological controls have not been tested. Insecticides which are approved based on the selection guidelines previously noted are listed in Table 20.

Lucerne Moth and Sod Webworms (Lucerne moth:*Nomophila noctuella;* Sod webworms:*Tehama bonifatella, Carmbus speryellus*). These are caterpillar larvae which can be very destructive if not diagnosed and treated early. The adult moths are inactive in the daytime and can be observed resting on the turfgrass, weeds, or on the leaves and stems of trees or shrubs. Likewise, the larvae are night feeders on the leaves of the grass. Scouting for both adults and larvae burrowed down in the grass can determine if damaging numbers are present. Moth activity is greatest from June to early October. Monitoring is critical to ensuring timely treatment. Evening treatment is required since that is when the larvae are active. A pyrethrum or detergent test is useful in determining thresholds for treatment. For biological control, *Steinernema carpocapsae* is a valuable control option. *Bacillus thuringiensis* can be used but it breaks down rapidly in sunlight, washes readily off the leaves, and is ineffective against late instar larvae. Insecticides which are approved based on the selection guidelines previously noted are listed in Table 20.

Weed Control

The most effective weed control is a dense healthy turf. Therefore, after the first year and the turf is fully established weed problems will be minimal. Paying strict attention to optimum cultural practices to maintain an aggressive turf is the first requisite in weed control. Herbicides which are recommended and approved based on the selection guidelines previously noted are listed in Table 21.

Annual bluegrass. While the common name implies this is an annual weed problem, the sub-specie (*Poa annua* spp. *reptans*) of this pest problem is actually a perennial. Growth and persistence of annual bluegrass is favored by compacted and/or wet soils, high soil pH, and high soil phosphorus levels. Keeping cultural practices current to prevent these conditions and favor the growth of the preferred grasses will minimize the competition.

Broadleaf weeds. A number of broadleaf weeds are special problems in turfgrass areas in California in that they compete aggressively with turfgrasses. California burclover (*Medicago polymorpha*) and black medic (*Medicago lupulina*) are annuals or short-lived perennials which are favored by low nitrogen fertility. White clover (*Trifolium repens*) is more likely to be a problem under moist soils and low nitrogen fertility. Dandelion (*Taraxacum officinale*) is a perennial that has a long taproot which can regenerate when severed. Thin, open turf areas with low density favor the development of this as a weed

Table 21. Herbicides' and Plant Growth Regulators' recommended for control of specific turfgrass weeds at Lion's Gate Golf Course. Control for specific weeds is based on efficacy and effectiveness. More specific information and is found in Appendix II.

Weed	**Greens**		**Tees/Fairways**		**Roughs**	
	Pre-	Post-	Pre-	Post-	Pre-	Post-
Annual bluegrass	bensulide	cimectacarb, paclobutrazol	none (would preclude overseeding)	none	oxadiazon, pendimethalin,	none
Broadleaves	none	2,4-D + mecoprop + dicamba (bentgrass formulation)	benefin, bensulide, oryzalin, pendimethalin, benefin+oryzalin,	dicamba, mecoprop, triclopyr, 2,4-D, 2,4-D + mecoprop + dicamba, 2,4-D+triclopyr	oxadiazon, pendimethalin,	2,4-D + mecoprop + dicamba, 2,4-D+triclopyr
Grassy	bensulide, bensulide + oxadiazon	none	benefin, bensulide, oryzalin, pendimethalin, benefin+oryzalin,	MSMA	oxadiazon, pendimethalin,	MSMA
Sedges	none	none	bentazon	bentazon	bentazon	bentazon

problem. English daisy (*Bellis perennis*) is a perennial that is most common in cool coastal climates. It is difficult to control and requires multiple applications of herbicides. Creeping woodsorrel (*Oxalis* spp.) is a strong creeping perennial that invades even well-maintained turf and for which there are no cultural controls. Plantains (*Plantago* spp.) are most commonly found in poorly maintained open turf areas. Other broadleaf weeds will invade weakened or thin turf.

Grassy weeds. As with broadleaf weeds, grassy weeds invade thin turf. Annual grassy weeds such as crabgrass (*Digitaria* spp.) have seed which require light for germination. Thus an effective control is to maintain a dense stand of grass. If it is determined that an herbicide is needed for control, crabgrass seed is known to germinate when soil temperatures reach 53 to 58 °F at a 4-inch depth. Thus timing of the herbicide application should be just prior to soil temperatures reaching this range. Goosegrass (*Eleusine indica*) is an annual grassy weed that germinates at soil temperatures slightly higher than crabgrass. If this is the targeted weed problem, then delaying preemergent herbicide application until just prior to soil temperatures reaching 64 to 67 F will aid in control. This weed is also favored by compacted soils, so core aerification to encourage a healthy turf will also provide some additional benefit. Dallisgrass (*Paspalum dilatatum*) is a warm-season perennial which forms short rhizomes. Only repeat applications of a postemergent material or a nonselective herbicide will control this tenacious weed. Kikuyugrass (*Pennisetum clandestinum*) is a tenacious warm-season perennial. No cultural controls have been found to reduce invasion.

Sedges. Yellow (*Cyperus esculentus*) and purple (*Cyperus rotundus*) nutsedge are perennial weeds which grows from underground tubers. A single application of herbicide may not prove completely effective. Summer treatment is recommended in early to mid-July.

The following guidelines under which weed management by use of herbicides may be initiated are provided for each area of the golf course:

	% Weeds Tolerated	
	Grassy Weeds	Broadleaf Weeds
Greens	0 - 1	0 - 1
Tees	2 - 6	1 - 4
Fairways	3 - 8	2 - 7
Roughs	7 - 12	8 - 13

A well designed weed management plan should include intense scouting and mapping of problem areas. This will allow selective control through spot-treatments. This approach will eliminate the need for broadscale pesticide applications on a routine basis.

MANAGING THE PROGRAM - PERSONNEL

The success of this golf course Environmental Management Plan depends, to a large extent, on the manner in which the program is carried out. Because Lion's Gate Golf Course is to be managed in an environmentally sensitive manner, it is imperative that the selection of personnel be made very carefully. The golf course will need a cadre of highly qualified key people to see that daily operations are carried out properly and in a timely manner.

Superintendent

Because turfgrass management has become more scientific in the past few years, it is desirable for the superintendent to have a degree in agronomy, horticulture, plant or soil sciences, as well as experience in all phases of golf course management. Since it is their management ability and day-to-day decisions based on sound agronomic principles and practices that make a successful program, they should have a thorough knowledge of Best Management Practices (BMPs), exhibit an understanding of the principles of Integrated Pest Management (IPM), and have a license to apply restricted use pesticides. A participating knowledge of the game of golf and the ability to train and effectively supervise employees are also important.

Assistant Superintendent

Similarly, the assistant should also have a degree in agronomy, horticulture, plant or soil sciences. They should be licensed in pesticide usage, have a working knowledge of golf course maintenance practices and the ability to schedule and supervise work to achieve the most efficient utilization of employees and equipment.

Irrigation Technician

Because of the highly sophisticated irrigation system to be used on the course and the importance of proper monitoring of water usage, the selection of this technician is critical. The person employed must have a working knowledge of computerized control systems as well as basic electricity, hydraulics, valves, pumps, sprinkler heads, etc.

Since efficient water use and conservation of irrigation water are the responsibility of the system operator, a knowledge of turfgrass water requirements and the capabilities of the irrigation system will be needed, also.

Pesticide Technician

Because the appropriate use of pesticides depends not only on proper selection, but also on proper equipment maintenance and calibration and application techniques, it is strongly recommended that this person is licensed in restricted pesticide usage and experienced in handling pesticides.

Mechanic

The success of all cultural practices is dependent on the condition of the equipment and tools used. Therefore, it is essential to have a person knowledgeable and capable in the maintenance and repair of the various types of equipment used on golf courses. Their responsibilities include not only keeping all equipment in operational condition at all times, but also includes keeping the service area and maintenance building clean and in accordance with all environmental regulations.

PESTICIDE SAFETY

Storage. Pesticides will need to be stored in a separate room designated for these materials only and located away from water sources (ponds, streams). The room will be kept locked and posted as required by law, including the courses, 'Hazard Communication Program' (See samples in Appendix IV). Good ventilation will be provided and chemicals kept away from direct contact with the concrete floor. All pesticides will be stored in their original containers with visible labels.

To be prepared for spills and/or leaks, an emergency spill response kit will be maintained which will include absorbent floor-sweep materials, sawdust or cat litter and activated charcoal as well as spill containment materials.

An inventory of pesticides and other chemicals will be kept, and MSDS and labels for each pesticide used will be readily accessible.

A fire extinguisher, protective clothing, respirator and first aid supplies will be kept in an attainable place and in ready condition.

Water will be available for both routine and emergency chemical removal, including showers and eye wash facilities.

Handling and Application. When handling pesticides, special attention will be given to warnings and precautions on the label. Applicators should always wear personal protective gear which includes: rubber gloves, goggles or face shields, respirators, protective clothing, and rubber boots when mixing and applying pesticides as specified by labeling requirements.

Chemicals should always be measured out below eye level; and applicators should not stand directly over the tank when adding chemicals, as they frequently splash and emit dusts.

Mixing and loading will be done in a designated area so that any spills can be handled effectively. Design will follow California regulations and requirements. An appropriate drainage sump and return system should be in place which will allow either adding spilled materials back into the spray tank directly or into rinsate tanks for later use, or transferring then into a unit designated for the handling of hazardous materials rather than returning it to the spray tank for application. Several of this type of unit are commercially available.

Before mixing chemicals together, their compatibility should be checked as chemical incompatibility could result in reduced effectiveness, increased toxicity to the applicator, or phytotoxicity to the turfgrass. The "quart jar method" can be used to determine compatibility and labels should be consulted to determine if restrictions apply. Spray adjuvants (such as wetting agents, emulsifiers, foaming agents and stickers) should be used in accordance with label recommendations.

Care will be taken to mix only the amount of pesticide needed for the application. However, if there is excess, the material will be sprayed on another area where it is in accordance with the label and where treatment is required, or it will be disposed of according to label directions.

As soon as pesticides are loaded, all equipment and apparel used will be washed, rinsed and air dried. Water used in the cleaning process will be dumped into the spray tank or washed into a drain at the wash down pad to be sent to a degradation unit or a filtration unit.

After the pesticide is applied, the sprayer tank, boom and nozzles will be washed in the designated area where the tank will be refilled with water; and this material (which will have an extremely low concentration of pesticide) will be sprayed on an area for which the pesticide is labeled, or sent to a degradation unit or filtration unit.

Disposal. Empty bottles, drums or cans will be disposed of according to the label which usually states to triple rinse and recycle, recondition or puncture and dispose of in an approved disposal site. Containers should be rinsed before spraying so that the rinsate can be put into the spray tank.

When a container has an expired shelf life or is damaged, the manufacturer, supplier or local state agency will be contacted for assistance in disposal.

Pesticide Record Keeping. Proper records of all pesticide applications will be kept according to government requirements. These records will help establish proof of proper use, facilitate comparison of results of different applications and/or find cause of an error. Records should include the following information:

1. Data and time of application.
2. Name of applicator.
3. Person directing or authorizing the application.
4. Weather conditions.
5. Target pest.
6. Pesticide Used (trade name, active ingredient, amount of formulation, amount of water).
7. Adjuvant/Surfactant and amount applied, if used.
8. The area of golf course ornamental plantings number of acres or square feet treated.
9. Total amount of pesticide used.
10. Application equipment.-
11. Additional remarks, such as severity of the infestation.

For a sample pesticide use record, see Appendix V.

Spill Prevention and Response

Prevention

- Mixing of chemicals occurs only at the designated chemical mixing area that is designed to contain any spillage until it is properly treated with the filtration unit.
- Prescribed routes for the transport of mixed, diluted chemicals. Routes are chosen to minimize the likelihood of spills (e.g., steep slopes are avoided) and to avoid sensitive areas (e.g., wetlands), and the routes are known to the applicators.
- Chemicals used on the course are dilute. The only concentrated chemicals at the course are stored in a locked storage facility, and are mixed only in a specially designed mixing area.
- The least toxic materials with the shortest half-life and greatest affinity for soils are used at the course. Thus the effect of any release is minimized.

Training

- Current pesticide operators license will be maintained by the Golf Course Superintendent, Assistant Superintendent, and the Pesticide Spray Technician.
- Safety plans including proper handling and storage as indicated on Material Safety Data Sheets (MSDS) will be followed.
- Training in proper storage, handling, mixing and containment of spills of chemicals will be conducted.

Containment

- Spill containment materials are readily available. Commercially available spill containment kits (containing for example, foam pillows and absorbent material) are kept readily available in the chemical mixing area and in the chemical storage area. Any used kits are correctly disposed of based on the type of chemical.

- A spill or hose leak on the course will result in the following actions.
  - spray technician contacts the superintendent or assistant superintendent.
  - appropriate containment measures are immediately instituted; e.g., use containment kit, create a berm with a shovel, and isolate the area.
  - contact appropriate local and state officials.
- Based on the amount of dilute (mixed) chemical released the following will occur:

  $<$ 10 gallons. Follow actions as listed above.

  10 - 50 gallons. Follow actions as listed above. Additional actions will depend on the chemical's toxicity and location of release.

  $>$ 50 gallons. Follow actions listed above. Monitor down-gradient and in potentially affected waters. Monitoring duration will depend on degradation properties of the chemical, but will include sampling at the time of release, and at appropriate intervals. Results of the monitoring will dictate future actions.

ENVIRONMENTAL MONITORING

The Environmental Monitoring Program at Lion's Gate Golf Course will include monitoring of surface water, pond sediments, and ground water. The monitoring plan, based on sound, scientific principles will:

1. Establish a baseline of water and sediment quality prior to construction,
2. Provide data that will establish environmental conditions, thus providing a basis for measuring compliance with environmental regulations, and
3. Ensure that Integrated Pest Management is functioning properly and that no health hazards have developed.

An adaptation from a model proposed by Madhun and Freed (1990) notes that there are four basic types of monitoring which can occur: 1) ***Reconnaissance*** - periodic observation to disclose changes or trends. With IPM employed this is an integral part of this program; 2) ***Surveillance*** - to comply with an enforcement program. Pesticide application licensing programs require record-keeping which may be monitored at any time. This will be required by law and serves as a record of a part of the cultural program; 3) ***Subjective*** - spot-checking for broad or open-ended exploration of problems. A superintendent with training and experience in the golf course management industry has the background and resources to investigate problems and make intelligent decisions; and 4) ***Objective*** - to provide data for use in developing or confirming the results of on-going programs. Monitoring operations at Lion's Gate Golf Course should focus on maintaining environmental quality and obtaining information on which to make adjustments in cultural programs using all of these approaches.

Results of the Environmental Monitoring Program provide feedback to the golf course superintendent, and thus provide a useful management tool. For example, the results of the program are used in determining the correct application rates and timing of pesticides and fertilizers, and the optimum operation of irrigation programs.

The Environmental Monitoring Program is established in three phases that coincide with golf course development. Phase I defines pre-development water and sediment quality conditions, Phase II is the construction and development phase and immediate post-development time-frame, and Phase III is the post-development, operational golf course. Phase III begins with golf course grow-in of turf.

Phase I. Background Surface Water, Groundwater, and Sediment Quality

The goal of Phase I is to establish background surface water, groundwater and sediment quality at Lion's Gate Golf Course.

Sample Locations.

Surface Water. Surface water will be sampled at three locations that are described below and shown on Figure 8 (SW means surface water):

Sample Station SW 1. West Branch Llagas Creek at the bridge near the golf cart path east of the tees at Number 8.

Sample Station SW 2. The existing stock pond, between Number 3 and Number 5.

Sample Station SW 3. Pond between the green near Number 18 and the tee near Number 10.

Obtaining water samples from the same location is imperative. Temporal changes in water quality can be interpreted with confidence only if the same location is consistently sampled. Sample stations will be located and permanently marked in the field, identified on maps, and photographed so that stations are easily located during subsequent sampling efforts. Data from these sample stations will allow an assessment of the quality of the water leaving the site.

Groundwater. Groundwater will be sampled at four locations that are described below and shown on Figure 8 (GW means groundwater):

Sample Station GW 1. Well near Number 9 tees, north of West Branch Llagas Creek.

Sample Station GW 2. Well near Number 9 tees, south of West Branch Llagas Creek.

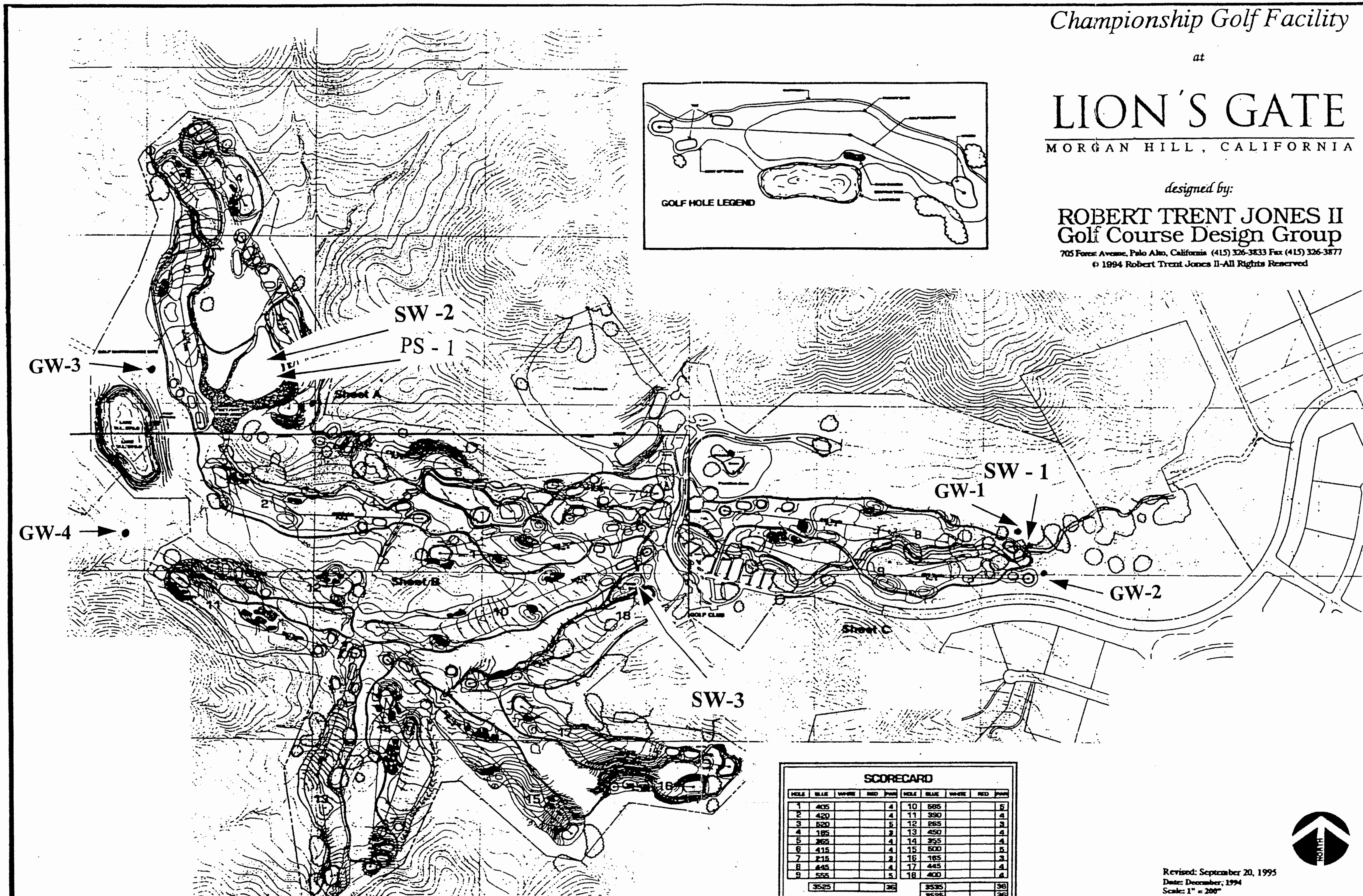
Sample Station GW 3. Well near the golf maintanence site near Number 3 tees.

Sample Station GW 4. Background well west of Number 11.

New 2" monitor wells will be installed. The wells will be constructed according to California regulations, under the direction of a geologist.

Groundwater sample stations will be field marked, identified on maps, and photographed. Data from these sample stations will allow an assessment of the quality of the groundwater on the site.

Sediment. Pond sediment will be sampled from the pond located above the wetlands between Number 3 and Number 5. Three locations will be composited into one sample in the field.



HOLE	BLUE	WHITE	RED	PAR	HOLE	BLUE	WHITE	RED	PAR
1	405			4	10	585			5
2	420			4	11	390			4
3	520			5	12	265			3
4	165			3	13	450			4
5	365			4	14	355			4
6	415			4	15	600			5
7	215			3	16	165			3
8	445			4	17	445			4
9	555			5	18	400			4
	3525			36		3535			36
						3525			36
					TOTAL	7080			72

Figure 8. Location of surface water (SW), groundwater (GW), and pond sediment (PS) sample stations, Lion's Gate Golf Course, Santa Clara County, California.

The three samples will be collected in a triangular pattern around the center of the pond. Sample location is shown on Figure 8 (PS means pond sediment):

Sample Station PS 1. The sediments at the middle of the existing stock pond located between Number 3 and Number 5.

Sample location will be photographed and marked on maps. Data from this sample station will allow an assessment of the quality of the sediment in the pond.

Sample Frequency.

The goal of Phase I is to define the baseline conditions at the site. Surface water samples will be collected four times prior to the beginning of construction. Two of the surface water samples will be taken after the rainfall events of ½ " or more in a 24 hr period and two surface water samples will be taken during non-rainfall periods (no rain for previous 5 days). Because of the pattern of rainfall in the Hayes Valley (see Table 14), the rainfall samples will probably be taken from October through April, and the dry-period samples taken from May through September. Sample events should be spaced at approximately quarterly intervals. West Branch Llagas Creek may be dry during the May through September samples. Every reasonable effort will be made to sample runoff close to the time of first flush; i.e., at the time beginning of the runoff event. Should water not be available on a given sample date, two additional attempts will be made to obtain a sample within the pre-construction time period.

Groundwater samples will be collected four times (once during Winter, Spring, Summer and Autumn) prior to the beginning of construction and sediment will be collected two times prior to construction (once during Winter and Summer). This phase of the monitoring program will be terminated when construction begins.

Sample Analytes

Surface water, groundwater and pond sediments will be analyzed for the analytes listed in Table 22.

The inclusion of pesticides and herbicides in the analytes was based on several factors that are detailed in the Integrated Pest Management plan for Lion's Gate Golf Courses. The primary factors were potential quantity of a chemical that may be used at the club, and the chemical's mobility, leaching potential, persistence and toxicity based on data in the scientific literature and computer models. Restrictions have been placed on pesticides and herbicides that have a high leaching potential; those that have a low to moderate leaching potential will be used sparingly; and those that will be used most frequently have a very low to no leaching potential and a rapid degradation time.

Field Methods.

Variables, container type, preservation and holding times for water samples are given in Table 23, and for sediment samples in Table 24.

Table 22. Variables to be Analyzed (x) in Surface- and Ground- Water and Pond Sediments at Lion's Gate Golf Course, Santa Clara County, California.

Variables	PHASE I and III Environmental Monitoring Program			PHASE II Environmental Monitoring Program		
	Surface Water	Ground Water	Pond Sediment	Surface Water	Ground Water	Pond Sediment
Field Analyses						
pH	x	x		x	x	
Water Temperature	x	x		x	x	
Specific Conductance	x	x		x	x	
Dissolved Oxygen	x			x		
Laboratory Analyses						
Nitrate-Nitrite Nitrogen	x	x		x		
Total Phosphorus	x	x		x		
Chloride	x	x		x		
Total Dissolved Solids	x	x		x		
Turbidity	x	x		x		
Particle size			x			x
2,4-D	x	x				
Chlorothalonil	x	x	x			

Table 23. Variables, container type, preservation, and holding times for water samples.

Variable	Container Type	Preservation	Holding Time	Analytical Method
pH	not applicable	not applicable	not applicable	EPA 150.1
Water Temperature	not applicable	not applicable	not applicable	EPA 170.1
Specific Conductance	not applicable	not applicable	not applicable	EPA 120.1
Dissolved Oxygen	not applicable	not applicable	not applicable	EPA 360.1
Nitrate-Nitrite Nitrogen	P,G	Cool, 4°C	48 h	EPA 353.1, 353.2
Total Phosphorus	P.G	Cool, 4° C, H_2SO_4 to pH <2	28 d	EPA 365.4
Chloride	P,G	Cool, 4° C	28 d or	EPA 325.3
Total Dissolved Solids	P,G	Cool, 4° C	7 d	EPA 160.1
Turbidity	P,G	Cool, 4°C	48 h	EPA 180.1
2,4-D	G	Cool, 4°C	7 d	NPS method 3
Chlorothalonil	G	Cool, 4°C	7 d	NPS method 2

From:

USEPA, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, updated 1983.

USEPA, Analytical Support Branch, Operations and Quality Control Manual, June 1985.

USEPA, Test Methods for Evaluating Solid Waste, SW-846, 1986, updated in 1987.

USGS. Laboratory Theory and Methods for Sediment Analysis.

40 CFR Part 136 Table II: Required Containers, Preservation Techniques and Holding Times (Water/Wastewater Samples), 1988.

NPS methods were developed as part of the EPA National Pesticide Survey.

Table 24. Variables, container type, preservation, and holding times for sediment samples.

Variable	Container Type	Preservation	Holding Time	Analytical Method
Particle Size	Polyethylene or Polypropylene bag, Glass jar	Cool, 4° C	28 d	Sieve Analysis, USGS
Chlorothalonil	Glass Jar	Cool, 4 °C	14 d	NPS method 2

[a] EPA Based means that in cases where standard methods are not available, the Laboratory will follow closely related standard practices, and demonstrate accuracy and precision of the method with at least a 5-point standard curve, sample spikes, and duplicate analyses.

From:

USEPA, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, updated 983.
USEPA, Analytical Support Branch, Operations and Quality Control Manual, June 1985.
USEPA, Test Methods for Evaluating Solid Waste, SW-846, 1986, updated in 1987.
USGS. Laboratory Theory and Methods for Sediment Analysis.
40 CFR Part 136 Table II: Required Containers, Preservation Techniques and Holding Times (Water/Wastewater Samples), 1988.
NPS methods were developed as part of the EPA National Pesticide Survey.

Surface Water. A number of variables will be measured on-site, including pH, water temperature, dissolved oxygen, and specific conductance. pH will be measured with a pH probe that has been calibrated just prior to use. Specific conductance will be measured with a calibrated specific conductance meter. Dissolved oxygen will be measured with a calibrated meter. Water temperature will be measured with a temperature probe attached to the specific conductance meter. Water discharge in the streams will be measured at the time of water sampling by standard USGS techniques that involve measuring flow with a current meter and calculating cross-sectional areas of each sample area (USGS 1968). The three-point method, using a calibrated current meter to measure flow and a standard tape measure to determine wetted area in the cross-section, will be employed to determine instantaneous discharge measures.

The pond and stream water will be sampled by obtaining 'discrete' grab samples of water. Discrete grab samples are taken at a selected location, depth and time, and then analyzed for the constituents of interest. Stream water will be obtained from the center of flow at mid-depth. Water will be collected in sample bottles that face upstream, and water is transferred to sample containers that include proper preservatives and labels. Pond samples will be taken approximately 6 inches below the surface. The sample containers are immediately placed in a cooler with ice and are taken to a laboratory for analysis and analyzed for the variables listed in Table 22.

A chain-of-custody program is followed to assure that proper transportation and storage practices are documented and that the appropriate analyses are being conducted. A field sampling log of surface water sampling and observations will be maintained. The log book documents site conditions, including stream water depth, observations, weather conditions, and field measurements. An example of a page from a field log is given in Appendix V.

Groundwater. Groundwater elevation is determined for each well on each sampling date.

After measuring water elevation, the standing water in the well is removed, and replaced by fresh formation water. The quantity of water removed is determined from the well volume and recharge rate. In general, high-yield wells are purged of three well casing volumes of water and low-yield wells are pumped to dryness. Each well is purged using a portable pump that is cleaned between well samplings. Water is suitable for sampling when three consecutive measures of water have stable pH, temperature and specific conductance readings.

Wells are allowed to recharge after purging to allow the system to equilibrate. Depth to the water table is remeasured, recorded and water samples are extracted. Extraction occurs with a pump, or a dedicated Teflon® bailer. Water temperature, pH, and specific conductance are measured in water that will not be used for laboratory analyses. Water samples are taken and decanted or drained into an appropriate sample container that has the proper preservatives and is labeled. Samples are transferred from the sample device to the sample container in a manner that will minimize turbulence and the loss of volatile compounds. Samples are immediately placed in a cooler with ice and transported to the analytical laboratory and analyzed for variables given in Table 22.

A chain-of-custody program is followed to assure that proper transportation and storage practices are documented and that the appropriate analyses are being conducted. A field sampling log on groundwater sampling and observations will be maintained. The log book documents site conditions, including water depth, observations, weather conditions, and field measurements. An example of a page from a field log is given in Appendix V

Sediment. Pond sediment will be collected with a gravity type sediment coring device or by hand. Three cores or grab samples will be taken and composited to yield one sample on which analyses will be performed. The approximate top 10-cm of the sediment will retained and analyzed for the variables listed in Table 22. Grain-size effects from the sediments will be reduced by analyzing the <125 μm sediment fraction.

A chain-of-custody program is followed to assure that proper transportation and storage practices are documented and that the appropriate analyses are being conducted. A field sampling log on sediment sampling and observations will be maintained. The log book documents site conditions, including water depth, sediment texture, observations, and weather conditions. An example of a page from a field log is given in Appendix V.

Laboratory Methods

Laboratories used for sample analysis must have received certification by the Environmental Protection Agency (EPA) or its designated State Agency to conduct chemical analyses on surface water and drinking water. Certification of the laboratory is maintained by successful performance of the EPA Water Pollution Study and EPA Water Supply Study. The Laboratory must have a Quality Control and Quality Assurance plan approved by the EPA or it's designated State Agency. Sample analyses will follow accepted, standard methods as defined in the laboratories accreditation and detailed in their Quality Assurance and Quality Control procedures. Sample containers, properly cleaned and containing the proper preservative, will be supplied by the analytical laboratory.

In cases where standard methods are not available, the Laboratory will follow closely related standard practices, and demonstrate accuracy and precision of the method with at least a 5-point standard curve, sample spikes, and duplicate analyses.

Phase II. Surface Water, Groundwater, and Sediment Quality during Construction and Immediate Post-Construction Period

The goal of Phase II is to assess construction and immediate post-construction activities on surface water, groundwater and sediment quality. Pesticides and fertilizers are not applied to the course during this Phase of monitoring.

Sample Locations.

Surface Water. Surface water will be sampled at three locations that are described in Phase I monitoring program. Locations on the property are given in Figure 8.

Obtaining water samples from the same location over time is imperative. Temporal changes in water quality can be interpreted with confidence only if the same location is consistently sampled. Sample stations will be located and permanently marked in the field, identified on maps, and photographed so that stations are easily located during subsequent sampling efforts. Data from these sample stations will allow an assessment of the quality of the water leaving the site.

Groundwater. Groundwater will be sampled at four locations that are identified in the Phase I monitoring program (Figure 8). Sample location will be photographed and marked on maps. Data from these sample stations will allow an assessment of the quality of groundwater.

Sediment. Pond sediment will be sampled from the deep marsh at three locations and composited into one sample in the field. The three samples will be collected in a triangular pattern around the center of the pond. Sample location is shown on Figure 8 and is the same as in Phase I (PS means pond sediments). Sample location will be photographed and marked on maps. Data from this sample station will allow an assessment of the quality of the sediment in the pond.

Sample Frequency.

The goal of Phase II is to define conditions at the site during construction. Surface water and groundwater samples will be collected four times per year. One sample event will be in Winter, one in Spring, one in Summer, and one in Autumn if construction is occurring during these seasons. As in Phase I, two of the surface water samples will be taken after the rainfall events of ½ " or more in a 24 hr period and two surface water samples will be taken during non-rainfall periods (no rain for previous 5 days). For surface water, every reasonable effort will be made to sample runoff close to the time of first flush; i.e., at the time beginning of the runoff event. Should water not be available on a given sample date, two additional attempts will be made to obtain a sample within the time period corresponding to the construction phase. Pond sediment will be sampled once per year in Winter. This phase of the monitoring program will be terminated when construction has been completed.

Sample Analytes

Surface water, groundwater and pond sediments will be analyzed for the analytes listed in

Table 22. Pesticides will not be analyzed in samples collected during Phase II because pesticides will not be used during the construction phase of course development.

Field Methods.

Variables, container type, preservation and holding times for water samples are given in Table 23, and for sediment samples in Table 24. Field methods for surface water, groundwater and sediments follow the procedures in Phase I.

Laboratory Methods

Laboratory methods follow the designations given for Phase I.

Phase III. Surface Water, Groundwater, and Sediment Quality during Golf Course Operations, and Soils Analysis.

The goal of Phase III is to monitor surface water, groundwater and sediment quality during the operation of Lion's Gate Golf Course.

Sample Locations.

Surface Water. Surface water will be sampled at three locations that are described in Phase I and shown on Figure 8. Sample stations will be located and permanently marked in the field, identified on maps, and photographed so that stations are easily located during subsequent sampling efforts. Data from these sample stations will allow an assessment of the quality of the water leaving the site.

Groundwater. Groundwater will be sampled at four locations described in Phase I and shown on Figure 8. Groundwater sample stations will be field marked, identified on maps, and photographed. Data from these sample stations will allow an assessment of the quality of the groundwater on the site.

Sediment. Pond sediment will be sampled from the deep marsh at three locations and composited into one sample in the field. The three samples will be collected in a triangular pattern around the center of the pond. Sample location is shown on Figure 8 and is the same location as in Phase I (PS means pond sediments). Sample location will be photographed and marked on maps. Data from this sample station will allow an assessment of the quality of the sediment in the pond.

Soils. Soils will be sampled at all greens, tees, and fairway areas. Locations will be photographed and marked on maps. Data from these analyses will be used to adjust fertilizer rates based on soil residual levels, and thereby avoiding excess application of materials which could become nonpoint sources of pollution.

Sample Frequency.

The goal of Phase III is to monitor surface- and ground-water and sediment quality during operation of the golf course. Surface water samples will be collected four times per year. One surface sample will be taken in the Winter, one in the Spring, one in the Summer, and one in the Autumn. Every reasonable effort will be made to sample runoff close to the time of first flush; i.e., at the beginning of the runoff event. The first sample of the year will be taken after pesticides have been applied to the course at least once. Should water not be available on a given sample date, two additional attempts will be made to obtain a sample within the time period (Winter, Spring, Summer, Autumn). Groundwater samples will be collected four times per year during Winter, Spring, Summer, and Autumn. Pond sediment samples will be collected two times per year in Winter and Summer.

Sample frequency will be reduced three years after construction has been completed. Surface water and ground water will be sampled twice per year in Winter and Summer, and sediments will be sampled one time in Winter.

Soils will be sampled two times per year in the Spring and Autumn.

Sample Analytes

Surface water, groundwater and pond sediments will be analyzed for the analytes listed in Table 22.

Soil samples will be analyzed for the following constituents: organic matter, nitrogen release, phosphorus, potassium, magnesium, calcium, pH, cation exchange capacity, and base saturation.

Field Methods.

Variables, container type, preservation and holding times for water samples are given in Table 23, and for sediment samples in Table 24. Field methods for surface water, groundwater and sediments follow the procedures in Phase I.

Soils. Soil samples will be taken with a standard soil sampling probe. Soils obtained from just below the thatch layer will be retained for analysis. Samples are immediately placed in a cooler with ice and transported to the analytical laboratory.

Laboratory Methods

Laboratory methods follow the designations given for Phase I.

Data Storage

Data generated from this monitoring program will be maintained by the superintendent along with other course records and data on pesticide and fertilizer use, personnel, and training. This information will be made available to any municipal board or commission on request. Monitoring data from field sampling and from laboratory analyses will be entered into a computer spreadsheet (e.g., QuattroPro, Lotus 1,2,3). Data analyses will be performed with this data set. The data set will be printed after each update and the printed data will be stored in a notebook. A backup of the computer spreadsheet data will be maintained. Field data sheets will be maintained in a notebook. A summary of the results of the surface and groundwater and sediment samples, with a list of any remedial actions that were taken will be kept.

The golf course superintendent will maintain records of cultural activities at the course. Items will include application schedules of all pesticides and fertilizers applied to the golf course as outlined in the Pesticide section of this Plan. Information will include the date of application, rate of application, product used, and specific location where the material was applied. Scouting records as part of the IPM program will also be kept.

Data Analysis

Data generated in the field sampling and from laboratory analyses will be assessed with descriptive statistics and graphic presentation to determine spatial and temporal distribution of the water variables at the site. Sediment data will be analyzed to determine temporal patterns. Point plots, scatter plots, bar charts and pie charts are examples of graphic presentations that may be useful in interpreting data. Data at each water and sediment station will also be analyzed to determine trends over time.

Data will also be compared with State water quality criteria (surface water and drinking water) and the USEPA pesticide Health Advisories Limits (HAL's, given in Appendix I, Table A1). In Phase II and III, concentrations of water and sediment variables will be compared with background concentrations to determine changes from background conditions.

Soils data will be compared with known requirements for turfgrass and adjustments in the fertilization rates will be made.

Protection of aquatic life will be evaluated by comparing measured concentrations against LC_{50} data (Appendix I, Table A1). LC_{50} data exist for most of the chemicals, and the lowest LC_{50} obtained for the pesticide was divided by a correction factor of 10 to obtain a screening criteria (Suter et al. 1989; Warren-Hicks et al. 1989, 1995). This is a conservative factor in that most measured chronic values would be higher than those estimated from this factor

(Suter et al. 1983).

Criteria for Management Response

Non pesticide analytes. If concentrations of non-pesticide analytes (variables) exceed State Criteria or if trends indicate an increase in concentration, then the media will be resampled and a review of management practices, site conditions and weather conditions will be implemented to determine reasons for increased concentrations. The following exceedances of total phosphorus and nitrate-nitrogen concentrations in either criterion will trigger immediate action: concentrations exceeding two standard deviations above the baseline mean, or concentrations exceeding the nitrate nitrogen MCL in ground water or the State Water quality criteria for nitrate nitrogen and total phosphorus in surface water. The immediate action will be an immediate reduction in fertilizer use and/or an increased proportion of slow-release fertilizers. Following the review cited above, these immediate restrictions may be lifted or modified, as appropriate. Records of all actions taken will be maintained by the superintendent.

Pesticide analytes. If a pesticide listed in Table 25 is detected in samples at concentrations below a toxicologically significant level as determined by the USEPA Health Advisories Limits (HAL's), the following responses will result:

1. The sample station, from which the exceedance was obtained, will be resampled and reanalyzed for the pesticide.

2. Further testing will be required for an additional suite of pesticides ('secondary level). A list of secondary pesticides is given is Table 25.

3. A review of the use, weather conditions after its application, and possible alternative control measures will be made and a decision made on the continued use of the specific problem pesticide.

If a pesticide listed in Table 22 is detected in samples at concentration above a toxicologically significant level as determined by the USEPA Health Advisories Limits (HAL's), the following responses will result:

1. The pesticide will be immediately removed from the list of recommended pesticides for use on the golf course, and its use will be terminated.

2. Further testing will be required for an additional suite of pesticides ('secondary level). A list of secondary pesticides is given is Table 25.

3. The sample station, from which the exceedance was obtained, will be resampled and reanalyzed for the pesticide. Should subsequent resampling and analysis indicate concentrations below HAL's, the golf course may reinstate the pesticide on the list of recommended pesticides.

Table 25. ' The 'Second Level' (Tier II) list of pesticides that will be analyzed if routine analyses of pesticides indicate concentrations greater than detection limits but less than health advisory limits. This assumes that these pesticides have been used on site.

Ground Water	Surface Water	Pond Sediments
Chlorpyrifos	Chlorpyrifos	Chlorpyrifos
Thiophanate-methyl	Thiophanate-methyl	Thiophanate-methyl
Dicamba	Dicamba	

Field Quality Control and General Water and Sediment Sampling Considerations.

The field quality assurance program is a systematic process which, together with the laboratory quality assurance programs, ensures a specified degree of confidence in the data collected for an environmental survey. The field quality assurance program involves a series of steps, procedures and practices which are described below.

<u>General Measures.</u>

a. All equipment, apparatus and instruments should be kept clean and in good working condition.

b. Records should be kept of all repairs to the instruments and apparatus and of any irregular incidents or experiences which may affect the measures taken.

c. It is essential that standardized and approved methodologies be used by field personnel.

Prevention of Sample Contamination

The quality of data generated in a laboratory depends primarily on the integrity of the samples that arrive at the laboratory, Consequently, the field personnel must take appropriate measures to protect samples from deterioration and contamination.

a. Field measurements should always be made on a separate sub-sample, which is then discarded once the measurements have been made. They should never be made on the same water sample which is returned to the analytical laboratory for chemical analysis.

b. Sample bottles, new or used, must be cleaned according to recommended procedures.

c. Only the recommended type of sample bottle for each parameter should be used.

d. Water sample bottles should be employed for water samples only.

e. Recommended preservation methods must be used. All preservatives must be of an analytical grade.

f. Solvent-rinsed Teflon liners can be used to prevent contamination from the bottle caps of water samples which are to be analyzed for organic compounds.

g. The inner portion of sample bottles and caps should not be touched with bare hands, gloves, mitts, etc.

h. Sample bottles must be kept in a clean environment, away from dust, dirt, fumes, and grime. Vehicle cleanliness is important.

I. All foreign and especially metal objects must be kept out of contact with acids and water samples. Petroleum products and exhaust fumes should be kept away from samples.

j. Specific conductance should never be measured in sample water that was first used for pH measurements. Potassium chloride diffusing from the pH probe alters the conductivity of the sample.

k. Samples must never be permitted to stand in the sun; they should be stored in an ice chest.

l. Samples must be shipped to the laboratory without delay.

m. The sample collector should keep their hands clean and refrain from smoking while working with water samples.

Field Quality Control

Quality control is an essential element of a field quality assurance program. In addition to standardized field procedures, field quality control requires the submission of blank and duplicate samples to check contamination, sample containers, or any equipment that is used in sample collection or handling, and to detect other systematic and random errors occurring from the time of sampling to the time of analysis. Replicate samples must also be collected to check the reproducability of the sampling. The timing and the frequency of blank, duplicate, and replicate samples are listed in Table 26.

Field Blanks. A daily "field blank" is prepared in the field at the end of each day's sampling. One blank is prepared for every 10 water samples. A field blank is prepared by filling appropriate sample bottles with ultrapure distilled water, adding preservative in the same manner as it was added to the water samples, capping the bottles tightly, and transporting them to the laboratory in the same manner as the water samples.

Duplicates. Duplicate samples (splits) are obtained by dividing one sample into two sub-samples. One sample in every ten water samples is split. Splits are done periodically to obtain the magnitude of errors owing to contamination, random and systematic errors, and any other variabilities which are introduced from the time of sampling until the samples arrive at the laboratory.

Replicates. Two samples are taken simultaneously in a given location. The samples are taken to measure the cross-sectional variations in the concentration of the parameters of interest in the system. One water sample per quarter will be replicated.

Table 26. Number and types of samples taken for field quality control.

Field Blank: 1 per 10 samples
Duplicates: 1 per 10 samples
Replicate: 1 per quarter per medium

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NO Pb 158

APPENDIX I

LIST OF PESTICIDES FOR USE AT LION'S GATE GOLF COURSE

Table A1. Chemical characteristics of pesticides evaluated for Lion's Gate Golf Course.

Table A2. Potential leaching and surface runoff of pesticides considered for use at Lion's Gate Golf Course.

Table A3. Relative ranking of pesticide exposure based on SCS rankings for runoff and the GUS rankings for leaching.

Table A4. Exposure potential based on leaching and surface runoff of pesticides considered for use at Lion's Gate Golf Course.

Table A5. Relative pesticide toxicity ratings.

Table A6. Toxicity and exposure potential data for pesticides considered for use at Lion's Gate Golf Course.

Table A7. Relative pesticide toxicity ratings. Other exposure potential and toxicity combinations are evaluated further to assess potential risk.

Table A8. Estimated concentrations of pesticides in aquatic environment and associated risk ratios.

Appendix I

Table A1. Chemical characteristics of pesticides evaluated for Lion's Gate Golf Course

Table A1. Chemical characteristics of pesticides evaluated for Lion's Gate golf course.

Pesticide	Water Solubility	Soil Adsorption	Half-life	Health Advisory Level (a)	LC50 (c)
	mg/l	Koc	days	ppb	ppb
Fungicides					
captan	5.1	200	2.5	900	73.2
chlorothalonil	0.6	1380	30	2	12.2
fenarimol	14	600	360	500	900
fosetyl-Al	120000	20	0.1	21000	75800
iprodione	13.9	700	14	280	2250
maneb	6	>2,000	70	40	1900
mancozeb	6	>2000	70	21	400
metalaxyl	8400	50	16	420	12500
PCNB(quintozene)	0.44	5000	21	21	770
thiophanate-methyl	3.5	1830	10	560	30
thiram	30	670	15	40	130
triadimefon	71.5	300	26	210	1600
vinclozalin	3	43000	20	200	5250
Herbicides					
2,4-D amine	796000	20	10	70	183000
benefin	0.1	9000	40	2100	370
bensulide	5.6	1000	120	50	700
bentazon	2300000	34	20	20	635000
bromoxynil	27	1,079	7		
dicamba	400000	2	14	200	28000
glyphosate	900000	24000	47	700	8300
mecoprop (MCPP)	660000	20	21	35	124000
MSMA		10000	1000	700	12000
oxadiazon	0.7	3200	60	40	320000
oryzalin	2.5	600	20	400	3,260
pendimethalin	0.275	5000	12	280	138
triclopyr	2100000	20	46	200	117,000
trifluralin	0.3	8000	60	5	41
Insecticides					
acephate	818,000	2	3	30	7300
carbaryl	120	300	10	700	2328
chlorpyrifos	0.4	6070	10	105	7.1
ethoprop	750	70	25	0.1	1380
fluvalinate	0.005	1,000,000	7	70	2.9
trichlorfon	120000	10	10	1250	18
Nematicides					
fenamiphos	400	100	50	2	110
Growth Regulators					
Cimectacarb				8750	35000
Paclobutrazol				460	23600

Water solubility, Soil Adsorption, and Half-life data were from Reviews of Wauchope et al. 1992, Reviews of Environmental Contamination and Toxicology.

(a) The lifetime Health Advisory Level or equivalent (HAL) provides a measure of pesticide toxicity to humans. The lifetime health advisory level as defined by EPA is the concentration of a chemical in drinking water that is not expected to any adverse health effects over a lifetime exposure (70 yrs) with a margin of safety.

(b) blanks indicate no data.

(c)The aquatic toxicity provides a measure of pesticide toxicity to aquatic species. The values given in the table are the lethal concentrations at which 50% of the test species dies (LC50) divided by a conservative safety factor of 10 (Suter et al 1989; Warren-Hicks et al. 1989). This is a conservative factor in that most measured chronic values would be higher than those estimated from this factor (Suter et al. 1983).

Appendix I

Table A2. Potential leaching and surface runoff of pesticides considered for use at Lion's Gate Golf Course.

Table A2. Potential leaching and surface runoff of pesticides considered for use at Lion's Gate Golf Course course. Potential was determined from screening models as defined below.

Pesticide	GUS Scores	GUS Ranking	PLP Scores	PLP Ranking	SCS rating Leaching	Runoff
Fungicides						
captan	0.67	Nonleacher	28	very low		
chlorothalonil	1.27	Nonleacher	46	low	small	medium
fenarimol	2.55	Intermediate	51	moderate	large	large
fosetyl-Al	0.00	Nonleacher	25	low	small	medium
iprodione	1.32	Nonleacher	33	low	small	large
maneb	1.54	Nonleacher	56	moderate	small	large
mancozeb	1.54	Nonleacher	36	low	small	large
metalaxyl	3.43	Leacher	50	moderate	large	large
PCNB	0.39	Nonleacher	40	low	small	small
thiophanate-methyl	0.74	Nonleacher	31	very low	small	medium
thiram	1.38	Nonleacher	44	low	small	large
triadimefon	2.15	Intermediate	43	low	medium	large
vinclozalin	0.57	Nonleacher	20	very low		
Herbicides						
2,4-D amine	2.70	Intermediate	41	low	medium	medium
benefin	-0.05	Nonleacher	36	very low	small	medium
bensulide	2.08	Intermediate	44	moderate	medium	large
bentazon	3.67	Leacher	36	moderate		
bromoxynil						
dicamba	4.24	Leacher	54	moderate	large	medium
glyphosate	0.00	Nonleacher	28	very low	small	large
mecoprop (MCPP)	3.51	Leacher	61	moderate	large	medium
MSMA	0.00	Nonleacher	27	very low	small	small
oxadiazon	0.88	Nonleacher	36	low	small	medium
oryzalin	1.58	Nonleacher	44	moderate		
pendimethalin	0.59	Nonleacher	18	low	small	medium
triclopyr	4.49	Leacher	53	moderate	large	large
trifluralin	0.17	Nonleacher	32	very low	small	medium
Insecticides						
acephate	1.76	Nonleacher	36	low		
carbaryl	1.52	Nonleacher	37	low	small	medium
chlorpyrifos	0.32	Nonleacher	21	very low	small	small
ethoprop	2.68	Intermediate	57	moderate	large	medium
fluvalinate	0.00	Non leacher	0	very low		
trichlorfon	3.00	Leacher	67	moderate	large	medium
Nematicides						
fenamiphos	3.01	Leacher	65	moderate	large	large
Growth Regulators						
Cimectacarb						
Paclobutrazol						

GUS=log10(t1/2)*[4-log10(Koc)] From Gustafson 1989
t1/2 = soil degradation half-life of a pesticide in days
Koc = organic matter partition coefficient
Ranking = Nonleachers<1.8; Intermediate=1.8 to 2.8; Leachers>2.8

PLP index = T1/2 * application rate *fraction of pesticide reaching soil/Koc
From Warren and Weber 1994
Ranking = very low <30; low 31-50; moderate = 51 - 75; high = 76-100.

SCS ranking after USDA Soil Conservation Servide pesticide and water quality screening ratings developed by Goss (1991) and reported in USDA SCS database (Wauchope et al. 1991)

Blanks indicate no data.

Appendix I

Table A3. Relative ranking of pesticide exposure based on SCS rankings for runoff and the GUS rankings for leaching.

Table A3. Relative ranking of pesticide exposure based on SCS rankings for runoff and the GUS rankings for leaching (from Balogh and Walker 1992). If other leaching rankings identified potential loss more conservatively than the GUS rankings, then those rankings were used to determine potential exposure.

Level of Potential Exposure	Potential for loss in runoff		Potential for loss in leaching
Low	Small	and	GUS < 1.8
Moderate	Small	and	GUS > 1.8
	Medium	and	GUS < 1.8
Moderately High	Medium	and	GUS > 1.8
	Large	and	GUS < 1.8
High	Large	and	GUS > 1.8

SCS rankings from Goss (1991) and Wauchope et al (1991).
GUS rankings from Gustafson (1989).

Appendix I

Table A4. Exposure potential based on leaching and surface runoff of pesticides considered for use at Lion's Gate Golf Course.

Table A4. Exposure potential based on leaching and surface runoff of pesticides considered for use at Lion's Gate Golf Course.

Pesticide	Exposure Potential See Tables A2 & A3 .
Fungicides	
captan	Large
chlorothalonil	Moderate
fenarimol	High
fosetyl-Al	Moderate
iprodione	Moderately High
maneb	Moderately High
mancozeb	Moderately High
metalaxyl	High
PCNB	Low
thiophanate-methyl	Moderate
thiram	Moderately High
triadimefon	High
vinclozalin	Moderate
Herbicides	
2,4-D amine	Moderately High
benefin	Moderate
bensulide	High
bentazon	High
glyphosate	moderately high
dicamba	Moderately High
mecoprop (MCPP)	Moderately High
MSMA	Low
oryzalin	Moderately High
oxadiazon	Moderate
pendimethalin	Moderate
triclopyr	High
trifluralin	Moderate
Insecticides	
acephate	High
carbaryl	Moderate
chlorpyrifos	Low
ethoprop	Moderately High
fluvalinate	Low
trichlorfon	Moderately High
Nematicides	
fenamiphos	High
Growth Regulators	
Cimectacarb	Low
Paclobutrazol	Low

GUS=log10(t1/2)*[4-log10(Koc)]
t1/2 = soil degradation half-life of a pesticide in days
Koc = organic matter partition coefficient
Ranking = Nonleachers<1.8; Intermediate=1.8 to 2.8; Leachers>2.8

SCS ranking after USDA Soil Conservation Servide pesticide and water quality screening ratings developed by Goss (1991) and reported in USDA SCS database (Wauchope et al. 1991)

Exposure potential is from Balogh and Walker (1992).

Appendix I

Table A5. Relative pesticide toxicity ratings.

Table A5. Relative pesticide toxicity ratings.

LC_{50} ug/l	Class
<100	Very Highly Toxic
100 -999	Highly Toxic
1,000-9,999	Moderately Toxic
10,000-99,999	Slightly Toxic
>100,000	Practically Non-toxic

From USEPA (1985) and USDA (1969)

Appendix I

Table A6. Toxicity and exposure potential data for pesticides considered for use at Lion's Gate Golf Course.

Table A6. Toxicity and exposure potential data for pesticides considered for use at Lion's Gate Golf Cours golf course.

Pesticide	Exposure Potential from Table A4.	LC50 ppb	LC50 Ranking	HAL ppb
Fungicides				
captan	Large	73.2	V.H. toxic	900
chlorothalonil	Moderate	12.2	V.H. toxic	2
fenarimol	High	900	H. toxic	500
fosetyl-Al	Moderate	75800	Sl. toxic	21000
iprodione	Moderately High	2250	Mod toxic	280
maneb	Moderately High	1900	Mod toxic	40
mancozeb	Moderately High	400	H. toxic	21
metalaxyl	High	12500	Sl. toxic	420
PCNB	Low	770	H. toxic	21
thiophanate-methyl	Moderate	30	V.H.toxic	560
thiram	Moderately High	130	H. toxic	40
triadimefon	High	1600	Mod toxic	210
vinclozalin	Moderate	5250	Mod toxic	200
Herbicides				
2,4-D amine	Moderately High	183000	Mod toxic	70
benefin	Moderate	800	H. toxic	2100
bensulide	High	379	H. toxic	50
bentazon	High	635000	Nontoxic	20
dicamba	Moderately High	28000	Sl. toxic	200
glyphosate	Moderately High	8300	Mod toxic	700
mecoprop (MCPP)	Moderately High	12400	Sl. toxic	35
MSMA	Low	12000	Sl toxic	700
oryzalin	Moderately High	3,260	Mod toxic	400
oxadiazon	Moderate	320000	Nontoxic	40
pendimethalin	Moderate	138	H. toxic	280
triclopyr	High	117,000	Nontoxic	200
trifluralin	Moderate	41	V.H. toxic	5
Insecticides				
acephate	High	7300	Mod toxic	30
carbaryl	Moderate	2328	Mod toxic	700
chlorpyrifos	Low	7.1	V.H. toxic	105
ethoprop	Moderately High	1380	Mod toxic	0.1
fluvalinate	Low	2.9	V.H. toxic	70
trichlorfon	Moderately High	18	V.H. toxic	1250
Nematicides				
fenamiphos	High	110	H. toxic	2
Growth Regulators				
Cimectacarb		35000	Sl. toxic	8750
Paclobutrazol		23600	Sl. toxic	460

See Table A1. for definitions of LC50 and Hal.
Toxicity categories are from EPA as given in Balogh and Watson 1992. Meaning in this table: V.H. toxic = very highly toxic; H. toxic = highly toxic; Mod toxic = moderately toxic; Sl. toxic = slightly toxic; and Nontoxic = Practically Non-toxic.

Appendix I

Table A7. Relative pesticide toxicity ratings. Other exposure potential and toxicity combinations are evaluated further to assess potential risk.

Table A7. Relative pesticide toxicity ratings. All other exposure potential and toxicity class combinations are evaluated further to assess potential risk.

Exposure Potential	Toxicity Class	Risk Ranking and Actions
Low	Practically Non-Toxic Slightly Toxic Moderately Toxic	Low, no further evaluation.
Moderate	Practically Non-toxic Slightly Toxic Moderately Toxic	Low, no further evaluation
Moderately High	Practically Non-Toxic Slightly Toxic	Low, no further evaluation
High	Practically Non-Toxic	Low, no further evaluation

Appendix I

Table A8. Estimated concentrations of pesticides in aquatic environment and associated risk ratios.

Table A8. Estimated concentrations of pesticides in the aquatic environment and associated risk ratios.

	Estimated Concentrations ppb	LC50 ppb	LC50*.1 ppb	Risk Ratio
'aching				
ungicides				
aptan	3.6389	73.2	7.32	0.497
chlorothalonil	0.7312	12.2	1.22	0.599
fenarimol	40.1618	900	90	0.446
iprodione	1.1100	2250	225	0.005
maneb	2.6833	1900	190	0.014
mancozeb	0.2959	400	40	0.007
PCNB(quintozene)	0.1249	770	77	0.002
thiophanate-methyl	0.1579	30	3	0.053
thiram	1.5338	130	13	0.118
triadimefon	4.2681	1600	160	0.027
Herbicides				
2,4-D amine	5.5903	183000	18300	0.000
benefin	0.0011	370	37	0.000
bensulide	24.6223	700	70	0.352
glyphosate	1.7276	8300	830	0.002
oryzalin	1.4216	3260	326	0.004
pendimethalin	0.0082	138	13.8	0.001
triclopyr	0.5849	117000	11700	0.000
trifluralin	610.4553	41	4.1	148.892
Insecticides				
acephate	0.0000	7300	730	0.000
chlorpyrifos	0.0067	7.1	0.71	0.009
ethoprop	61.4876	1380	138	0.446
·ichlorfon	689.7294	18	1.8	383.183
rface Runoff				
ıngicides				
captan	2.0358	73.2	7.32	0.278
chlorothalonil	3.0265	12.2	1.22	2.481
fenarimol	0.6650	900	90	0.007
iprodione	25.2888	2250	225	0.112
maneb	3.6685	1900	190	0.019
mancozeb	12.2658	400	40	0.307
PCNB(quintozene)	125.7430	770	77	1.633
thiophanate-methyl	9.9950	30	3	3.332
thiram	6.9850	130	13	0.537
triadimefon	12.3980	1600	160	0.077
Herbicides				
2,4-D amine	0.5950	183000	18300	0.000
benefin	0.1252	370	37	0.003
bensulide	63.2580	700	70	0.904
glyphosate	1.7580	8300	830	0.002
oryzalin	0.6598	3260	326	0.002
pendimethalin	7.1025	138	13.8	0.515
triclopyr	0.6985	117000	11700	0.000
trifluralin	17.5690	41	4.1	4.285
Insecticides				
acephate	12.6930	7300	730	0.017
chlorpyrifos	0.1530	7.1	0.71	0.215
ethoprop	251.3620	1380	138	1.821
hlorfon	45.2690	18	1.8	25.149

;50*0.1 is protective of the aquatic environment (Parkhurst & Warren-Hicks 1995).
Estimated concentrations from simulation conducted assuming use
of all chemicals at the same time to control simultaneous outbreaks of pests.
Estimated concentration devided by the LC50*0.1 provides a risk ratio; a number
>1 indicates potential risk and use and management are adjusted accordingly

APPENDIX II

WEED CONTROL RECOMMENDATIONS

SUSCEPTIBILITY OF WEEDS TO HERBICIDE CONTROL (12/93)

	HERBICIDES: Preemergence											Postemergence														
	ATR	BEN	BES	DCP	NAP	ORY	OXA	PEN	PRO*	BEN ORY	BEN TRI	BTZ	BRO	DIC*	DSM	FLU	GLY	MEC	MSM	24A*	24E*	TRY	SET	24D* MEC	24D* MEC DIC*	24D* TRY
ANNUAL WEEDS																										
annual bluegrass	C	C	C	C	C	C	C	C	C	C	C	N	N	N	N	N	C	N	N	N	N	N	N	N	N	N
barnyardgrass	C	C	C	C	C	C	P	C	C	C	C	N	N	N	N	C	C	N	C	N	N	N	C	N	N	N
birdseye pearlwort	–	P	N	–	–	C	N	C	–	C	C	–	–	C	N	N	C	C	N	–	–	–	N	–	C	–
birdseye speedwell	–	C	N	P	–	C	–	C	–	C	C	–	–	–	N	N	C	–	–	N	N	N	N	P	P	N
black medic	C	N	N	N	N	N	N	N	N	N	N	–	N	C	N	N	P	C	N	P	P	C	N	C	C	C
bristly oxtongue	N	N	N	N	N	N	N	N	N	N	N	–	N	C	N	N	C	C	N	C	C	P	N	C	C	C
California burclover	C	N	N	N	C	P	C	P	N	P	P	–	N	C	N	N	C	C	N	P	P	P	N	C	C	C
cheeseweed	C	N	N	N		P	C	P	P	P	P	–	C	C	N	N	P	C	N	C	C	–	N	C	C	C
chickweed	C	P	N	P	C	C	N	C	C	C	C	–	P	C	N	N	C	C	N	P	C	P	N	C	C	C
common purslane	C	C	N	C	C	C	C	C	C	C	C	C	C	C	N	N	C	C	N	C	C	C	N	C	C	C
cudweed	C	N	N	N	N	N	N	N	N	N	N	N	N	C	N	N	C	C	N	N	P	–	N	P	P	P
cutleaf geranium	–	–	N	N	–	C	–	C	–	C	C	–	–	C	N	N	C	C	N	C	C	C	N	C	C	C
goosegrass	P	P	C	P	P	C	P	C	P	C	C	N	N	N	N	C	C	N	C	N	N	N	C	N	N	N
Italian ryegrass	P	C	C	P	P	C	N	C	C	C	C	N	N	N	N	C	P	N	N	N	N	N	C	N	N	N
henbit	C	N	N	N	N	P	C	P	–	C	C	C	–	C	N	N	C	C	N	P	C	–	N	C	C	C
large crabgrass	P	C	C	C	C	C	C	C	C	C	C	N	N	N	C	C	C	N	C	N	N	N	C	N	N	N
prickly lettuce	C	N	N	N	P	P	C	P	N	P	P	–	C	C	N	N	C	C	N	C	C	–	N	C	C	C
prostrate knotweed	C	C	N	P	C	C	C	C	C	C	C	–	–	C	N	N	P	C	N	P	C	–	N	C	C	C
redroot pigweed	C	C	C	P	C	P	C	P	C	P	P	C	C	C	N	N	C	C	N	C	C	C	N	C	C	C
scarlet pimpernel	C	C	N	C	C	C	C	C	–	C	C	–	–	C	N	N	C	C	N	C	C	C	N	C	C	C
smooth crabgrass	P	C	C	C	C	C	C	C	C	C	C	N	N	N	C	C	C	N	C	N	N	N	C	N	N	N
solvia (spurweed)	C	N	N	N	C	P	C	P	N	P	P	–	C	P	N	N	C	C	N	C	C	–	N	C	C	C
spotted spurge	C	N	N	P	N	C	P	C	N	C	C	–	C	P	N	N	C	P	N	P	P	C	N	P	P	C
yellow foxtail	P	C	C	C	C	C	C	C	C	C	C	N	N	N	–	P	C	N	–	N	N	N	C	N	N	N

Continued on next page.

C = control
P = partial control
N = no control
– = no information

ATR = atrazine (Aatrex, Drexel Atrazine)
BEN = benefin (Balan)
BES = bensulide (Betasan, Presan, etc.)
DCP = DCPA (Dacthal W-75 for Turf, etc.)
NAP = napropamide (Devrinol)
ORY = oryzalin (Surflan)
OXA = oxadiazon (Ronstar)
PEN = pendimethalin (Pre-M)
PRO = pronamide* (Kerb)
TRI = trifluralin
BTZ = bentazon (Basagran)
BRO = bromoxynil (Buctril, Brominal)
DIC = dicamba* (Banvel 4-S)
DSM = DSMA (Chacon Crabgrass Control, etc.)
FLU = fluazifop (Fusilade, etc.)
GLY = glyphosate (Roundup, Ortho Kleenup)
MEC = mecoprop (MCPP)
MSM = MSMA (Bueno 6, etc.)
24A = 2,4-D amine*
24E = 2,4-D ester*(Chacon)
24D = 2,4-D*
TRY = triclopyr (Turflon)
SET = sethoxydim (Poast)

* Permit required from county agricultural commissioner for purchase or use.

Susceptibility of weeds to herbicide control cont. (12/93)

	HERBICIDES																									
	Preemergence											Postemergence														
	ATR	BEN	BES	DCP	NAP	ORY	OXA	PEN	PRO*	BEN ORY	BEN TRI	BTZ	BRO	DIC*	DSM	FLU	GLY	MEC	MSM	24A*	24E*	TRY	SET	24D* MEC	24D* MEC DIC*	24D* TRY
PERENNIAL WEEDS																										
bermudagrass	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	C	C	N	N	N	N	N	N	N	N	N
broadleaf plantain	N	N	N	N	N	N	N	N	N	N	N	N	N	P	N	N	C	P	N	C	C	P	N	C	C	P
buckhorn plantain	N	N	N	N	N	N	N	N	N	N	N	N	N	P	N	N	C	P	N	C	C	P	N	C	C	P
common yarrow	N	N	N	N	N	N	N	N	N	N	N	N	N	C	N	N	C	P	N	P	C	-	N	P	C	P
creeping woodsorrel	C	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	C	P	N	N	N	C	N	N	P	C
curly dock	N	N	N	N	N	N	N	N	N	N	N	N	N	C	N	N	C	N	N	P	P	C	N	P	P	C
dallisgrass	N	N	N	N	N	N	N	N	N	N	N	N	N	N	C	P	C	N	C	N	N	N	N	N	N	N
dandelion	N	N	N	N	N	N	N	N	N	N	N	N	N	P	N	N	C	P	N	C	C	P	N	C	C	C
English daisy	N	N	N	N	N	N	N	N	N	N	N	N	N	P	N	N	C	N	N	N	N	N	N	N	P	P
field bindweed	N	N	N	N	N	N	N	N	N	N	N	N	N	P	N	N	P	N	N	P	P	P	N	P	C	P
German velvetgrass	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	P	C	N	N	N	N	N	N	N	N	N
healall (selfheal)	N	N	N	N	N	N	N	N	N	N	N	N	N	P	N	N	C	-	N	N	N	P	N	N	C	P
kikuyugrass	N	N	N	N	N	N	N	N	N	N	N	N	N	N	P	C	C	N	P	N	N	N	N	N	N	N
knotgrass	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	C	C	N	N	N	N	N	P	N	N	N
mouseear chickweed	P	N	N	N	N	N	N	N	N	N	N	N	N	C	N	N	C	C	N	P	P	-	P	C	C	C
purple nutsedge	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	P	N	P	N	N	N	C	N	N	N
red sorrel	P	N	N	N	N	N	N	N	N	N	N	N	N	C	N	N	C	N	N	N	N	-	C	P	C	P
spotted catsear	P	N	N	N	N	N	N	N	N	N	N	N	N	C	N	N	C	P	N	C	C	-	C	C	C	C
white clover	P	N	N	N	N	N	N	N	N	N	N	N	N	C	N	N	P	C	N	P	P	C	N	C	C	C
yellow nutsedge	N	N	N	N	N	N	N	N	N	N	N	P	N	N	P	N	P	N	P	N	P	N	N	N	N	N

C = control N = no control
P = partial control - = no information

ATR = atrazine (Aatrex, Drexel Atrazine)
BEN = benefin (Balan)
BES = bensulide (Betasan, Presan, etc.)
DCP = DCPA (Dacthal W-75 for Turf, etc.)
NAP = napropamide (Devrinol)
ORY = oryzalin (Surflan)
OXA = oxadiazon (Ronstar)
PEN = pendimethalin (Pre-M)
PRO = pronamide* (Kerb)
TRI = trifluralin
BTZ = bentazon (Basagran)
BRO = bromoxynil (Buctril, Brominal)
DIC = dicamba* (Banvel 4-S)
DSM = DSMA (Chacon Crabgrass Control, etc.)
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24D = 2,4-D*
TRY = triclopyr (Turflon)
SET = sethoxydim (Poast)

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HERBICIDE TREATMENT TABLE: (12/93)

Herbicide (commercial name)	Amount/Acre

PREPLANT

A. DAZOMET — 275 lb a.i./acre or 10 oz a.i./1000 sq ft
(Basamid)
COMMENTS: Soil-applied fumigant for control of annual weeds. Apply directly to the soil and mix 6 inches deep with a power tiller. Seed in 3 weeks if temperature is over 60 F and soil is moist but not wet.

B. METHAM — 345-517 lb a.i. or 8-10 lb a.i./1000 sq ft
(Vapam)
COMMENTS: Preirrigate soil to imbibe seeds and juvenate perennial propagules. Apply as soil begins to dry; soil temperature should be at least 50 F at 1 inch for best results. Apply in water on calm day; follow immediately with sprinkler irrigation to seal the soil surface or, preferably, cover with vaporproof covering. Seed in 2 weeks on light sandy soils, in 3-4 weeks on heavier clay or organic soils. Extend waiting period if temperature is below 60 F. Two applications usually required to eradicate bermudagrass, nutsedge, or kikuyugrass. Rototilling before treatment will enhance control.

C. METHYL BROMIDE* — 430 lb a.i. or 10 lb a.i./1000 sq ft
(Brom-O-Gas)
COMMENTS: Methyl bromide is extremely dangerous and must be applied by a licensed applicator. Soil should be friable for gas to penetrate. Inject methyl bromide under a vaporproof cover, sealed at the edges; remove cover in 24-48 hours. Vapor is toxic when sealed cover is removed; exclude people and pets from the area until the cover has been removed and the fumigant dissipated. Will kill roots of trees and shrubs present in the fumigated soil. Methyl bromide is effective on bermudagrass, field bindweed, kikuyugrass, and nutsedge. Control may be incomplete for hard-seeded species like mallow, clovers, medics, and pigweed.

D. GLYPHOSATE — 2-4 lb a.i.
(Roundup, Rodeo plus surfactant, Ortho Kleenup)
COMMENTS: Glyphosate is a nonselective, foliar-applied postemergent herbicide that will eliminate nearly all established weeds and turf species from a site before seedbed preparation. It has no preemergence activity on emerging weeds or turf species. Use the lower rate for annual weeds and the higher rate for perennial weeds. Apply to actively growing weeds that are not stressed. A single application of glyphosate will not control nutsedge.

POSTPLANT

Preemergent to weed

A. ATRAZINE — 1-2.2 lb a.i.
(Aatrex, Drexel Atrazine)
COMMENTS: Labeled for sod production only. Used for control of annual broadleaf weeds and some annual grasses in St. Augustinegrass or zoysiagrass turf. Do not use on other turf types or injury will result. May be applied up to 30 days before cutting or lifting sod. Do not apply in light textured (sandy) soils where tree or shrub roots may absorb the herbicide.

Continued on next page

* Permit required from county agricultural commissioner for purchase or use.

Herbicide treatment table cont. (12/93)

Herbicide (commercial name)	Amount/Acre

B. BENEFIN (Balan) — 3 lb a.i.

COMMENTS: For crabgrass control, apply 2-3 weeks before initial germination (January for Los Angeles Basin, early to mid-February for Central Valley and central coast, mid-February to March 1 for northern California and north coastal areas). Sprinkle-irrigate after application to wash herbicide off leaves and into the soil. For annual bluegrass control, apply 2-3 weeks before initial germination (August-September) and sprinkle-irrigate after application to wash herbicide off leaves and into the soil. For speedwell control, apply preemergence in January. Benefin is often combined with other preemergence herbicides, such as trifluralin or oryzalin, for longer residual. Do not apply to bentgrass greens.

C. BENEFIN
...*AND*...
ORYZALIN
(XL) — 2-3 lb a.i.

COMMENTS: For use on warm season grasses only. Apply on established turf before annual weeds germinate. Do not aerate or verticut after application. Do not use on bluegrass, bentgrass, ryegrass, or fescue turf.

D. BENEFIN — 1.5-2 lb a.i. - cool season species
...*AND*... — 2-3 lb a.i. - warm season species
TRIFLURALIN
(Team)

COMMENTS: Apply on established turf in spring 1-2 weeks before expected germination of summer annuals (crabgrass, goosegrass, foxtail, or barnyardgrass). For annual bluegrass control, apply in late summer or early fall before germination. A second application can be applied 10-12 weeks after the first in the southern part of the state to control late-germinating weeds. Do not overseed grasses for 12-16 weeks after application.

E. BENSULIDE (Betasan, Presan, etc.) — 7.5-10 lb a.i.

COMMENTS: Safest preemergence control material in bentgrass. For crabgrass control, apply 2-3 weeks before initial germination (January for Los Angeles Basin and south coast area, mid-February for Central Valley and central coast, mid-February to March 1 for northern California and north coastal areas). For annual bluegrass control, apply 7.5 lb a.i./acre in fall and 7.5 lb a.i./acre in midwinter (Jan-Feb). Crabgrass may germinate and become established in turf in late summer if lower rates are used. Good management will allow use of lower rates. For annual bluegrass control, apply in early fall before annual bluegrass germinates (mid-August to mid-September). Exclude children and pets during application and until treated area has been thoroughly sprinkler-irrigated.

Continued on next page.

Herbicide treatment table cont. (12/93)

Herbicide (commercial name)	Amount/Acre

F. DCPA — 10 lb a.i.
(Dacthal W-75 for Turf, Acme Garden Weed Preventer Granules, etc.)
COMMENTS: Apply 2-3 weeks before initial crabgrass germination (January for Los Angeles Basin and south coast area, early- to mid-February for Central Valley and central coast area, mid-February to March 1 for northern California and north coast area). Do not use on bentgrass and dichondra. Exclude children and pets during application and until treated area has been thoroughly sprinkler-irrigated. Will not control crabgrass after germination. For annual bluegrass control, apply at the end of August or beginning of September.

G. NAPROPAMIDE — 2-3 lb a.i.
(Devrinol)
COMMENTS: Apply at seeding or on established dichondra; can also be used on bermudagrass, St. Augustinegrass, and fescue. Principally for grass control, but will control some broadleaf weeds. A split application of 2 lb can be applied for crabgrass and 2 lb for goosegrass; apply 8-10 weeks apart. Follow treatment with a minimum of 1 inch of water to wash material from the leaves and into the soil. Do not reseed or overseed within six months after application.

H. ORYZALIN — 1.5-2 lb a.i.
(Surflan)
COMMENTS: For use on warm season grasses only. Apply on established turf before annual weeds germinate. Use low rate of application for annual bluegrass control in late summer or early fall. Use high rate in late winter or early spring before germination of summer annual weeds. Do not aerate or verticut after application. Do not use on bluegrass, ryegrass, or tall fescue turf. Long residual may prohibit overseeding of winter annual grass from a summer application.

I. OXADIAZON — 2-4 lb a.i.
(Ronstar)
COMMENTS: The granule formulation can be used safely on most grass species except bentgrass. Some foliar injury may be observed if the granules are applied to wet foliage or the herbicide is not washed from the leaves after application. Only use the wettable powder formulation on dormant established bermudagrass, St. Augustinegrass, or zoysiagrass turf. Apply the wettable powder formulation at least 2 weeks before turf greens in spring. Do not use on dichondra or on newly seeded turf. Has not been effective for control of prostrate spurge or creeping woodsorrel (*Oxalis*) in California.

J. PENDIMETHALIN — 1.5-3 lb a.i.
(Pre-M)
COMMENTS: Apply to established turf before annual weeds germinate. Useful in the control of many weeds including: crabgrass, foxtail, oxalis, and spurge. Use lower rate for control of annual bluegrass in fall or as a split application for control of crabgrass or spurge in late winter and early summer. Do not aerate or verticut after application. Do not overseed with grasses for 8-12 weeks after application. Do not apply on bentgrass.

Continued on next page.

Herbicide treatment table cont. (12/93)

Herbicide (commercial name)	Amount/Acre
K. PRONAMIDE* (Kerb) 50W	0.5-1 lb a.i.

COMMENTS: Used for control of annual bluegrass in bermudagrass turf; the higher rate gives longer residual control. Most effective in late fall at, or just before, emergence; 14-21 days are required before results are observed. Do not use on seedling, newly sprigged, or newly sodded turf.

Postemergent to weed

A. BENTAZON (Basagran) 4EC	1-2 lb a.i.

COMMENTS: Apply in 40 gal water/acre for yellow nutsedge in established turfgrass; thorough coverage is important. The nutsedge should be growing vigorously with good soil moisture. If control is not as desired, apply a second treatment after 10-14 days. Do not apply more than 3 lb a.i. per season. For optimum control, do not mow 3-5 days before or after application.

B. BENTAZON (Basagran) 4EC	1 lb a.i.
...*PLUS*...	
2,4-D*	1 lb a.i.

COMMENTS: For nutsedge and other broadleaf control. Do not use on newly seeded or sprigged turf.

C. BROMOXYNIL (Buctril, Brominal)	0.5-1 lb a.i.

COMMENTS: Apply on young turfgrass after grass has emerged and when broadleaf weeds are in the 3-4 leaf stage or up to 6 inch weed height, or on rosette plants before they exceed 1.5 inches in diameter to control broadleaf weeds. On established turf, use lower rate on small weeds and higher rate on large weeds. During periods of high temperature, leaf tip burn may occur on turf. Do not use on bentgrass greens. Apply in at least 20 gal water/acre. May be tank-mixed with other broadleaf materials such as 2,4-D and 2,4-DP, MCPP, dicamba, MSMA, or DSMA, or combinations of these materials, depending upon the weed species present.

D. DICAMBA* (Banvel 4-S)	0.25-0.5 lb a.i./100 gal water

COMMENTS: Apply in 40 gal water/acre for control of chickweeds, clovers, English daisy, prostrate knotweed, pearlwort, red sorrel, curly dock. Do not apply more than two times per year. The 4 lb acid equivalent/gal formulation can also be used for spot spraying; do not exceed 0.5 lb acid equivalent/acre/season. Active through the soil; do not use where roots of ornamental plants may extend into treated area or spray on tree basins. Spray on calm days to avoid spray drift onto susceptible crops or ornamentals. Do not use on dichondra or spray in tree basins.

Continued on next page

* Permit required from county agricultural commissioner for purchase or use.

Herbicide treatment table cont. (12/93)

Herbicide (commercial name)	Amount/Acre

E. DICAMBA* — Label rates
...*AND*...
2,4-D*
(Lawn Weed Killer, etc.)
COMMENTS: For English daisy or other difficult to control broadleaf weeds such as dandelion or plantain. Do not exceed 0.25 acid equivalent/acre of dicamba on bentgrass turf. Active through the soil; do not use where roots of ornamentals may extend into treated area. Spray on calm days to avoid spray drift onto susceptible crops or ornamentals. Do not use on dichondra.

F. DSMA — 3-4 lb a.i.
(Chacon Crabgrass Control, Weedone Crabgrass Killer, DSMA Liquid, etc.)
COMMENTS: Apply in 175-200 gal water/acre. Effective for crabgrass, dallisgrass, and nutsedge control. Temperature, soil moisture, and turf type determine degree of turf selectivity. Avoid spraying under hot, droughty conditions. Bentgrasses, fine-leaved fescues, and dichondra are most sensitive; bermudagrass is most tolerant. Do not use on St. Augustinegrass turf. Use lower rate on bentgrasses and fine-leaved fescues and if daily temperatures exceed 80 F. Lower rate is sufficient to control young crabgrass; use higher rate for mature crabgrass; requires 2-3 resprays at 5-7 day intervals. Use repeated monthly sprays for established dallisgrass and nutsedge. Use higher rate on bermudagrass and, if temperatures are 80 F or lower, in Kentucky bluegrass as well; will yellow zoysiagrass turf.

G. FLUAZIFOP — Label rates
(Ortho Grass-B-Gon, Fusilade)
COMMENTS: For selective grass control in dichondra only. Will not control annual bluegrass. Apply when the grass is young and vigorous and has good soil moisture. Retreatments may be required for hard-to-kill weeds such as bermudagrass, dallisgrass, and kikuyugrass. Will not control nutsedge.

H. GLYPHOSATE — 1-2 lb a.i./acre or 1.6 oz a.i./gal/1000 sq ft
(Roundup, Ortho Kleenup, Systemic Grass and Weed Killer, etc.)
COMMENTS: Apply to rapidly growing weeds in 20 to 40 gal water/acre or as a spot treatment. For control of annual weeds shorter than 6 inches, apply 1 lb a.i./acre; if 6 inches or taller, apply 1.5 lb a.i./acre. Allow minimum of 3 days between application and renovation or cultivation. For control of perennial weeds, apply 4-5 lb a.i./acre to vigorous but nearly mature weeds (bermudagrass in summer-fall; field bindweed, at full bloom). In mowed turfgrass areas, *do not mow* before application. Delay verticutting, removing sod, or tillage for at least 7 days after treatment. To maximize control, allow the soil surface and root area to dry after verticutting or sod removal before replanting. When turf or ornamentals are to be planted, a followup preemergence program is required to control the seeds of perennials.

Continued on next page.

Herbicide treatment table cont. (12/93)

Herbicide (commercial name)	Amount/Acre

I. MECOPROP — 1-1.5 lb acid equivalent
(MCPP)
COMMENTS: For control of clover, prostrate knotweed, pearlwort. Spray on calm days to avoid spray drift onto susceptible crops or ornamentals. Safer to use on bentgrass than 2,4-D; do not use on dichondra. Use 1 qt surfactant/100 gal spray. For spot spraying use the same concentration/100 gal spray or 3-4 tsp mecoprop plus 2 tsp surfactant/gal water. (Rate for spot spraying applies only to formulations containing 2 or 2.5 lb acid equivalent/gal.)

J. MSMA — 2-4 lb a.i.
(Acme Crabgrass & Nutgrass Killer, Bueno 6, etc.)
COMMENTS: Temperature and turf type determine degree of selectivity. Use lower rate for nutsedge control, on bentgrass, and on other turf types when daily temperature exceeds 85 F. Apply at monthly intervals for control of dallisgrass and nutsedge. Apply uniformly over area regardless of distribution of the weed. Hesitating with sprayer over weedier spots may cause excessive rate and injure or kill the turf. Repeated applications of high rates reduces kikuyugrass. Turf may be temporarily discolored. Injurious to St. Augustinegrass, red fescue, dichondra, and zoysiagrass.

K. PRONAMIDE* — 0.75-1.5 lb a.i.
(Kerb)
COMMENTS: For control of annual bluegrass in bermudagrass turf only. Use 0.75 to 1 lb a.i. to control seedling to young tillering stages of annual bluegrass; a higher rate of 1 to 1.5 lb a.i. is needed for seed-forming stages. Do not apply where the herbicide can move into sensitive cool season grasses. Do not overseed cool season grasses within 90 days after treatment.

L. TRICLOPYR — 0.25-0.5 lb a.i.
(Turflon)
COMMENTS: For use on cool season turf species only. Especially useful for creeping woodsorrel control. Apply in 50 to 100 gal water/acre to vigorously growing broadleaf weeds, preferably in spring or fall. May be retreated 4 weeks following the first application for hard-to-kill weeds. To broaden weed spectrum and control dandelion, use a tank mix of amine or low volatile ester of 2,4-D with triclopyr. Do not apply around trees or shrubs, since injury may result. Do not follow application with an irrigation within 4 hours.

M. 2,4-D LOW-VOLATILE ESTERS* — 1-1.5 lb a.i.
(Chacon, Broad-Leaf Weed Killer, Esteron 99 Concentrate, etc.)
COMMENTS: Apply in 100 gal water/acre. Use to control common yarrow, speedwells, mallows, mature knotweed. For spot treatments, use 4 tsp formulation/1 gal water.

Continued on next page

* Permit required from county agricultural commissioner for purchase or use.

Herbicide treatment table cont. (12/93)

Herbicide (commercial name)	Amount/Acre
N. 2,4-D WATER-SOLUBLE AMINES*	1-1.5 lb a.i.

(Formula 40, 2,4-D Amine No. 4, etc.)
COMMENTS: For control of dandelion, plantain, young pigweed use 1 lb acid equivalent plus 1 qt surfactant in 100 gal water/acre. For spot treatment use 2 tsp formulation plus 2 tsp surfactant to 1 gal water. For control of young knotweed (2-4 leaf stage), field bindweed, wild lettuce, and filaree use 2 lb acid equivalent plus 1 qt surfactant in 100 gal water/acre. For spot treatment, use 4 tsp formulation plus 2 tsp surfactant to 1 gal water. On bentgrasses use water-soluble amine only and do not exceed 0.75 lb acid equivalent/acre.

O. 2,4-D* — 0.5-1 lb a.i.
...*PLUS*...
MCPP — 1 lb a.i.
COMMENTS: A tank mix. Do not apply in windy conditions where drift can occur. Do not mow grass 2-3 days before or after treatment. Do not use on bentgrass greens, St. Augustinegrass, or centipede turf. Do not irrigate for 4 hours after application.

P. 2,4-D* — Label rates
...*AND*...
MCPP
...*AND*...
DICAMBA*
(Trimec, Trexsan, etc.)
COMMENTS: For broad spectrum control of broadleaf weeds. Use lower rates for bentgrass, hybrid bermudagrass and other sensitive turfgrasses. Nonselective on dichondra. Avoid applying to drought- and heat-stressed turf. Do not irrigate within 24 hours of application. Newly seeded turf should not be treated until after the second or third mowing. Bentgrass is the most sensitive of the turfgrasses. Read label for further application directions. Do not allow spray drift to contact broadleaf ornamentals or injury may occur.

Q. 2,4-D* — Label rates
...PLUS...
TRICLOPYR — Label rates
(Turflon)
COMMENTS: A tank mix used for control of a broad spectrum of broadleaf weeds. Particularly effective for oxalis when other broadleaf weeds are present. Do not use on dichondra, bentgrass, or warm season turfgrasses. Avoid applying to drought or heat stressed turf. Do not irrigate within 24 hour of application. Do not allow drift to contact broadleaf ornamentals or injury may occur.

R. SETHOXYDIM — 0.3-0.5 lb a.i.
(Poast)
COMMENTS: Apply in 10-20 gal water plus an oil concentrate at the rate of 1 qt/acre. Rates dependent on grass size and species. Grasses should be stress free and actively growing. Effective in controlling small seedling annual grasses and some perennial grasses. Its effectiveness is reduced when grasses are under moisture stress. Later growth stages of annual grasses are more difficult to control. Follow label instructions regarding the use of adjuvants. Will not control annual bluegrass or fine fescues.

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APPENDIX III

IPM REPORT FORMS FOR GOLF COURSES
PESTICIDE USE REPORT
MONTHLY SUMMARY PESTICIDE USE REPORT

STATE OF CALIFORNIA
DEPARTMENT OF FOOD AND AGRICULTURE

PESTICIDE USE REPORT

426254

☐ NURSERY

COUNTY NO. 1	SECTION 2	TOWNSHIP N S 3	RANGE E W 4	BASE & MERIDIAN S H S M 5	APP. METHOD AIR ☐ GROUND ☐ OTHER ☐ 6	PERMITTEE/PROPERTY OPERATOR 7	APPLICATOR NAME AND ADDRESS 13

OPERATOR ID/PERMIT NO. 8	SITE IDENTIFICATION NUMBER 9	TOTAL PLANTED ACRES/UNITS 10
LOCATION 11		BLOCK ID (IF APPLICABLE) 12

DATE/TIME APPLIED 14	ACRES/UNITS TREATED 15	COMMODITY/SITE TREATED 16

CHEM. NO. 17	MANUFACTURER/NAME OF PRODUCT APPLIED 18	EPA/CALIF. REG. NO. FROM LABEL 19	TOTAL PRODUCT USED 20	RATE 21	DILUTION 22
			LB. OZ. PT. QT. GA.		
			LB. OZ. PT. QT. GA.		
			LB. OZ. PT. QT. GA.		
			LB. OZ. PT. QT. GA.		
			LB. OZ. PT. QT. GA.		
			LB. OZ. PT. QT. GA.		

DAYS REENTRY 24	DAYS PREHARVEST 25	APPLIED/SUPERVISED BY 26

(1) CAC Submit to AGRICULTURAL COMMISSIONER within 7 days of application 33-025 REV. 3/90 70 99243

DISTRIBUTION: ORIGINAL — COUNTY 1ST COPY — APPLICATOR

State of California

DISTRIBUTION: ORIGINAL — COUNTY
1ST COPY — APPLICATOR
2ND COPY — STATE

State of California
DEPARTMENT OF FOOD AND AGRICULTURE
INFORMATION SERVICES BRANCH

MONTHLY SUMMARY PESTICIDE USE REPORT

DATE SUBMITTED ______________

OPERATOR (FIRM NAME)	COUNTY WHERE APPLIED	COUNTY NO.	MONTH/YEAR OF USE	NAME OF PERSON RESPONSIBLE FOR REPORT

ADDRESS	CITY	ZIP CODE

PHONE NUMBER	LICENSE NUMBER	RESTRICTED MATERIAL PERMIT NO.	TOTAL NO. OF APPLICATIONS

SUBMIT ORIGINAL AND SECOND COPY TO THE COUNTY AGRICULTURAL COMMISSIONER BY THE 10th OF THE MONTH FOLLOWING THE APPLICATIONS.

– COMPLETE COLUMNS A, B, C AND D FOR ALL USES –

IF USE IS:	CODE	IF USE IS:
–STRUCTURAL PEST CONTROL	1	–COMMODITY FUMIGATION
–LANDSCAPE MAINTENANCE	3	–SPOT TREATMENT
–RIGHT-OF-WAY	4	–SEED TREATMENT
–PUBLIC HEALTH PEST CONTROL	5	–OTHER (AS PERMITTED BY THE COUNTY AG. COMM.)
–VERTEBRATE PEST CONTROL	8	
–REGULATORY PEST CONTROL	10	

THEN:
- ENTER CODE IN COLUMN E
- LEAVE COLUMNS F & G BLANK

THEN:
- LEAVE COLUMN E BLANK
- FILL IN COLUMNS F & G

USE DEFINITIONS

STRUCTURAL PEST CONTROL — any pest control work performed within or on buildings and other structures. This includes work done by a licensed structural pest control operator.

LANDSCAPE MAINTENANCE — any pest control work performed on landscape plantings around residences, or other buildings, golf courses, parks, school grounds, cemeteries, etc.

RIGHT-OF-WAY — any pest control work performed along or on roadsides, power lines, ditch banks and similar sites.

PUBLIC HEALTH PEST CONTROL — any pest control work performed by or under contract with State or local public health or vector control agencies.

REGULATORY PEST CONTROL — any pest control work performed by public employees or contractors in the control of regulated pests.

	A	B	C	D	E	F	G
	MANUFACTURER AND NAME OF PRODUCT APPLIED	REGISTRATION NUMBER FROM LABEL INCLUDE ALPHA CODE	TOTAL PRODUCT USED (Circle One Unit of Measure)	NUMBER OF APPLICATIONS	CODE	COMMODITY OR SITE TREATED	ACRES/UNITS TREATED
1		– – –	LB OZ PT QT GA				
2		– – –	LB OZ PT QT GA				
3		– – –	LB OZ PT QT GA				
4		– – –	LB OZ PT QT GA				
5		– – –	LB OZ PT QT GA				
6		– – –	LB OZ PT QT GA				
7		– – –	LB OZ PT QT GA				
8		– – –	LB OZ PT QT GA				
9		– – –	LB OZ PT QT GA				
10		– – –	LB OZ PT QT GA				

39-C (REV. 6/80)

Turf IPM Field History Report Form

Hole Number _____ Scout ____________________________ Date ________________

;	Turf species	Area	Mowing Schedule	Soil Analysis pH	P	K	Soil Drainage	Fertilization (N/1000 sq.ft) Spring	Summer	Fall	Winter	Irrigation Schedule
;en												
;												
rway												
ugh												
ving ge												
rsery green												
ctice green												

mments on specific topics such as shade, nitrogen carrier, topdressing mix, weather, irrigation salinity levels, etc.

____

____

____

Turf IPM Field Infestation Report

Hole _____ Scout ______________________________ Date __________

Site (turf species)	Mowing Height	Soil Moisture	Weeds Species No. or %	Diseases Species No. or %	Insects Species No. or %	Nematodes Species No. or %
Green						
Tee						
Fairway						
Rough						
Notes:			1. Goosegrass 2. Crabgrass 3. Thin Paspalum 4. Torpedograss 5. Broadleaves 6. Nutsedge (Yellow, Globe, Annual, Kylinga) 7. Nutsedge (Purple) 8. Poa annua 9. Other	1. Dollar spot 2. Leaf spot 3. Pythium blight 4. Pythium root rot 5. Fairy ring 6. Brown patch (R. solani) 7. Rhizoctonia leaf and sheath blight (R. zeae) 8. Bermudagrass decline 9. Algae/Moss 10. Other	1. Mole crickets 2. Sod webworms 3. Armyworms 4. Cutworms 5. White grubs 6. Fire ants 7. Mites 8. Grass scales 9. Other	1. Sting 2. Lnace 3. Stubby-root 4. Root-knot 5. Cyst 6. Ring 7. Spiral 8. Sheath 9. Other

APPENDIX IV

HAZARD COMMUNICATION PROGRAM

A-6 SUMMARY OF WORKER SAFETY REGULATIONS

The purpose of the pesticide worker safety regulations is to specify safe work practices for employees who handle (mix, load, apply, flag for aerial application or service contaminated equipment) pesticides or enter treated fields. Employers must ensure that their employees work safely and follow all safety rules, including requirements shown on the label. Pesticide mixing, loading and application equipment used by employees must be safe to use and is subject to inspection at any time. If a worksite is suspected of being dangerous, the Department of Pesticide Regulation or the local Agricultural Commissioner may prohibit entry of employees or place special restrictions on entry to protect employees. Important requirements of the regulations follow.

Hazard Communication (CCR 6723 and 6761). Hazard communication is designed to ensure that employees are aware of the hazards they face and what they should do to protect themselves from those hazards. For pesticide handlers the three principle provisions of the program are: (1) labels and other warnings; (2) training and (3) exposure records and monitoring. For field workers, general hazard information is provided on Crop Sheets that must be available to the worker. Pesticide Safety Information Series (PSIS) leaflet A-9, which tells the worker where the use records can be found, must also be available to the worker. Employers must have Material Safety Data Sheets (MSDS) and PSIS leaflets, if available, for the pesticides used.

Labels and Other Warnings (CCR 6602, 6618, 6674, 6678 and 6776). Pesticide labels must be available at the worksite. If pesticides are transferred from their original container the new container must be labeled with the identity of the pesticide, the signal word from the product label and the name of the person or firm responsible (except for limited on-farm use by the farmer).

The employer is responsible for warning employees about areas that have been treated and enforcing reentry restrictions. Oral warnings must be given to all employees who might enter when there is a reentry interval in effect. Warning signs must also be posted by the operator of the property for the duration of any reentry interval of more than seven days and for certain crops and conditions when the application of a pesticide with the signal word "DANGER" on the label results in a reentry interval of two days or more. Warnings are also required around pesticide storage areas and when pesticides are applied in irrigation water.

Training (CCR 6724, 6764 and 6770). Employees who handle pesticides must be given adequate training in the use of the pesticides. This training must be given <u>before</u> the employee begins to handle pesticides. They also must be given refresher training each year. Each employee must fully understand the immediate and long term hazards of use and know the procedures they must follow to safely work with the pesticides they will be using, even during emergency or non-routine situations.

Training must include the use of protective clothing and safety equipment, the common symptoms of poisoning, where to get emergency medical care, the provisions of medical supervision, regulations and label requirements, and the need for immediate decontamination of the skin and eyes when exposure occurs. The training must also cover the information contained in applicable PSIS leaflets and the appropriate MSDS as well as where these documents are located. There are additional special training requirements for employees who must use respiratory protection. Employees must be informed that they have the right to receive information (or it can be given to their physician) about pesticides to which they may be exposed. Employees cannot be fired for exercising their rights.

Records of each employee's training must be kept at the employee's work headquarters. Both the employer and the employee must sign the training record to acknowledge its accuracy.

The onsite field work crew leader must be trained about reentry and posting and how to handle any illness or injury that may occur in the field. The employer must train employees about where specific hazard and use information is kept. Early entry field workers are required to be trained about specific pesticides used and the protective clothing and hygiene procedures they should follow to prevent exposure.

Emergency Medical Care (CCR 6726 and 6766). The employer must make prior arrangements for emergency medical care, and tell employees where they should be taken if they get sick or injured on the job. For employees who handle pesticides, the name, address and telephone number of the physician, clinic or emergency room able to provide care must be posted in a prominent place at the work site, or on the work vehicle if there is no fixed work site. Emergency medical care must also be planned in advance for employees who work in fields after a pesticide application. At least the field work crew supervisor must know what to do if someone gets sick or is injured on the job.

Engineering Controls (CCR 6742, 6746 and 6793). All tanks on pesticide equipment used by employees must have covers to prevent spillage when in use. If the tank is 50 gallons or larger and used for pesticides with the signal word "DANGER" or "WARNING" there must be an automatic fill shut-off or an external sight gauge to help prevent over filling.

Closed Systems (CCR 6746). Closed systems must be used by all employees who mix and load liquid pesticide products or liquid mixes of dry pesticide products with the signal word "DANGER" or any minimal exposure pesticide used for the production of an agricultural commodity. When pesticides with the signal word "DANGER" or "WARNING" are handled by employees, the loading hose must have a shut-off device on the end to prevent spills when removed from the application vehicle tank. Closed systems are fully explained in PSIS A-3.

Cleaning/Repairing Equipment (CCR 6744). Employees who clean or repair pesticide handling equipment must be fully informed of and protected from the hazards of working on that equipment.

Protective Equipment (CCR 6738 and 6793). Employers are required to provide all necessary protective clothing and equipment and see that it is cleaned and repaired. Generally, the label of the pesticide used will say what is needed. However, there are additional requirements that may not appear on labels.

Eye protection - Eye protection is required when handling pesticides, except when injecting or incorporating pesticides into the soil, applying dry baits, working in an enclosed cab or operating equipment with the nozzles located below the employee and pointed downward.

Gloves - Gloves must be used for all mixing and loading, for adjusting, cleaning or repairing contaminated equipment and for all hand application activities (except vertebrate pest control using long-handled tools). Gloves must be replaced or washed every day. It is especially important that gloves be washed on the inside as well as the outside, since residue can accumulate inside.

Respiratory Equipment. When respiratory protection is required the employer must adopt written procedures for selecting, fitting and maintaining the equipment. Employees with certain medical conditions, such as heart or respiratory disease, must be evaluated by a physician before being assigned to this kind of work. Respiratory protection is explained in PSIS A-5.

Full-Body Chemical Resistant Clothing. Some pesticides with unusual hazards require full body chemical resistant clothing. Heat stress may occur if this kind of clothing is used in warm temperatures. Since the hazards of the pesticide will not allow its use without this kind of protection, the following rule applies: Employees are prohibited from using pesticides with this clothing requirement when the temperature is above 80°F during the day or 85°F at night unless they are provided with cooled chemical suits or use closed systems and work in enclosed cabs.

Hygiene (CCR 6732, 6734 and 6793). Clean water, soap and towels must be available at the work site where employees mix or load pesticides with the signal word "DANGER" or "WARNING" or pesticides listed as minimal exposure pesticides.

Employees must be provided a place to wash and change clothing after work if their exposure to pesticides that carry the signal word "DANGER" or "WARNING" exceeds 6 days in a 30 day period. A change area is also required if employees handle minimal exposure pesticides. Employees handling only antimicrobial agents, are exempt from the change area requirements.

Work Clothes (CCR 6736 and 6793). Employees must be provided clean work clothes if they handle pesticides with the signal word "DANGER" or "WARNING" or any minimal exposure pesticide. Work clothes can be either coveralls or a shirt and trousers, but must have long sleeves and long legs. The employer is responsible for the washing of work clothes and must inform the person washing the clothes that it may be contaminated with pesticides and should be washed separately. Washing of contaminated clothing is discussed in PSIS A-7. Employees handling only antimicrobial agents, are exempt from the work clothes requirements.

Use Records (CCR 6624, 6728 and 6778). Records about when and where pesticides were used must be kept for most pesticide use situations. The employer must have records of employee exposure to organophosphate and N-methyl carbamate pesticides used in the production of an agricultural commodity. These records must show for each person the name of the pesticide and the date of the exposure.

Medical Supervision (CCR 6728). Employees whose exposure to organophosphate and carbamate pesticides with the signal word "DANGER" or "WARNING" exceeds 6 days in a 30-day period, for the production of an agricultural commodity, must be provided with appropriate medical supervision that includes periodic cholinesterase blood tests. Medical supervision is explained in PSIS B-1.

Employee Contact (CCR 6730). An employee working alone with pesticides with the signal word "DANGER" for the production of an agricultural commodity must have contact with another person at least once every two hours during the day and once every hour at night.

Fumigants (CCR 6780, 6782 and 6784). Fumigants are pesticides which are used as a gas. A permissible exposure level (PEL) has been set for most fumigants. These PELs must not be exceeded. It is the employer's responsibility to know that employees are not being overexposed or to provide approved respiratory protection. Where fumigants are used, there must be an accident response plan that tells employees what to do in case of a spill, leak or fire. Employees must know what is in the plan.

Some fumigants cannot be detected in the air by odor, taste, irritation or sight. For these fumigants, the employer must know or anticipate possible exposure from routine work activities. This is done by monitoring the actual worksite or use of previous monitoring from similar procedures and situations. This will show that one of three situations exist: (1) Employee exposure does not exceed the PEL, in which case no respiratory protection is required during those times; (2) Employee exposure will exceed the PEL, in which case approved respiratory protection is required and (3) Employee exposure is variable (i.e., there are times when the levels exceed the PEL and times when it does not). In these cases approved respiratory protection must be worn at all of these uncertain times unless there is continuous monitoring at the worksite. If there is continuous monitoring, respiratory equipment is necessary only when monitors indicate the PEL is exceeded.

Reentry Interval (CCR 6770, 6772, 6774). A reentry interval is the period of time, following a pesticide application, when employees are not allowed to go into the treated field for picking (hand-harvesting), thinning, weeding, tying, pruning, limb propping or similar work.

Reentry, for activities such as irrigating or operating tractors, is allowed if special protection is used to used to prevent employee exposure to residues. Reentry intervals for many pesticides have been established by regulation, others are stated on pesticide labels. Both must be observed. Some label reentry intervals will allow field work if the workers are wearing special work clothing and gloves. This condition applies only after any more restrictive intervals in regulation have expired.

Spray Is Dry, Dust is Settled (CCR 6770). No employee can enter a treated area before the pesticide spray has dried or dust has settled.

Minimal Exposure Pesticides (MEP) (CCR 6790-6793). The following pesticides are on the minimal exposure pesticide list: propargite (Omite®, Comite®), folpet, bromoxynil (Buctril®, Bromate®) and oxydemeton-methyl (Metasystox®-R). The hazards of using these pesticides require special safety rules regardless of the toxicity category of the pesticide. These rules are: (1) a change area must be provided; (2) washing facilities must be at all mix/load sites; (3) clean work clothing must be provided each day; (4) a closed system must be used for liquid pesticides or liquid dilutions of pesticides; (5) employees who handle MEPs must wear clean or new rain suit protection (except when using a closed system or sealed water soluble packaging, in enclosed cabs or vehicles, injecting or incorporating pesticides into the soil or using equipment with spray nozzles behind the applicator that are pointed down); and (6) respiratory protection must be used when applying by hand or ground (except when incorporating into the soil or using equipment with the nozzles behind the applicator and pointed down).

You may examine a complete set of these regulations at your County Agricultural Commissioner's office.

EXAMPLE OF A HAZARD COMMUNICATION PROGRAM

____

(NAME OR COMPANY)

____

(LOCATION-DIVISION)

It is the intent of________________________, ______________________________
(Name of Company) (Address-Location-Division)

to comply with the requirements of the Hazard Communication Standard in our continuing effort to provide a healthy and safe workplace for our employees.

This program is designed to provide employee information and training (1) the hazardous chemicals known to be in the workplace, (2) the methods that will be employed to protect workers, (3) the precautionary methods employees must follow to protect themselves from hazardous chemicals, (4) the detection of a release of hazardous chemicals and (5) emergency procedures to follow should there be a release of hazardous chemicals and/or employee exposure to them.

WRITTEN HAZARD COMMUNICATION PROGRAM: Copies of the written Hazard Communication Program are available from the office of

________________________.

(Name of Office or Person)

program is reviewed annually and is updated as needed. All present or new employees will be given a copy of the program. Employees and/or their authorized representative may obtain an additional copy of the program during normal working hours at a cost of $1.00 per page.

MATERIAL SAFETY DATA SHEETS: Following is a listing of all hazardous chemicals known to be in the workplace; the location(s) of the chemical are also provided:

HAZARDOUS CHEMICAL LOCATION/USE

1.

2. (List all known or suspected hazardous chemicals.)

3. (If you do not have copies or all MSDS's, you will need to contact your suppliers for the necessary copies).

A Material Safety Data Sheet (MSDS) and/or label of each hazardous chemical is filed in the office of ________________________________. Employees and/or their

(Name of Office or Person)

representative may obtain a single copy of an MSDS and/or label during normal working hours at a cost of $1.00 per page. The relevant information on the MSDS will be shared with employees during the hazard communication training program. The MSDS will be available in the workplace to all employees who are urged to review them whenever they have a question regarding the chemical.

NOTIFICATION OF OTHER EMPLOYERS: When other employers bring a work crew onto our property they will be supplied with a copy of the Hazard Communication Program and with copies of the MSDS for hazardous chemicals which could be encountered in their work area. It shall be their responsibility to train their employees, provide personal protective equipment and handle employee emergencies. Any releases or spills of hazardous chemicals shall within minutes, be brought to the immediate attention of

________________________.

(Name of Office, Person or Position Title)

USE OF LABELS: Whenever possible hazardous chemicals will be kept in their original containers. Should an original container ever become defective (leak) the chemical will be transferred to a similar type container. The label will be transferred to the replacement container and be securely attached. If the label is non-transferrable, a replacement label with all significant information will be prepared and be securely and prominently placed on the new container. This container of a chemical will be used for its intended use as soon as possible.

Placards will be placed on all containers in which hazardous chemicals are used, such as storage tanks for chemicals, solvent tanks for cleaning parts, etc.

EMPLOYEE INFORMATION AND TRAINING: All employees will be provided with information and training on hazardous chemicals in their workplace:

- ✓ At the time of their initial employment.
- ✓ Whenever a new hazardous chemical is brought into their workplace.
- ✓ At least annually.

All affected employees are required to participate in this training. The training will be provided or arranged by

____.
(Name of Office or Person or Position Title)

The employees will be provided with the following information:

- ✓ The requirements of the Hazard Communication Standard.
- ✓ Operations in their work area where hazardous chemicals are present, used or stored.
- ✓ Location and availability of the written Hazard Communication Program and MSDS files.

Employee training will include:

- ✓ Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.)
- ✓ The physical and health hazards of the chemicals in the work area.
- ✓ The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used and
- ✓ The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the

Material Safety Data Sheet, and how employees can obtain and use the appropriate hazard information.

HAZARD CHEMICAL RELEASE, SPILL OR EXPOSURE

Employees will immediately, within minutes, notify their immediate supervisor of any release, spill or human exposure to a hazardous chemical. If it is a significant release into the atmosphere, a spill on non-owned property or into a surface or ground water supply, notify the local emergency service agency and/or fire department (telephone 911) and/or the State Emergency Response Commission.

If a person or persons are exposed to a hazardous chemical, emergency treatment as specified by the MSDS or label will be immediately applied and whenever a question of further medical treatment may be required, the individual(s) will be transported to

________________Name of Doctor or ______________________________. A copy of the MSDS and/or label will be at the Emergency Treatment Center, transmitted with the exposed individual(s).

The supervisor of an area in which a hazardous chemical release, spill or exposure occurs will, immediately after emergency action, notify _________________________ of the event. (Name of Office or Person)

EMPLOYEE REQUIREMENTS: Employees are required to follow all standard operating procedures in the handling of hazardous chemicals, including the use of protective equipment. Failure to do so shall provide sufficient reason for reprimands, suspension or termination of employment.

INFORMING OUTSIDE CONTRACTORS

There may be instances where tasks will be performed by contractors that are not company employees. Should there be a hazardous substance in the work area, it is the obligation or our company to make the contractor aware of the situation. This may be accomplished by:

1. A list hazardous substances in the work area.

2. A diagram of the work area with the locations designated where hazardous substances are used and/or stored.

The contractor will be advised that MSDS are on file and available upon request. The contractor will sign an acknowledgment of receipt of information.

ACKNOWLEDGMENT OF RECEIPT

DATE:______________________________

ON THE ABOVE DATE, I ____

(CONTRACTOR'S NAME)

RECEIVED A LIST OF HAZARDOUS SUBSTANCES USED AND/OR STORED IN THE WORK AREA FROM

____.

I UNDERSTAND THAT MSDS ARE AVAILABLE FOR ALL SUBSTANCES LISTED, UPON REQUEST. I ALSO MAY OBTAIN A DIAGRAM OF THE WORK AREA DESIGNATION USE AND/OR STORAGE OF HAZARDOUS SUBSTANCES.

____

(CONTRACTOR'S SIGNATURE)

HAZARDS OF NON-ROUTINE TASKS

A non-routine task is defined as one or more of the following:

1. A task not done frequently

2. A task not listed on your job description

3. A task for which you are not trained

Should your Supervisor/Foreman call upon you to perform a non-routine task involving hazardous chemical handling or working in an area where hazardous chemicals are used or stored, the following steps will be taken by the him\her:

1. Give the employee a complete description of the task

2. Brief on hazardous chemicals in the work place

3. Brief on the effects the chemicals may have on the person

4. Determine if the employee is allergic to the chemicals present

5. Brief on proper handling of the chemicals

6. Brief an first aid procedures to take concerning the chemicals

7. State that there will be mandatory use of safety equipment

8. The Supervisor/Foremen will closely monitor the employee while working in the area of hazardous chemicals

REQUIRED POSTERS AND RECORDS IN MAINTENANCE AREA

1. OSHA JOB SAFETY AND PROTECTION POSTER
   U.S. Department of Labor
   Occupational Safety and Health Administration

2. EQUAL EMPLOYMENT OPPORTUNITY POSTER
   Equal Employment Opportunity Commission

3. WORKERS' COMPENSATION POSTER
   Obtain from Insurance carrier

4. BE SAFE WITH PESTICIDES POSTER
   Environmental Protection Agency

5. RIGHT-TO-KNOW LAW POSTER
   Toxic Substances Information Center

6. MATERIAL SAFETY DATA SHEETS (MSDS)
   Obtain from distributor for each hazardous chemical used and/or stored.

7. PESTICIDE LABELS
   Obtain from distributor of each pesticide used and/or stored.

8. HAZARD COMMUNICATION PROGRAM
   A written program prepared by the course.

9. RESTRICTED USE PESTICIDE APPLICATION RECORD

   Date and location of application.

   Product name and quantity (pounds or gallons) of pesticide applied

   Area treated and application rate method of application

10. RESTRICTED PESTICIDE CERTIFICATION LICENSE

    Test is given at the County Cooperative Extension service.

    Required only for individuals purchasing and using restricted pesticides.

APPENDIX V

FIELD SAMPLING SHEETS

AND

PESTICIDE RECORD SHEET

SURFACE WATER FIELD SAMPLING SHEET

Station Number : ______ Samplers: ______________________________

Description: ______________________________

____

Date of Sampling: ______________________________

Time of Sampling: ______________________________

Weather: ______________________________

Field Measurements:

Water Temp(°C) ____________________

Air Temp (°C) ____________________

pH ____________________

Specific Cond(µS) ____________________

Depth of Water (m) ____________________

Depth at which Sample taken (m) ____________

Wetted Area (m) ____________________

Water Flow (m/sec) ____________________

Calibration of Instruments

Specific Conductance: Meter ____________________

Reading in KCl soln ________________

pH Meter Model: ____________ Calibration Buffers used: ____________________

Sample Apparatus: ______________________________

Mode of Transport: ______________________________

Shipping Date: ______________________________

Remarks:

POND SEDIMENT FIELD SAMPLING SHEET

Station Number: ______ Samplers: ______________________________

Description: ______________________________

Date of Sampling: Day ______ Month ______ Year ______

Time of Sampling: Hour ______ Minute ______

Field Measurements:

Water Temp(°C) ______________________

Air Temp (°C) ______________________

pH ______________________

Specific Cond(μS) ______________________

Depth of Water at which sample taken(m) ______________________

Calibration of Instruments

Specific Conductance: Meter ________ Meter Reading in KCl soln: ______

pH Meter Model: ____________ Calibration Buffers used: ________

Sample Apparatus: ______________________________

Mode of Transport: ______________________________

Shipping Date: ______________________________

Remarks:

GROUND WATER FIELD SAMPLING SHEET

Well Number:______ Samplers: ______________________________________

Description:____

Weather:____

Date of Sampling: Day ______ Month ______ Year ______

Time of Sampling: Hour ______ Minute ______

EVACUATION:

Static Water Level (TOC): ________ Static Water Volume:(TOC)______

Pump Start Time: ______________ Pump End Time:______________

Total Pump Time: ______________ Volume Evacuated:____________

Conductivity, pH, Temperature

1__________µS; ____________°C; ____________s.u.

2__________µS; ____________°C; ____________s.u.

3__________µS; ____________°C; ____________s.u.

SAMPLE:

Sample Water Level(FT):________________

Water Temp(°C) ________________________

Air Temp (°C) ________________________

pH ________________________

Specific Cond(µS)____________________

CALIBRATION OF INSTRUMENTS

Specific Conductance: Meter _________________Meter Reading in KCl soln:______

pH Meter Model:__________ Calibration Buffers used:______________________

Sample Apparatus: ____

Mode of Transport and date of shipment:_______________________________

SOILS FIELD SAMPLING SHEET

Station Number: ______ Samplers: ______________________________

Description:
____

Weather:
____

Date of Sampling: Day ______ Month ______ Year______
Time of Sampling: Hour ______ Minute ______

Mode of Transport: ______________________________

Shipping Date: ______________________________

Remarks:

PESTICIDE USE RECORD

Application Date ______________________

Time of Day ______________________

Operator ______________________

Supervisor ______________________

Weather Conditions

Temperature ____________ degrees F

Humidity ____________ %

Wind Speed ____________ MPH

Wind Direction ____________

Rainfall ____________ inches

Soil Moisture ____________

Pest ______________________________

Pesticide	Active Ingredient	Amount of Formulation	Am't of Water
________	________	________	________
________	________	________	________
________	________	________	________

Adjuvant/Surfactant	Amount of Formulation
________________	________________

Area Treated

____________ Acres ____________ Square feet

Total Amount of Pesticide Used:

Application Equipment:

Sprayer ____________ Spreader ____________

Remarks:

APPENDIX VI

RESTRICTED USE MATERIALS

CALIFORNIA PESTICIDE PERMIT REQUIREMENTS

A FEDERALLY RESTRICTED MATERIALS

PESTICIDES DISPLAYING THE STATEMENT SHOWN HERE OR A SIMILAR STATEMENT ON THE PRODUCT CONTAINER ⇨

> **RESTRICTED USE PESTICIDE**
> FOR RETAIL SALE TO AND APPLICATION ONLY BY CERTIFIED APPLICATOR OR PERSONS UNDER THEIR DIRECT SUPERVISION

PRODUCTS BEARING THE "PHYSICALLY PRESENT" STATEMENT ON THE LABEL ARE REQUIRED TO HAVE A CERTIFIED APPLICATOR PHYSICALLY PRESENT AT THE USE SITE

B CALIFORNIA RESTRICTED MATERIALS

TRADE NAMES ARE USED IN THE INTEREST OF SIMPLICITY, OTHER PRODUCTS WITH THE SAME COMPOUND AS AN ACTIVE INGREDIENT ARE ALSO SUBJECT TO THE PERMIT REQUIREMENTS. REFER TO THE CALIFORNIA CODE OF REGULATIONS TITLE 3, SECTION 6400

ACROLEIN FOR USE AS AN AQUATIC HERBICIDE
ALL DUST (EXCEPT THOSE PRODUCTS CONTAINING ONLY EXEMPT PESTICIDES)**
ANTIFOULING PAINTS OR COATINGS CONTAINING TRIBUTYLTIN**
ANY PESTICIDE USED PURSUANT TO A SECTION 18 EMERGENCY EXEMPTION
AVITROL
AZODRIN
BENTAZON FOR RICE
BIDRIN
CADMIUM CONTAINING PESTICIDES**
CALCIUM CYANIDE
CARBON BISULFIDE
CHLOROPICRIN
DASANIT
DEF/FOLEX
DICAMBA
DI-SYSTON**
EDB
EDC
ENDOSULFAN**
ENDRIN
ENDRIN TREATED CONIFER SEEDS
EPN
ETHION
ETHYL PARATHION
FURADAN
GALECRON/FUNDAL
GUTHION
INORGANIC ARSENICALS OTHER THAN SODIUM ARSENITE**
LANNATE/NUDRIN**
LINDANE**
MCPA
METASYSTOX-R
METHYL BROMIDE
METHYL PARATHION
MERCURY CONTAINING PESTICIDES**
MOCAP
MOLINATE
MONITOR
NEMACUR
OMPA
PARAQUAT
PHOSDRIN
PHOSPHAMIDON
PHOSTOXIN
PICLORAM
PROPANIL
SEVIN**
SODIUM CYANIDE
SODIUM ARSENITE
STARLICIDE
SULFOTEPP
SYSTOX
SUPRACIDE
TEMIK
TEPP
THIMET
THIOBENCARB
TORAK
TRITHION
ZINC PHOSPHIDE
2, 4-D
2, 4-DB
2, 4-DP
2, 4-DINITROPHENOL
4, 6-DINITRO-O-CRESOL

RESTRICTED MATERIALS - SUSPENDED/CANCELLED

ALDRIN ③
BHC ③
CARBON TETRACHLORIDE ③
CHLORDANE ②
COMPOUND 1080 ②
DDD ③
DDT ③
DIELDRIN ③
DINOSEB ③
HEPTACHLOR ②
SILVEX ③
STRYCHNINE ①
TELONE ①
TOK ②
TOXAPHENE ②
2, 4, 5-T ②

① Suspension order in effect. ② Use provisions may exist. ③ All uses are prohibited.

CERTIFIED APPLICATORS

PRIVATE APPLICATORS

GROWERS, NURSERYMEN AND OTHERS USING RESTRICTED PESTICIDES TO PRODUCE AGRICULTURAL COMMODITIES

A PESTICIDES IN "A" ABOVE PERMIT REQUIRED, NO EXEMPTIONS

B PESTICIDES IN "B" ABOVE PERMIT REQUIRED, EXEMPTIONS APPLY UNLESS THE PESTICIDES IS IN "A" ABOVE

COMMERCIAL APPLICATORS

EVERYONE OTHER THAN PRIVATE APPLICATORS USING RESTRICTED PESTICIDES

- JOURNEYMAN PILOTS
- VECTOR CONTROL TECHNICIANS
- QUALIFIED APPLICATOR LICENSEES
- STRUCTURAL PEST CONTROL OPERATORS
- QUALIFIED APPLICATOR CERTIFICATE HOLDERS

A PESTICIDES ONLY IN "A" ABOVE, NO PERMIT REQUIRED

B PESTICIDES IN "B" ABOVE PERMIT REQUIRED, EXEMPTIONS APPLY

PERMIT EXEMPTIONS

**NO PERMIT REQUIRED FOR HOME, STRUCTURAL, INDUSTRIAL AND INSTITUTIONAL USES OF PESTICIDES MARKED WITH AN ASTERISK.

- READY-TO-USE SYRUPS OR PASTES CONTAINING SODIUM ARSENIC LABELED FOR CONTROL OF ANTS
- USE ON LIVESTOCK OR POULTRY LINDANE FOR SEED TREATMENT ONLY
- CARBARYL FORMULATED AS A BAIT
- ETHYLENE DICHLORIDE IN HOME USE FORMULATIONS ONLY
- PARAQUAT IN HOME USE FORMULATIONS ONLY
- MOCAP FOR OTHER THAN TURF
- ONE PINT OR LESS OF A PRODUCT CONTAINING A RESTRICTED HERBICIDE PER 24 HOURS
- ONE GALLON OR LESS OF DILUTED READY-TO-USE SOLUTION CONTAINING A RESTRICTED HERBICIDE PER 24 HOURS
- UP TO 50 POUNDS OF A RESTRICTED HERBICIDE CONTAINING LESS THAN 10% OF ACTIVE INGREDIENT PREPARED FOR USE PER 24 HOURS
- ONE POUND OR LESS OF A RESTRICTED HERBICIDE IN DRY FORMULATION PER 24 HOURS
- A WAX BLOCK IMPREGNATED WITH A RESTRICTED HERBICIDE
- ONE QUART OR LESS OF DICAMBA PER 24 HOURS
- FLY BAIT CONTAINING 1% METHOMYL OR LESS

PR-ENF-013a (Rev. 10/94)

RESTRICTED USE PESTICIDES

Trade Name	Common Name
Dursban	Chlorpyrifos
Mocap	Ethoprop
Nemacur	Fenamiphos

AUDUBON COOPERATIVE SANCTUARY SYSTEM

The Audubon Cooperative Sanctuary System

Audubon Conservation Services • PO Box 1226 • Cary, NC 27512 • (919) 380-9640

November 14, 1995

Mr. Tom Hix
Hix-Rubenstein Companies
405 El Camino Real, #127
Menlo Park, CA 94025

Reference: Lion's Gate Environmental Management Plan

Dear Tom:

Please find enclosed the Environmental Management Plan for the Lion's Gate Golf Course. Comments and changes that we discussed have been incorporated into the document. I have sent one copy of the plan to the individuals listed below. Please note that this document and the information that it contains is specific to the Lion's Gate project site. Information from this document must not be applied to other locations.

Also, please find an analysis of the potential nitrate loading to the property. We made assumptions based on the results of turf studies as indicated in the analysis. The work of Dr. Yates is particularly useful because studies were conducted in California.

Please do not hesitate to contact us if we may be of assistance. Thank you.

Sincerely yours,
AUDUBON CONSERVATION SERVICES

Miles M. (Bud) Smart, PhD
Senior Environmental Scientist

Charles H. Peacock, PhD
Senior Agronomic Scientist

cc: Mr. Earl Kemp, Forsgren Associates
Mr. Norm Hantzsche, Questa Engineering
Mr. Malcolm Sproul, LSA Associates
Mr. Bruce Charlton, Robert Trent Jones II International
Mr. Bert Verrips, Nolte and Associates

AUDUBON COOPERATIVE SANCTUARY SYSTEM

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November 9, 1995

AN ANALYSIS OF THE POTENTIAL FOR NITROGEN LOADING AT LION'S GATE GC

Nitrogen fertilization at Lion's Gate GC will utilize soil and plant tissue testing analyses as guidelines for actual programs. This will minimize the total amount of nitrogen applied and make the most efficient use of materials. However, in order to determine the potential for nitrogen movement off-site via leaching to ground water the following analysis is offered:

Total Nitrogen application at the highest possible recommended rates: 26,188 pounds
Total acreage fertilized:108
Acreage used in calculating recharge: Receiving rainfall: 253 Irrigated: 108

Leaching potential based on utilizing best management practices is evaluated by:

$N_c = N_L/(8.34)(R)$

N_C	=	nitrate concentration
R	=	recharge based on rainfall + irrigation - ET
N_L	=	nitrogen leached in pounds
8.34	=	conversion factor gallons to pounds
27,152	=	acre-inches to gallons

Research data under turf conditions has found that nitrogen leaching can range from less than 1 to 7.5% of the total applied (see enclosed articles).

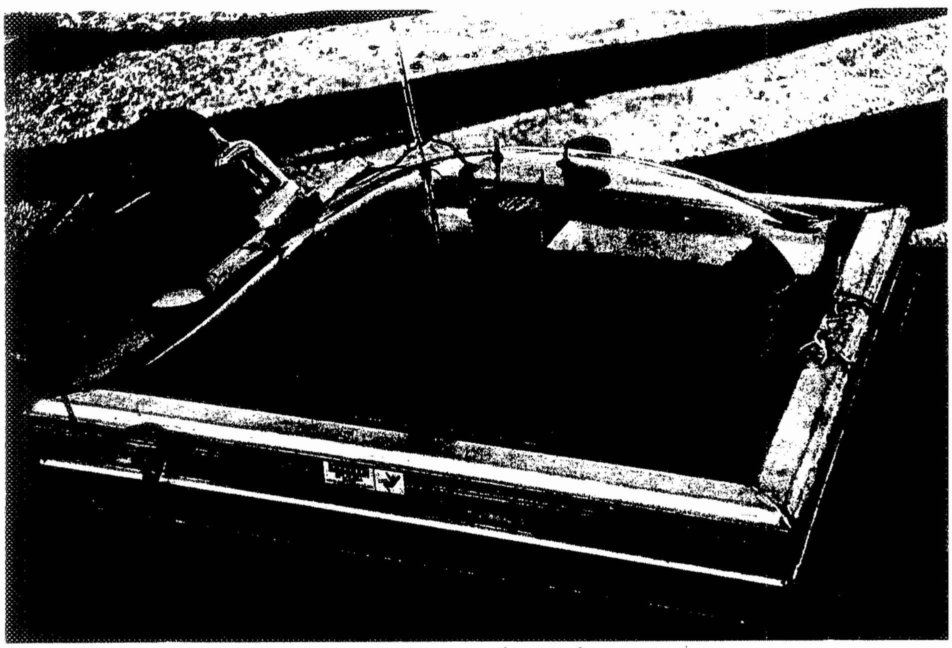
Assuming 1% leaching:

N_C = 262 pounds/(8.34 pounds per gallon) (51.9 million gallons)
= 0.61 ppm NO_3-N

Assuming 7.5% leaching:
$N_{C=}$ 1965 pounds/(8.34 pounds per gallon) (51.9 million gallons)
= 4.5 ppm NO_3-N

The Fate of Pesticides and Fertilizers in a Turfgrass Environment

by DR. MARYLYNN V. YATES
Department of Soil & Environmental Sciences, University of California, Riverside



A system used to measure volatilization of pesticides from turfgrasses.

ENVIRONMENTAL protection has become a national issue in the past several years. While concerns focused on cleaning up contaminated surface waters in the 1970s, the focus in the 1980s and into the 1990s has been on groundwater. More than one-half of the population of the United States relies on groundwater for all or part of its potable water. Up to 95% of rural residents obtain their water supplies from wells. Domestic uses account for only 18% of the groundwater used in this country, while almost two-thirds of the groundwater withdrawn in the U.S. is used for irrigation. In California, up to 20 billion gallons of groundwater is used every day for all irrigation purposes. The heavy dependence on groundwater for both domestic and agricultural uses makes groundwater a very valuable resource that must be protected from contamination.

Widespread use of pesticides has been made in agriculture during the past 40 years. California alone accounts for 25% of the pesticides applied in the United States. Prior to 1979, little monitoring of groundwater for the presence of pesticides was practiced because it was assumed that they were not sufficiently long-lived and mobile to pose a threat to groundwater. However, the discovery of a soil fumigant, 1,2-dibromo-3-chloropropane (DBCP) in well water in Lathrop, California, triggered widespread groundwater sampling programs. As a result, approximately 10,000 wells in the state have been analyzed for pesticide residues. The monitoring program detected more than 50 different pesticides in 23 California counties.

To try to prevent or minimize future groundwater contamination by pesticides, AB2021, the Pesticide Contamination Prevention Act, was passed in 1985. As a result of this bill, the use of several pesticides is being restricted in some areas of the state. In addition, the California EPA's Department of Pesticide Regulation is monitoring the groundwaters and soils of the state for the presence of more than 50 other pesticides. If these compounds are detected, their use may be restricted as well.

In addition to pesticides, nitrates have received a great deal of attention. Contamination of groundwater by nitrates is one of the major sources of non-point source pollution in the United States. A recent survey by the United States Geological Survey (USGS) suggested that the use of fertilizers in agriculture is a large contributing factor to elevated nitrate levels.

There has also been concern expressed over exposure to pesticides by routes other than drinking water. In California, a number of pesticides have been designated as potential toxic air contaminants. Thus, consideration of pesticide volatilization is an important aspect to consider in an environmental fate study, both from a pesticide efficacy and an environmental contamination standpoint.

The purpose of this research project was to study the fate of pesticides and fertilizers applied to turfgrass in an environment that closely resembles golf course conditions. The goal was to obtain information on management practices that will result in healthy, high-quality turfgrass while minimizing detrimental environmental impacts. By simultaneously looking at interactions between soils, turfgrasses, irrigation amounts, pesticides, and fertilizers, questions about "best management practices" for turfgrass growth and maintenance will be able to be answered.

METHODS

Site Construction

A site was constructed specifically for the purposes of this project at the Turfgrass Research Facility at the University of California, Riverside. The site consists of 36 plots, each of which measures 12 ft × 12 ft. The fairway area consists of 24 plots, 12 each of two different soil types (a sandy loam and a loamy sand) that were located randomly in the fairway area. Because the soil types were distributed randomly in the fairway area, borders were constructed to contain the soil in its respective plot. The putting green area has 12 plots that were constructed using 18"

Table 1
Summary of Results from Nitrogen and Pesticide Leaching and Pesticide Volatilization Experiments

Turfgrass Species	Source of N	Irrigation	Soil	N Leached (%)	2,4-D Leached (%)	Carbaryl Leached (%)	2,4-D Volatilized (%)	Carbaryl Volatilized (%)
Creeping	SCU	100% ETc	sand/peat	0.56	7.580	0.0240	1.05	0.030
Bentgrass	SCU	130% ETc	sand/peat	0.55	2.250	0.0450	0.96	0.034
(putting green)	Urea	100% ETc	sand/peat	0.71	4.180	0.0690		
	Urea	130% ETc	sand/peat	1.69	2.490	0.0220		
Tifway II	SCU	100% ETc	loamy sand	0.47	0.071	0.0027	0.52	0.038
Bermudagrass	SCU	130% ETc	loamy sand	0.58	0.260	0.0100	0.72	0.047
(fairway)	Urea	100% ETc	loamy sand	0.30	0.280	0.0180		
	Urea	130% ETc	loamy sand	0.75	0.190	0.0045		
	SCU	100% ETc	sandy loam	0.67	0.071	0.0017	0.43	0.025
	SCU	130% ETc	sandy loam	1.71	0.300	0.0230	0.50	0.021
	Urea	100% ETc	sandy loam	0.57	0.042	0.0032		
	Urea	130% ETc	sandy loam	0.63	0.056	0.0015		

[1]Average of three replicate values

of Caltega IV green sand with 15% sphagnum peat.

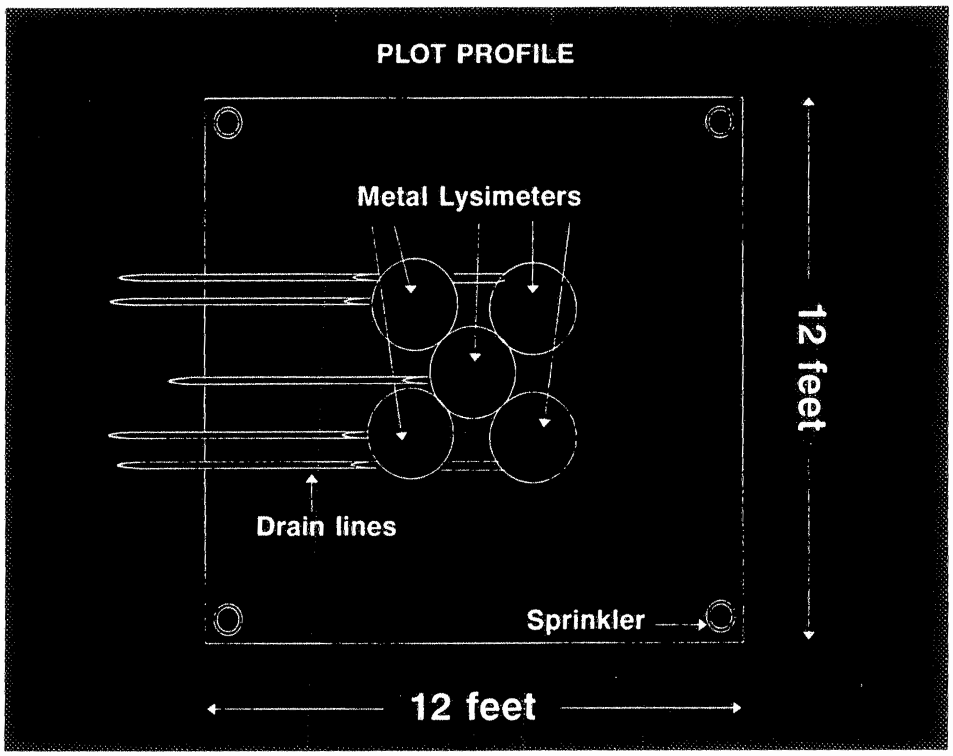
To enable us to obtain samples of leachate from each of the plots, collection devices had to be constructed. Lysimeter assemblies, consisting of 5 metal cylinders, were placed in the center of each of the 36 plots. Each of the lysimeters has a metal drain pipe at the bottom that extends the length of the field and terminates at a retaining wall on the south side. The lysimeter assembly and drain system were fabricated using only metal so that there was no potential for pesticide adsorption. This allowed us to make a quantitative determination of the mass of pesticide leaching through the turfgrass.

The irrigation system was designed so that each of the 36 plots could be irrigated individually. Each plot has 4 sprinklers, one at each corner. The entire irrigation system is outside of the lysimeter assembly so that there is no potential for adsorption of the pesticides to the PVC pipe. The irrigation is controlled electronically; scheduling was determined based on the evapotranspiration requirements of the turfgrass.

Sod was laid on the plots in February 1992. Creeping bentgrass (*Agrostis palustris*) was installed on the green plots, and hybrid bermudagrass (*Cynodon dactylon* by *Cynodon transvaalensis* var. Tifway II) on the fairway plots.

Experimental Design

All turfgrass soil-type combinations were subjected to two irrigation regimes: 100% crop evapotranspiration (ETc) and 130% ETc beginning in March 1992. The 100% ETc treatment is the optimal amount of water required by the turfgrass to grow and maintain itself in a healthy state. Thus, 130% ETc is above the optimum water requirement, but is well within the range of standard practice within the industry.



Each plot was equipped with a lysimeter assembly consisting of five metal cylinders with metal drainpipes on the bottom.

Two fertilizer treatments were established for the plots. The green plots were fertilized at a rate of 1 lb N/1000 sq ft per month, and the fairway plots at a rate of 0.5 lb N/1000 sq ft per month. The two fertilizer sources were urea and sulfur-coated urea (SCU). The SCU applied to the green plots was in the form of miniprills to minimize losses during mowing operations. Fertilizer was hand-applied twice per month to each plot individually to ensure even distribution of the fertilizer.

Trimec® Bentgrass Formulation (pbi/Gordon Corporation, Kansas City, MO) was applied to all plots in May and August, 1993. This formulation contains 0.45 lb 2,4-D per gallon in the form of a dimethylamine salt. The herbicide was applied at a rate of 1.8 oz and 3.2 oz per 1000 sq ft for the green and fairway plots, respectively. Sevin® brand

XLR plus (Rhone-Poulenc Ag Company) insecticide was applied to the plots in August, 1993, at a rate of 6.1 oz and 10.7 oz per 1000 sq ft for the green and fairway plots, respectively. This formulation of carbaryl contains 4 lb active ingredient per gallon.

Sample Collection

Samples of drainage water were collected from each of the 36 plots on a weekly basis. The samples were analyzed to determine the concentration of nitrate, phosphate, carbaryl, and 2,4-D present. Drain volumes were measured and recorded several times per week, allowing a calculation of the mass of nutrients and pesticides leaching from the plots.

The volatilization of 2,4-D and carbaryl was measured during an experiment conducted in August, 1993. Immediately after pesticide application, a volatilization flux chamber was placed directly on the turf in each of the designated plots. The air above the surface of the turfgrass was pulled out of the chamber at a very low rate (approximately 10 liters/minute). As it was removed, the air was passed through a polyurethane foam plug (PUF) that adsorbed any pesticides present in the air. Air from outside the chamber was drawn into the chamber to replace the air that was removed. Any pesticides in the outside air were removed as the air was drawn into the chamber. The PUFs were replaced every four hours. The position of the flux chamber was rotated between two marked spots on the plots to minimize damage to the turfgrass. The volatilization experiment was conducted for 7 days.

RESULTS AND DISCUSSION

Leaching Studies

The mass of nitrate-N that leached through the turf was calculated by multiplying the volume of water that drained through the lysimeters in a given plot each week by the concentration of nitrate-N in the leachate that week. Between April 1992 and December 1993, 47.85 g of nitrogen was applied to the 13.2 sq ft surface area of each fairway lysimeter. Of that amount, between 0.30% and 1.71% (less than 1 g) was not used by the turfgrass and leached through the plots. These results are summarized in Table 1. An analysis of variance showed that there was no significant difference in the percent of nitrate-N leached through the plots caused by the different treatments (i.e., soil type, fertilizer type, or irrigation amount).

In the putting green plots, between 0.56% and 1.69% of the applied nitrogen leached through the turfgrass. Once again, none of the treatments caused any significant differences in the observed mass of nitrate-N that leached through the plots.

The mass of 2,4-D that leached through the plots varied considerably, from approximately 0.055% on the sandy loam plots receiving 100% ETc to approximately 5% on the green sand plots receiving 100% ETc (Table 1). An analysis of variance using all the plots confirmed that the soil type significantly affected the mass of 2,4-D that leached through the soil. This result is not unexpected, as pesticides can be adsorbed to the clay fraction of soil. The pesticide 2,4-D has an adsorption coefficient of approximately 20 cm^3/g. This compound would not be expected to adsorb to a great extent to the soil, although it will adsorb if clay is present. The sandy loam soil contains 12.9% clay; thus, adsorption would be expected to be greater in this soil than the other soils, which have clay contents of less than 2%. When only the fairway plots were considered, soil type did not significantly affect leaching, reflecting the small differences in clay content between the two fairway soils.

The mass of carbaryl that leached through the plots was very low, ranging from 0.0015% to 0.07%. When all plots were considered, the soil type was significantly correlated with the mass leached, similar to the situations with 2,4-D. However, when only the fairway plots were considered, soil type was not significantly correlated with the mass of carbaryl leached.

Volatilization Studies

Volatilization of 2,4-D into the air above the turfgrass was measured during an experiment performed in August, 1993. The mass of 2,4-D that volatilized from the plots is shown in Table 1. The percent volatilized ranged from less than 0.5% to approximately 1%. An analysis of variance indicated that there was a significant difference in the percent that volatilized between the green, fairway, and control plots. The difference between the green and fairway plots was also significant, suggesting that the differences may be due to the turfgrass species or to the difference in cutting height.

The mass of carbaryl that volatilized from the plots was very small: between 0.021% and 0.047% of the amount applied. No significant differences in the percent of carbaryl volatilized resulted from the different treatments.

Turfgrass Quality

The turfgrass was rated approximately every two weeks to enable us to assess any effects of the different treatments on the quality of the turfgrass. No significant differences were found for any of the plots as a result of the different irrigation or fertilizer treatments. However, there was a significant difference in the quality of the turfgrass on the sandy loam plots compared to the loamy sand plots. The scores for the loam plots averaged approximately one rank higher than the loamy sand plots during the same week.

CONCLUSIONS

The overall conclusion that can be made on the basis of the experiments performed at the University of California, Riverside, is that, in general, there is very little potential for groundwater or air contamination from turfgrass chemicals under our conditions. The only exception noted was for the leaching of 2,4-D in the putting green plots where the soil was too sandy to prevent the movement of a portion of the chemical below the rootzone. Specific conclusions from this research are:

1. Under the conditions of this study (i.e., biweekly applications of urea and sulfur-coated urea), little leaching of nitrate-nitrogen (generally less than 1% of the amount applied) was measured. No significant differences in percent leached as a result of irrigation amount or fertilizer type was documented.

2. Leaching of 2,4-D was very low in soils that contained some clay to adsorb the pesticide; however, up to 7.5% leaching was measured in sand. Irrigation amount did not significantly affect the amount of leaching.

3. Less than 0.1% of the carbaryl leached, regardless of soil type. Irrigation amount did not significantly affect the amount of leaching.

4. Little volatilization of 2,4-D was measured (≤ 1%) from any of the plots, although the difference in the amount volatilized was significantly different between the two turfgrass species used.

5. Little volatilization of carbaryl was measured (≤ 0.05%) from any of the plots; no significant differences between the treatments occurred.

6. Neither fertilizer type nor irrigation amount caused any significant differences in the quality of the turfgrass as determined by biweekly turfgrass ratings.

These results cannot necessarily be extrapolated to all golf course situations, however. For example, some modifications in the fertilizer application program had to be made for the purposes of this study. The SCU was applied on a biweekly basis to make it on the same schedule as the urea, which would not be the case on a golf course. Thus, the amount applied at any one time was relatively small compared to what might be applied on a golf course. This could have had an impact on the amount of leaching measured. We are planning to conduct further studies that follow a more typical golf course fertilization program to try to answer this question.

Dr. Stan Brauen using a moisture probe on the treated plots to monitor the study.

Leaching of Nitrate from Sand Putting Greens

by DR. STANTON E. BRAUEN
and DR. GWEN K. STAHNKE
Washington State University,
Puyallup Research and Extension Center

GOLF IS PLAYED year round in the coastal Pacific Northwest. Summers are dry and often cool, yet the long, mild, wet winters may cleanse nutrients from sand profiles of putting greens and flush them into drainage systems. These conditions suggest to the public that golf course management practices are a potential threat to environmental quality because of the use of pesticides and nitrogen to maintain play, appearance, and turfgrass quality. If true, the result could be groundwater contamination. To complicate matters, golf course putting greens, tees, and other athletic turf areas in the coastal Pacific Northwest are often constructed of sand, some with coarse particle sizes and without amendments in order to reduce construction costs and improve drainage during the wet seasons.

The Problem

Among the questions we wanted to answer is whether nitrate nitrogen applied to putting green profiles constructed of sand or peat/soil-amended sand could potentially leach or move into streams, lakes, or groundwater. If it does move, what is the critical time of year when the leaching would occur, and what daily management practices would reduce the threat of further contamination? Would modified rooting mediums, efficient nitrogen fertilizer practices, minimal fertilization rates, deeper sand profiles, or efficient irrigation practices eliminate the threat while maintaining adequate turf for the playing of the game of golf? The development of this information would serve as the basis in providing guidance for its correction, reduction, or elimination. The objectives of the study were to quantify the effect of rooting medium, fertilization interval, and annual nitrogen rate on nitrate nitrogen leached from creeping bentgrass putting greens. It was thought that lighter, more frequent applications of fertilizers from slow-release sources might be helpful at mitigating potential leaching losses.

How the Studies Were Conducted

The study was carried out in 36 small lysimeters constructed in a manner similar to USGA putting greens. A lysimeter is simply a term used to describe a system that gives turf scientists the ability to closely measure the inputs and outputs of a system. In this case, the emphasis was on nitrate nitrogen leached.

The turfgrass lysimeters were located 30 miles south of Seattle, Washington, at Washington State University Research and Extension Center, in Puyallup, Washington. Each lysimeter was 32 sq ft, lined with chlorosulfonated polyethylene reinforced liner and fitted with 2" ABS drain tube so leachates that moved through the 12" rooting medium, the 3" intermediate layer, and 3" pea-sized gravel layer could be collected daily. The rooting medium consisted of pure sand (CEC 2.6 meq per 100 g, pH 6.8) or a mixture of 88% sand, 10% sphagnum peat, and 2% screened Sultan silt loam. Particle size analysis of the sand was 4.2% between 1.0 and 4.7 mm, 85.1% between 0.25 and 1.0 mm, 8.5% between 0.13 and 0.25 mm, and 2.2% < 0.13 mm. The effects of rooting medium, annual nitrogen rate, and nitrogen application interval on leached nitrate nitrogen were monitored for two years.

The nitrogen fertilizer rates were 4, 8, and 12 lb N per 1000 sq ft per year. The nitrogen was supplied in granular form as greens-grade blends of ammonium sulfate, ammonium phosphate, isobutylidene diurea (IBDU), sulfur-coated urea (SCU), and methylene urea (MU). The ammonium sulfate and ammonium phosphate quantities were equal for all nitrogen rates, and all of the increase in nitrogen rate from 4 to 12 lb was supplied as IBDU, SCU, and MU (see Table 1). Phosphorus was supplied from ammonium phosphate, and potassium was supplied from potassium sulfate. Fertilizer applications were made every 14 or 28 days in 22 or 11 applications per year. Fertilizers were applied from February through December.

After construction of the lysimeters during the summer of 1991, the area was seeded on October 3. The first rainfall occurred on October 24, 1991, and leachates were collected in plastic 5.5-gallon buckets beginning on October 25. Leachate volumes were measured daily and subsamples were collected daily, when available, for the next two years.

Table 1
Quantity of Soluble and Slow-Release N Applied at Each Fertilizer Application Interval

Nitrogen Rate	Annual Rate (lb N/1000 sq ft) 4	8	12
	11 Monthly Applications (lb N/1000 sq ft)		
Ammonium phosphate	0.04	0.04	0.04
Ammonium sulfate	0.20	0.20	0.20
Urea	0.02	0.07	0.13
Slow release[1]	0.10	0.41	0.72
Total Application[2]	0.30	0.72	1.09
	22 "Two Week" Applications (lb N/1000 sq ft)		
Ammonium phosphate	0.02	0.02	0.02
Ammonium sulfate	0.10	0.10	0.10
Urea	0.01	0.04	0.07
Slow release[1]	0.05	0.20	0.36
Total Application[2]	0.18	0.36	0.55

[1]Slow-release nitrogen sources consisted of methylene urea, sulfur-coated urea and IBDU supplied in quantities to provide equal parts nitrogen from each source. Potassium was supplied from potassium sulfate as a part of the mix.

[2]Pounds of nitrogen applied per 1000 sq ft per application.

When Nitrate Leached

During the first fall and spring following seeding and when the creeping bentgrass was very immature, nitrates did leach from the lysimeters. The concentration of nitrate nitrogen in the drainage water increased with annual nitrogen rate applied. Very little nitrate was leached at the 4 lbs per 1000 sq ft rate. Nitrate was present in drainage water until late December and declined to low levels in January and February.

The concentration of nitrate percolating from the lysimeters during the first fall, winter, and spring following construction and seeding was considerably different from the concentrations of nitrate leached during the second fall, winter, and spring after the turf had matured. These nitrate patterns are shown in Figure 1. The differences shown emphasize the changes that occur in the ability of turfgrass to trap nitrogen as the turf matures. Note the large differences in nitrate concentrations from November to June of 1991-92 when lysimeters were fertilized with the 12 lbs N per 1000 sq ft per year rate versus the lower rate of 8 lbs N per 1000 sq ft in 1992-93.

During the first fall, when the turf was young, there were few grass roots and no thatch, and there was no organic matter in the pure sand rooting medium. This resulted in free movement of nitrates through the rooting medium and into the drainage water. Pure sand rooting systems are very susceptible to nitrate leaching immediately after construction. Everyone would have expected this to be the case. As a consequence, nitrates in relatively high concentrations were lost at the highest rate of nitrogen application even though the nitrogen sources were primarily ammonium sources. Little nitrate was leached at the lowest application rate.

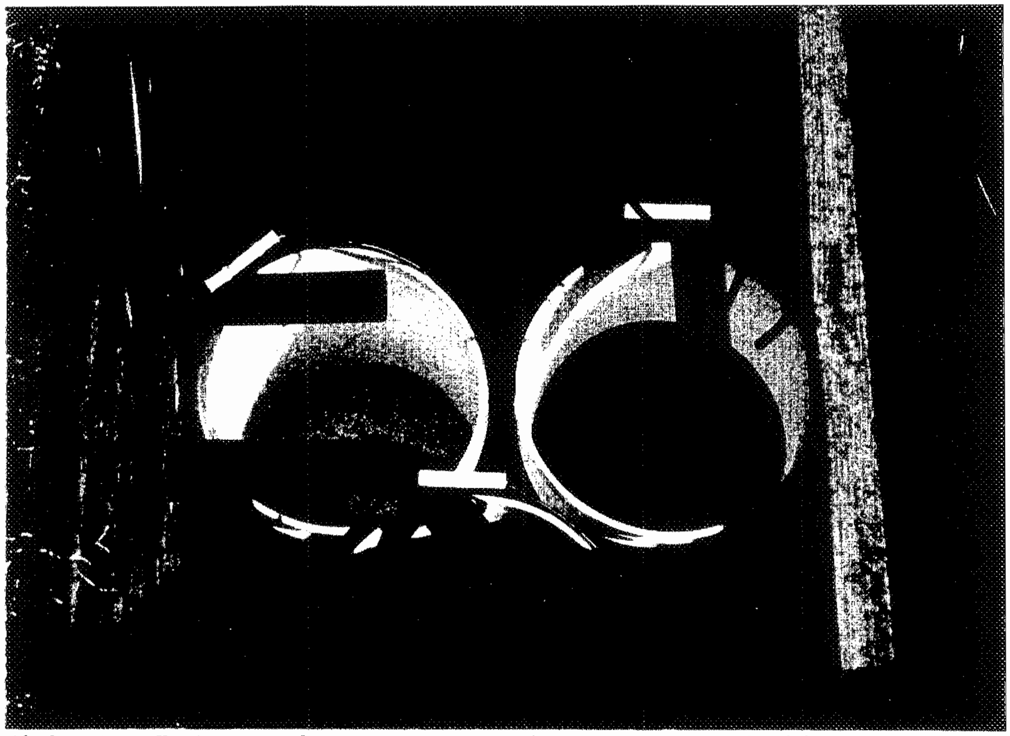
The frequency of nitrogen application (14 or 28 days) and the makeup of the rooting medium (pure sand versus organic matter modified sand) were big factors in controlling the quantity of nitrate leached during the first fall and winter when the turf was young. The average monthly nitrate-N concentration of leachate from the pure sand rooting medium was significantly greater than the leachate concentration from the modified sand rooting medium during November 1991 to June 1992.

By the second fall, the turf had become well established. Roots were well defined and a surface thatch had developed. The rooting medium and the frequency of fertilizer application were less important in reducing nitrate movement. Then, the quantity of nitrogen applied was the main factor responsible for nitrate movement into the drainage water.

For the most part, nitrates leached only from lysimeters that were fertilized with 12 lbs of nitrogen per 1000 sq ft per year during the second year. Rooting medium had little effect in regulating the concentration of leachable nitrate. Frequency of nitrogen application seemed to have some effect on reducing nitrate leaching during the late fall and early winter period. Nitrates could be detected during periods when excessive rainfall was experienced following the heaviest nitrogen applications. Periods when this occurred were when nitrogen applications above 0.4 lb N per 1000 sq ft were applied followed by periods of slow precipitation over the next seven to 10 days and after the rooting medium temperature had declined 33° to 40°F. Under these conditions, halving the rate of nitrogen application and applying on a more frequent interval reduced nitrate movement. As long as the 2" temperature of the rooting medium remained in the above range, plant uptake appeared to be great enough to prevent nitrate accumulation in the leachates. November nitrogen fertilization at moderate rates did not result in leaching of nitrate-N.

The highest concentration of nitrates in leachates occurred in early to mid-spring growth periods. The rainfall pattern was significantly different during the winter and early spring of 1993 as compared to 1992. Precipitation occurred early in January in 1992, resulting in very low levels of nitrate concentration in leachates during January and February. Precipitation was considerably lower in March and early April in 1992 as compared to 1993, which may have resulted in a lower volume of leachates and higher concentration of nitrate-N in 1992. The differences in nitrate concentrations between these two years also may reflect the differences in the maturity of the rooting mediums and the accumulation of organic matter in the rooting medium. Organic matter in the rooting medium had increased to nearly 2% in the pure sand root zone by the end of the second year and approached 2.5% in the modified rooting medium. No nitrates were found in any treatment combination during the summer through mid-fall of either year. This would imply that the risk of leaching nitrates in summer due to unexpected heavy rain or over-irrigation is very low when turfs are fertilized on frequent intervals and the total rate of application does not exceed the moderate rates used in these studies.

The quantity of nitrate that leached through the greens is a function of the nitrate concentration in the drainage water and the volume of drainage water produced. The product of these two values showed that, in the first year, two periods of the year were most sensitive to nitrate leaching. These were in November, four to eight weeks after seeding, and in April and May when soil temperatures fluctuated between 45°F and 55°F. Even though the greens were actively growing during this period of the spring, the root systems still lacked sufficient maturity to be highly efficient in nitrate uptake.



The leaching collection system from the lysimeters provides turfgrass scientists the ability to closely monitor the inputs and outputs from the system. The project at Washington State University studied amended versus non-amended sands with varying N fertilization rates.

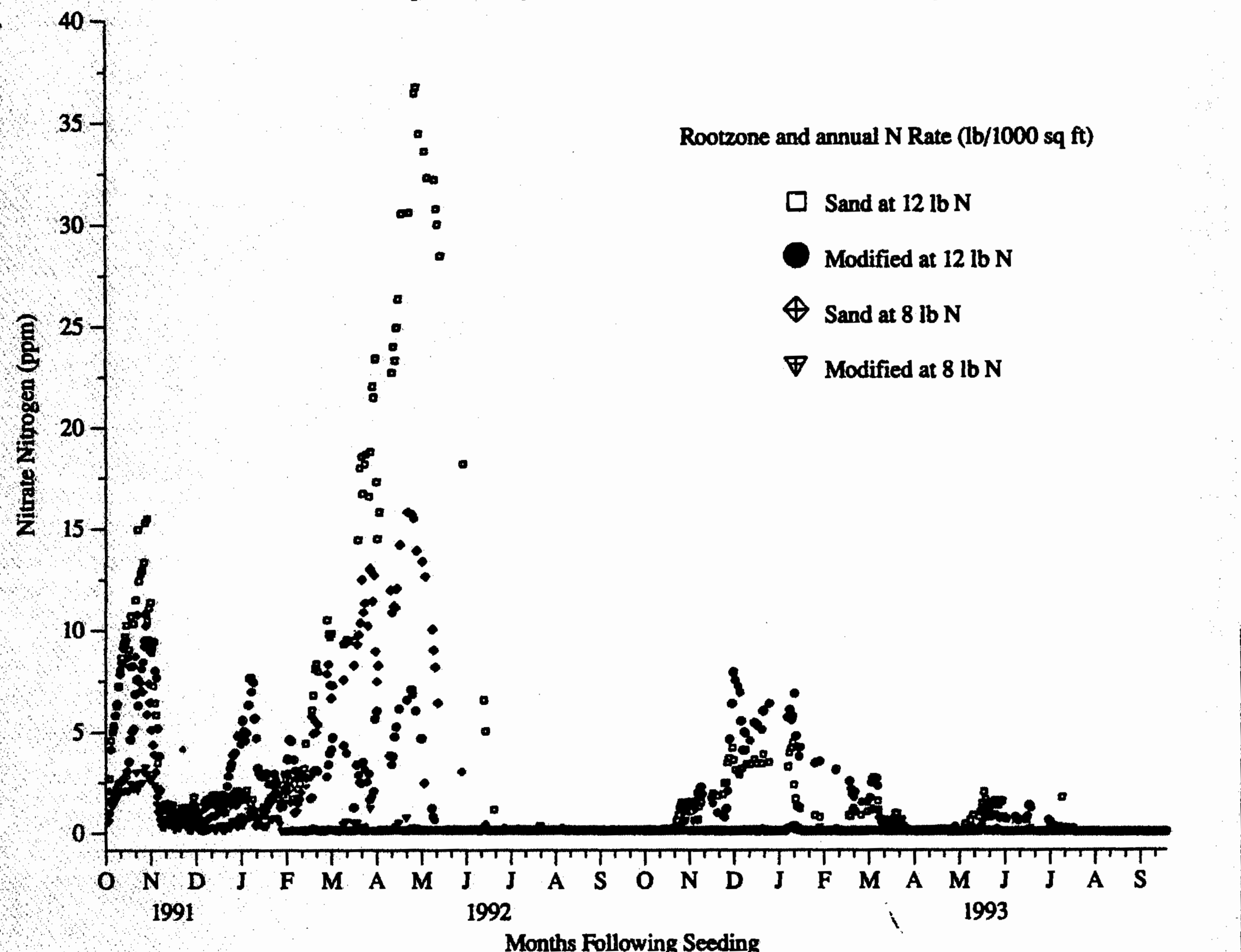
Table 2
Percent of Total Applied Nitrogen Leached as Nitrate

Rooting Medium	Annual N lb/1000 sq ft	Year 1 Percent	Year 2 Percent	Year 3 Percent
Sand	4	5.37	0.06	2.71
	8	6.31	0.04	3.17
	12	7.55	0.70	4.28
Modified (sand/peat)	4	0.33	0.40	0.16
	8	0.91	0.02	0.17
	12	3.37	1.26	2.31

As little as 0.33% and as much as 7.55% of the applied nitrogen was leached as nitrate in the first year. The highest percent nitrate lost was from the 12 lb N per 1000 sq ft per year rate. In the second year, 1.26% was the highest quantity leached. Essentially no nitrate was leached from the 4 or 8 lb rates in the second year in either the pure sand or the modified sand greens (see Table 2). It should be noted that 4 lbs of nitrogen per 1000 sq ft per year was insufficient to support bentgrass or annual bluegrass growth in putting greens under play in the Northwest. But 0.36 lb N per 1000 sq ft (8 lbs N per 1000 sq ft per year rate) applied at two-week intervals was more favorable. At this fertilization rate each 14 days, 2.7 lbs nitrate per acre or 2.1% of the nitrogen applied was leached in the first year. In the second year, only 0.03% of the nitrogen applied was leached.

In summary, experimental putting greens that were constructed close to USGA specifications were monitored for concentration of nitrate in leachates from October 1991 to October 1993. During the first year, the concentration of nitrate nitrogen leached from their profiles was related to application rate and was strongly modified by the rooting medium and frequency of nitrogen application made to the immature turf. In this same time period, the concentration of nitrate leached from the pure sand rooting medium was much greater than the nitrate leached from the sand rooting medium modified with peat moss. Modified sand greatly reduced the

Figure 1
Daily Nitrate-N in Leachates from Sand and Modified Sand Rootzone Putting Green Lysimeters Fertilized with 8 lb and 12 lb N/1000 sq ft Annually. Values Summarized Over 14- and 28-Day Fertilization Intervals.

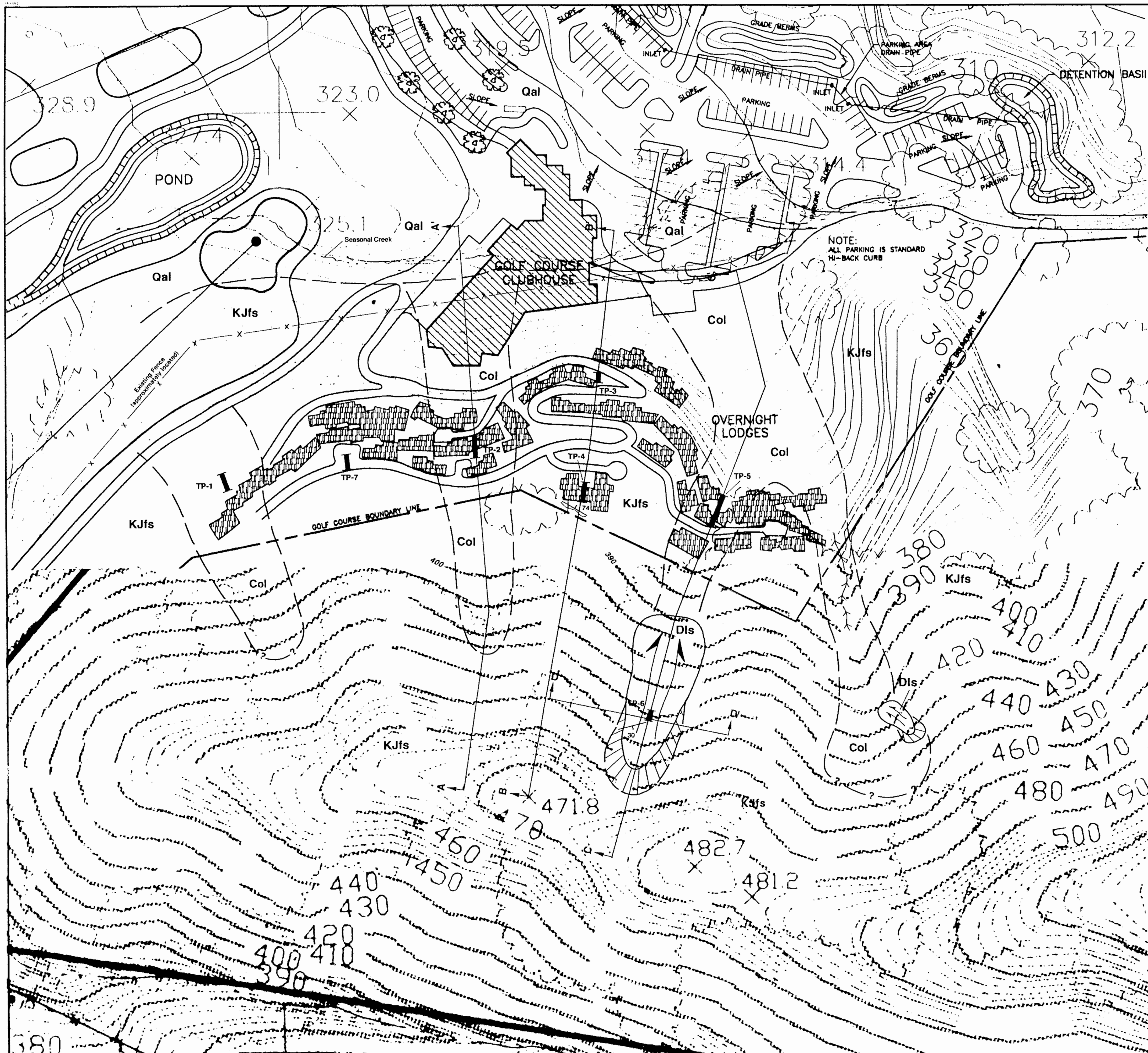


total quantity of nitrogen that was lost as compared to pure sand. The frequency of nitrogen application to young turf during the first year significantly affected the level of nitrate-N lost. Although the impact of this factor was much less than either nitrogen rate or rooting medium effects, it did consistently influence nitrate-N concentration in the leachate. The use of modified sand rooting medium, moderate levels of total annual N application and frequent nitrogen applications combined to reduce nitrogen lost in leachates to 2.7 to 3.6 lbs per acre and the percentage of applied nitrogen lost in leachates to as low as 3% to 5%.

In the second year, nitrate-N concentration in the leachates was greatly reduced compared to year one. A significant part of this major change was attributed to more extensive rooting, increase in thatch and increase in organic matter in the rooting medium. The leachate nitrate concentration was rate-related again, but the extent of nitrate leached was not strongly modified by the rooting medium or by how often the turf was fertilized. The nitrate concentration found in leachate from pure sand profiles was similar to that found from modified sand profiles most of the year. In addition, the reduced nitrate concentration in leachates was attributed to a greater quantity of precipitation (2.2") during early spring in 1993, as compared to 1992, resulting in dilution of leachate nitrate concentration. Nearly zero concentration of nitrates was observed in leachates in summer or early winter.

Conclusions

When putting greens were immature and fertilized with a moderate nitrogen rate, the most important factor in limiting nitrate leaching was to modify the rooting medium during construction with organic matter, in this case peat. Applying the fertilizer on 14-day intervals vs. 28 days also was important, particularly during the periods when leaching pressure was high. Managing young greens in this manner essentially eliminated nitrate movement into the drainage system. As putting greens matured and thatch and organic matter levels developed in the pure sand system, nitrogen fertilization rate was the major factor affecting nitrate leaching. Rates of 8 lbs or less nitrogen per 1000 sq ft per year resulted in little or no nitrate leaching. Applying nitrogen fertilizers with at least 70% of the nitrogen source in slow-release form on a frequent interval such as every 14 days provided excellent protection from nitrate leaching. At this point in our study, we conclude that nitrate concentration in drainage water from putting greens can be effectively limited by using appropriate nitrogen application rates, frequent and light nitrogen applications, and a modified sand rooting medium during early establishment.



EXPLANATION

EARTH MATERIALS

Qal ALLUVIUM - Unconsolidated gravel, sand, silt and clay; primarily coarse-grained sediments deposited in an alluvial plain environment.

Col COLLUVIUM - Unconsolidated clay, silt, sand and rock fragments, primarily fine-grained sediments deposited in hillside terrain between and along lower flanks of ridges. Mapped where estimated to be thicker than about 5 feet.

Dls DORMANT LANDSLIDE - Colluvium that has moved as a slide or flow sometime within recent decades; presumed potentially unstable.

KJfs FRANCISCAN COMPLEX SANDSTONE AND SHALE - Sandstone is generally fine-grained to medium-grained, hard, cemented, thick-bedded, slightly to moderately weathered, moderately fractured, in many places slightly metamorphosed, veined and "vuggy". Shale is generally dark colored, pervasively sheared, medium hard, moderately weathered.

MAP SYMBOLS

? Contact between earth materials, dashed where approximate queried where uncertain

30 Orientation of bedrock stratification

74 Orientation of bedrock shear foliation

Landslide mass and headscarp, arrows show direction of movement

Drainage course incised by erosion; mapped where channel erosion is deeper than about 3 feet

Seasonally flowing creek

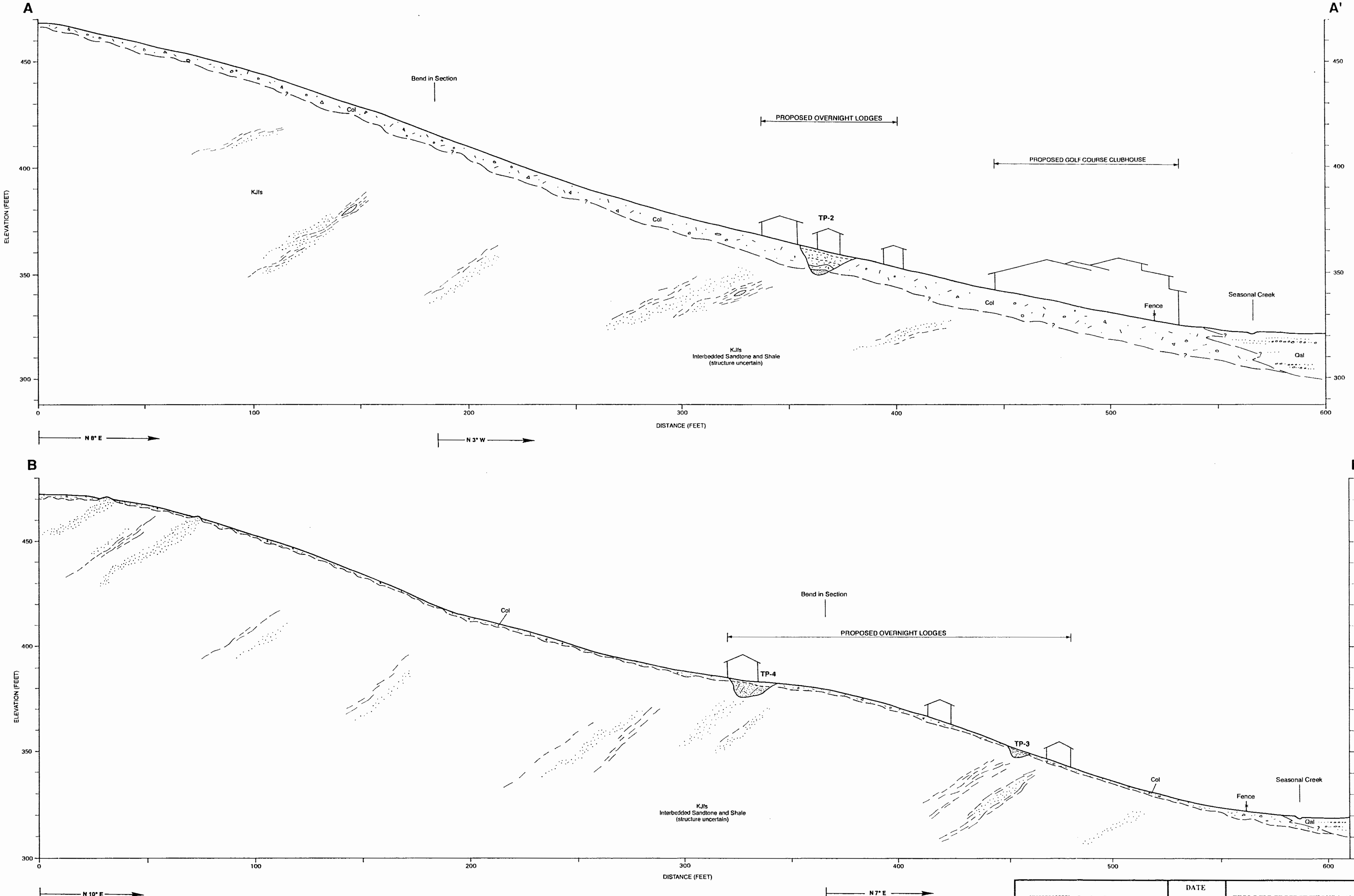
TP-7 Exploratory backhoe test pit

D D' Location of geologic cross section

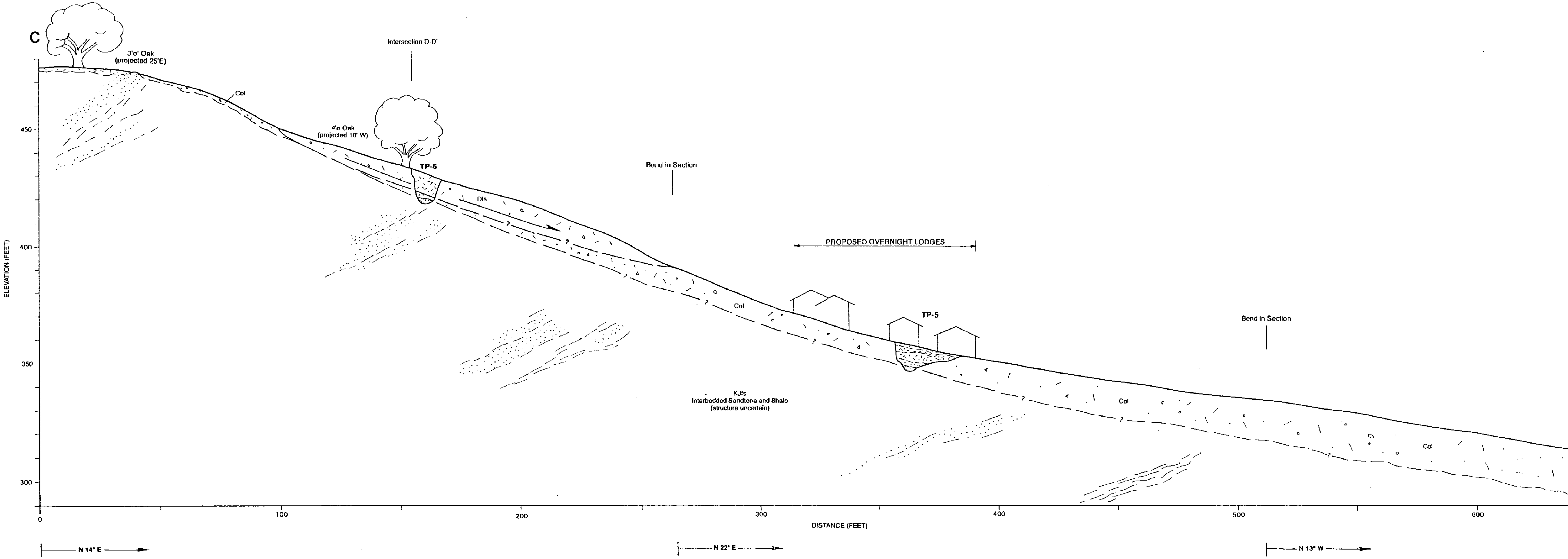
N

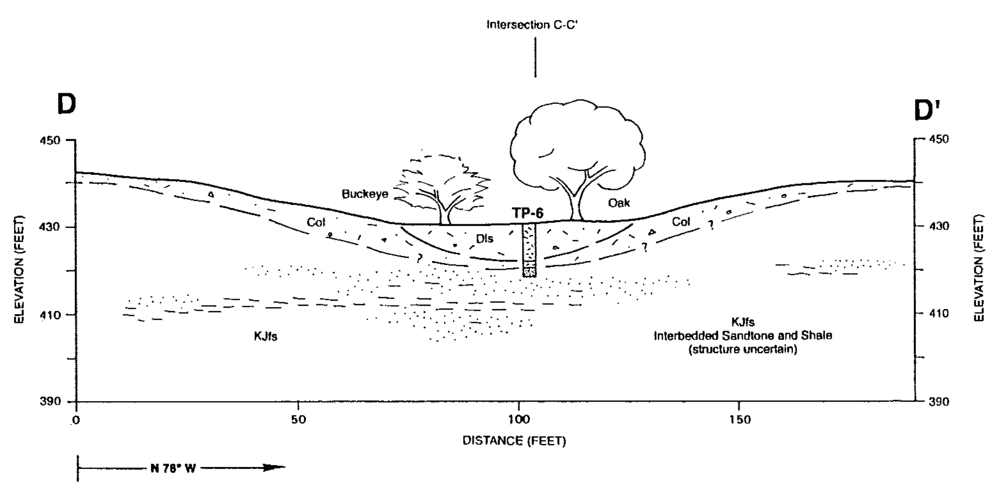
BASE MAP: Portion of topographic map by Aero Geodetics, 1993, enlarged from 1"=200'; joined with portion of "Clubhouse and Parking Site Plan" by Forsgren Associates, undated (inferred to be 1995), 1"=50'.

PACIFIC GEOTECHNICAL ENGINEERING	DATE: DEC. 1995	SITE GEOLOGIC MAP	FIGURE: 3
	SCALE: 1" = 50'	CLUBHOUSE AND OVERNIGHT LODGES THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	PROJECT: 1385/5G



PACIFIC GEOTECHNICAL ENGINEERING	DATE DEC. 1995	GEOLOGIC CROSS SECTIONS A-A' and B-B'	FIGURE 4
	SCALE 1" = 20'	CLUBHOUSE AND OVERNIGHT LODGES THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	PROJECT 1385/5G





PACIFIC GEOTECHNICAL ENGINEERING	DATE DEC. 1995	GEOLOGIC CROSS SECTIONS C-C' AND D-D'	FIGURE 5
	SCALE 1" = 20'	CLUBHOUSE AND OVERNIGHT LODGES THE LION'S GATE RESERVE SAN MARTIN, CALIFORNIA	PROJECT 1385/5G

DRAFT

ENVIRONMENTAL IMPACT REPORT

LION'S GATE RESERVE

Lead Agency: County of Santa Clara

File #4039-67-28-93
SCH #94043016

March 1996

VOLUME I: EIR TEXT

PREFACE

Introduction

This document has been prepared by the County of Santa Clara as the Lead Agency in conformance with the California Environmental Quality Act (CEQA), to inform public decision makers and the public of the environmental effects of projects and plans that they propose to approve or carry out.

In accordance with CEQA, the EIR provides objective information regarding the environmental consequences of the proposed project to the decision makers for the review of a project. The following guidelines are included in CEQA to clarify the role of an EIR:

> § 15121(a). **Informational Document.** An EIR is an informational document which will inform public agency decision makers and the public of the significant environmental effects of a project, identify possible ways to minimize the significant effects, and describe reasonable alternatives to the project. The public agency shall consider the information in the EIR, along with other information which may be presented to the agency.
>
> § 15151. **Standards for Adequacy of an EIR.** An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently considers environmental consequences. An evaluation of the environmental effects of the proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection, but for adequacy, completeness, and a good-faith effort at full disclosure.

Previous Development Proposal

A golf course and residential project was originally proposed by Hix-Rubenstein Companies for the Hayes Valley site in 1989. At that time a much larger project was proposed, consisting of over 800 residential units and a championship golf course. That proposal included a 4.3 MGD wastewater treatment plant, to be built on the Hayes Valley site. This treatment facility was intended to serve the wastewater treatment and disposal needs of the project, as well as the City of Morgan Hill, to which the project was originally proposed to be annexed. In 1990, the Morgan Hill City Council voted not to participate in the wastewater treatment facility, and subsequently the development application filed with the County was withdrawn.

Total - 1,676
O.S. - 1,265
G.C. - 263
r. - 148

SUMMARY

A. PROJECT DESCRIPTION

The Lion's Gate site consists of a 1,676-acre site located west of the unincorporated community of San Martin in south Santa Clara County, approximately one mile south of Morgan Hill.

The proposed project consists of the following: 18-hole public access golf course with a clubhouse, a swim and tennis center, and 45 units of overnight accommodations; 41 lots for single-family dwellings; an equestrian center; and 1,265 acres to be maintained as permanent open space.

The discretionary approvals required for the project include: a General Plan Amendment to redesignate approximately 270 acres from "Agriculture-Medium Scale" to "Hillsides," along with the corresponding rezoning for this area; a Conditional Use Permit for the golf course and related facilities; two cluster subdivision approvals, one for 6 lots on a 32-acre Rural Residential parcel, and a second for a 35 lot Hillside cluster subdivision, and 1,265-acre permanent open space area.

B. SUMMARY OF IMPACTS AND MITIGATIONS

IMPACT	MITIGATION
A. LAND USE	
1. The project would result in a substantial alteration of the land use of the site. **(Less-than-Significant Impact)**	1. No mitigation required.
B. AGRICULTURE	
1. The development of the site would result in the loss of approximately 180 acres of Class II soils, including approximately 110 acres designated as "Prime Farmland" or "Farmland of Statewide Importance." **(Potential Significant Impact)**	1. The loss of approximately 110 acres of prime farmland would be offset by the planting of vineyards in areas not proposed for development, and by the fact that the site is not economically viable for cultivation. **(Less-than-Significant Impact with Mitigation)**
2. The residential lots proposed at the eastern end of the site would potentially create land use conflicts with nearby agricultural operations. **(Potential Significant Impact)**	2. The creation of buffer zones along the eastern edge of the site would minimize the interface conflicts with existing farming operations. **(Less-than-Significant Impact with Mitigation)**

IMPACT	MITIGATION

C. PARKS, RECREATION AND OPEN SPACE

1. The conversion of portions of the site to golf course and residential uses would represent a substantial loss of semi-natural open space.
(Potential Significant Impact)

1a. The project would provide approximately 263 acres of managed recreational open space in the form of a golf course. The golf course would provide an added recreational opportunity in the County.

b. The remaining 1,265 acres of natural and semi-natural area of the site would be preserved as permanent open space as a condition of the cluster development permit.

c. A trail easement for the 2 to 3 mile segment of the proposed San Martin Cross-Valley Trail would be dedicated in conjunction with the project. Segments of two additional trails along the project frontages on Coolidge Avenue and Watsonville Road would be dedicated and improved in conjunction with required roadway dedications and improvements.
(Less-than-Significant Impact with Mitigation)

cluster permit

Trail Dedications

D. GEOLOGY AND SOILS

1. Potential secondary ground rupture or sympathetic movement along inactive faults crossing the site may result in minor damage to structures, roadways and utility lines located directly over such features.
(Potential Significant Impact)

1a. Where proposed structures for human occupancy are determined to be underlain by an inactive fault trace, appropriate setback distances for those structures may be required.

b. Potential for rupture of water, wastewater or utility lines would be reduced by measures such as the use of pipes with flexible or telescoping couplings, double pipe and other measures.
(Less-than-Significant Impact with Mitigation)

2. Strong ground shaking during an earthquake may damage buildings, bridges and other structures.
(Potential Significant Impact)

2. Structural damage to buildings would be largely prevented by following the Uniform Building Code, as required. Bridges and other structures would be designed in accordance with seismic design loads, as determined by the project geologist.
(Less-than-Significant Impact with Mitigation)

IMPACT	MITIGATION

D. GEOLOGY AND SOILS (CONT'D)

IMPACT	MITIGATION
3. Seismic shaking could induce ground failure resulting from liquefaction, potentially causing damage to buildings and other structures. **(Potential Significant Impact)**	3. If liquefiable material is found at building sites, mitigation would involve subexcavation of the liquefiable material and replacement with engineered fill, or alternative measures as recommended by the project geologic engineer. **(Less-than-Significant Impact with Mitigation)**
4. Seismic ground shaking could induce lateral spreading, potentially causing damage to buildings and other structures. **(Potential Significant Impact)**	4. The risk of damage from lateral spreading would be minimized by setting planned structures back a safe distance from stream banks, in accordance with the recommendations of the project geologist and geotechnical engineer. **(Less-than-Significant Impact with Mitigation)**
5. The presence of unstable slopes and landslide deposits on the project site may pose a hazard to some proposed structures, and may be affected by project grading, construction, and spray irrigation of treated effluent. **(Potential Significant Impact)**	5. Potential damage from landslides would be avoided by setting structures back from known landslide deposits, by repairing landslides, or by implementing other slope stabilization measures. **(Less-than-Significant Impact with Mitigation)**
6. Potential debris flows originating in the hillside areas of the site could cause damage to proposed structures and the golf course. **(Potential Significant Impact)**	6. Where a potential for debris flow is present, the hazard would be mitigated by removing accumulations of soil from the potential source areas, or by constructing debris deflection, channeling and containment facilities at the mouths of the potentially affected ravines. **(Less-than-Significant Impact with Mitigation)**
7. Expansive soils present on the site may cause movement or heaving, potentially resulting in damage to foundations, concrete slabs and pavements. **(Potential Significant Impact)**	7. Potential damage to foundations and pavements would be avoided or mitigated by following the requirements of the Uniform Building Code, and may necessitate removal of the expansive soils from areas where buildings, slabs-on-grade or pavements are planned to be constructed. **(Less-than-Significant Impact with Mitigation)**
8. Areas with potential soil creep may cause damage to foundations, concrete pads and pavements. **(Potential Significant Impact)**	8. Protection from potential surface sliding and soil creep would be provided by preventing surface water from draining onto potentially unstable slopes, through subsurface drainage control, and by providing for resistance to higher lateral pressures in the design of footings and walls. **(Less-than-Significant Impact with Mitigation)**

IMPACT	MITIGATION

D. GEOLOGY AND SOILS (CONT'D)

IMPACT	MITIGATION
9. Project grading and vegetation removal may result in erosion and sedimentation of downstream waterbodies. **(Potential Significant Impact)**	9. Erosion control practices would be implemented during grading and construction. (See text in Section *III. F. Water Quality* for details.) **(Less-than-Significant Impact with Mitigation)**
10. Shallow groundwater conditions in areas of the site may adversely affect below-ground structures and utilities. **(Potential Significant Impact)**	10. Groundwater problems would be minimized by avoiding construction during or just after the rainy season, and through implementation of grading and drainage measures to improve surface and subsurface drainage. **(Less-than-Significant Impact with Mitigation)**
11. Any unplanned grading or construction activity that encroaches upon the on-site serpentine hillsides could result in the release of airborne particulates of naturally-occurring chrysotile asbestos previously bound in the rock, potentially causing a public health hazard in the form of inhalation. **(Potential Significant Impact)**	11. The disturbance of the serpentine bedrock area, would be avoided by ensuring that no development or grading is planned for this area. In addition, the edge of this area would be flagged, fenced or roped-off to prevent inadvertent encroachment by construction equipment. **(Less-than-Significant Impact with Mitigation)**

E. HYDROLOGY AND DRAINAGE

IMPACT	MITIGATION
1. The project would potentially result in increased downstream flooding during the 100-year and 10-year storms. **(Potential Significant Impact)**	1. The on-site lake proposed for the southern residential cluster subdivision would be designed to provide sufficient detention storage for increased peak runoff resulting from site development. With this pond, the peak flow rates leaving the project site during the 100-year and the 10-year storms would be lower than under existing conditions. **(Less-than-Significant Impact with Mitigation)**
2. Portions of the residential cluster subdivisions would be subject to shallow flooding (one-foot average depth) during a 100-year event, and the proposed structures could also partially obstruct this sheet flow through the site. **(Potential Significant Impact)**	2. Potential impacts to the residential subdivisions from shallow flooding would be mitigated by constructing building pads on fills raised above flood elevations. The partial obstruction of shallow overland sheet flows by the proposed development would be mitigated by balancing fills with cuts within the flood-prone areas. **(Less-than-Significant Impact with Mitigation)**

F. WATER QUALITY

IMPACT	MITIGATION
1. During grading and construction, erosion from exposed slopes, and pollutants from equipment may result in water quality impacts to downstream water bodies. **(Potential Significant Impact)**	1. The final golf course grading plan would be required to conform to all drainage and erosion control standards adopted by Santa Clara County and would require approval by the County. A comprehensive erosion control program and Storm Water Pollution Prevention Plan (SWPPP) would be required to be implemented during grading and construction (see text for details). **(Less-than-Significant Impact with Mitigation)**
2. After project completion, concentrated runoff from paved surfaces may result in isolated areas of erosion. **(Potential Significant Impact)**	2. Stormwater would be collected and dispersed in a manner to prevent concentrated flows, or outfall areas would be protected with channel armoring to prevent erosion and scouring. **(Less-than-Significant Impact with Mitigation)**
3. The project would generate nonpoint urban pollutants which may be carried in stormwater runoff from paved surfaces to downstream waterbodies. **(Potential Significant Impact)**	3. The project would include stormwater controls at the parking lots and maintenance facility. **(Less-than-Significant Impact with Mitigation)**
4. The project may result in water quality impacts to groundwater due to the use of fertilizers and pesticides on the golf course. **(Potential Significant Impact)**	4. The project would follow irrigation and chemical management practices under which application of water, fertilizers and chemicals would precisely meet plant needs, thus minimizing potential for leaching into the groundwater table. Monitoring wells would be installed to sample for the presence of golf course chemicals, with corrective action taken if necessary. **(Less-than-Significant Impact with Mitigation)**
5. The project may result in water quality impacts to surface water from fertilizers and pesticides used on the golf course. **(Potential Significant Impact)**	5. The potential for surface water quality impacts from golf course chemicals would be mitigated by infiltration into turf and rough areas, the use of grass filter strips, maintenance of setbacks for streams, and strategic installation of subdrains and retention basins. Surface water quality would be sampled and tested periodically, with corrective action taken if necessary. **(Less-than-Significant Impact with Mitigation)**

IMPACT	MITIGATION

F. WATER QUALITY (CONT'D)

IMPACT	MITIGATION
6. The equestrian center could result in impacts to groundwater and surface water quality if manure or stall sweepings accumulate in stormwater runoff. **(Potential Significant Impact)**	6. The equestrian center would be operated in accordance with a manure management plan and an erosion control plan; and runoff from the facility would be directed to an on-site retention pond. **(Less-than-Significant Impact with Mitigation)**
7. The soils in the existing livestock corrals may contain accumulated nitrogenous compounds which could result in impacts to surface and groundwater quality. **(Potential Significant Impact)**	7. The potentially affected soils would be sampled for nitrogen content and incorporated into the grading of the golf course in a manner that makes maximum benefit of the fertilizer value of the soil. **Less-than-Significant Impact with Mitigation)**

[NOTE: The potential water quality impacts associated with wastewater disposal are discussed under *Q. Wastewater Treatment and Disposal*]

G. BIOLOGICAL RESOURCES

IMPACT	MITIGATION
1. The project would involve the removal of 246 acres of non-native grasslands, orchards, cropland and residential landscaping. **(Less-than-Significant Impact)**	1. No mitigation required. (Approximately 482 acres of grasslands would be included in the area to remain as permanent open space.)
2. Development of the two partially wooded lots (Lots 24 & 25) in the residential cluster subdivision in the southeastern portion of the site may result in the limited removal of valley oak woodland. **(Potential Significant Impact)**	2. The removal of valley oak woodland within Lots 24 & 25 would be avoided to the extent feasible by placing the building envelopes in areas with relatively little tree cover. Any valley oaks which cannot be avoided by the future residential construction would be replaced at a ratio of 5:1. **(Less-than-Significant Impact with Mitigation)**
3. The project would result in the loss of 1.7 acres of riparian vegetation or in the reduction of habitat quality in the riparian zone. **(Potential Significant Impact)**	3. Impacts to the riparian habitat would be avoided to the extent feasible. The unavoidable loss of riparian vegetation and the reduction of habitat value would be mitigated by the on-site replacement of lost habitat, and by measures to protect and enhance the remaining habitat. **(Less-than-Significant Impact with Mitigation)**

Oak tree replacement (cluster subdiv.)

G. BIOLOGICAL RESOURCES (CONT'D)

IMPACT	MITIGATION
4. The proposed golf course would result in the removal of up to 18 trees. **(Potential Significant Impact)** Landscape Plan	4a. Existing trees would be preserved to the greatest extent possible. b. A tree replacement program would be prepared to provide for replacement of native trees removed by the project. c. Detailed guidelines would be prepared by a certified arborist to minimize potential damage to trees to be preserved. **(Less-than-Significant Impact with Mitigation)**
5. The main access road would cross the driplines of several oak trees near the proposed eastern bridge across West Branch Llagas Creek, potentially resulting in stress or damage to those trees. **(Potential Significant Impact)**	5. Grading and paving within the driplines of the affected oaks would be subject to the recommendations of a qualified arborist to minimize stress and damage, with replacement required for any trees that do not survive. **(Less-than-Significant Impact with Mitigation)**
6. The proposed project may result in direct impacts to the California tiger salamander, a special-status species, and would result in loss of breeding habitat for the tiger salamanders. **(Potential Significant Impact)**	6. The project would include measures to reduce direct mortality to the California tiger salamander, and measures to preserve existing habitat and create new habitat to replace the habitat lost due to the project. **(Less-than-Significant Impact with Mitigation)**
7. The proposed project may result in direct impacts to the western pond turtle, a special-status species, and would result in the loss of potential upland habitat for the pond turtle. **(Potential Significant Impact)**	7. The project would include measures to preserve existing pond turtle habitat, and to create new habitat on the project site. **(Less-than-Significant Impact with Mitigation)**
8. The special-status plant and invertebrate species of the serpentine grasslands on the site would be subject to potential disturbance by grading for the adjacent residential subdivision, and by the general intensification of human activity resulting from the project. **(Potential Significant Impact)** serp. re: cluster	8. The serpentine habitat area would be fenced, and signs would be posted to prevent encroachment of grading from the adjacent residential subdivision, and to prevent the incursion of human activities after the project is completed. **(Less-than-Significant Impact with Mitigation)**
9. Project construction may adversely affect any future burrowing owl nests that may be established on the site prior to development. **(Potential Significant Impact)** preconstr. surveys re: cluster site grading	9. Preconstruction surveys would be conducted 30 days prior to site grading to ensure that no burrowing owl nests have been established, with implementation of appropriate mitigations if active nests are found. **(Less-than-Significant Impact with Mitigation)**

IMPACT	MITIGATION
G. BIOLOGICAL RESOURCES (CONT'D)	
10. The project may adversely affect any future nests of the Golden Eagle or other raptors that could be established on the site prior to development. **(Potential Significant Impact)**	10. Preconstruction surveys would be conducted 30 days prior to site grading to ensure that no active eagle or raptor nests have been established on the site, with implementation of appropriate mitigations if active nests are found. **(Less-than-Significant Impact with Mitigation)**
11. The project would result in the reduction of on-site habitat for the ringtail, American badger, California horned lizard, and several species of raptor, all of which are special-status species which occur or potentially occur on the site. **(Less-than-Significant Impact)**	11. No mitigation required.
12. The project would eliminate approximately 1.5 acres of existing wetlands on the site. **(Potential Significant Impact)**	12a. A detailed wetland protection, replacement and restoration plan would be prepared which meets with the approval of the County, the Corps of Engineers, and the Department of Fish and Game. b. Best management practices would be used to manage and maintain the golf course in order to minimize impacts of pesticides, fertilizers and herbicides on the wetlands of the site. c. A detailed erosion and sedimentation control plan would be prepared and implemented during project grading and construction. **(Less-than-Significant Impact with Mitigation)**
13. The introduction of non-native species to the site may adversely affect the native vegetation of the site. **(Potential Significant Impact)**	13. The use of invasive species in project landscaping would be avoided. **(Less-than-Significant Impact with Mitigation)**
H. ARCHAEOLOGY	
1. The construction of the main project entrance road may have an adverse impact on the archaeological site recorded as CA-SCl-76. **(Potential Significant Impact)**	1. Grading and excavation in the vicinity of SCl-76 would be subject to intermittent or spot monitoring by a qualified archaeologist. **(Less-than-Significant Impact with Mitigation)**

IMPACT	MITIGATION

H. ARCHAEOLOGY (CONT'D)

2. In the other areas of the site which are archaeologically sensitive, such as at the locations where prehistoric sites were previously recorded but where no archaeological material was found in recent surveys, there is a potential that buried archaeological resources may be damaged or destroyed by grading or excavation for the project.
(Potential Significant Impact)

Cluster & soil course conditions

2a. Should evidence of prehistoric cultural resources be discovered during construction, work in the immediate area of the find shall be stopped to allow adequate time for evaluation and mitigation, and a qualified professional archaeologist shall be called in to make an evaluation; the material shall be evaluated; and if significant, a mitigation program including collection and analysis of materials prior to the resumption of grading, preparation of a report, and curation of the materials at a recognized storage facility shall be developed and implemented under the direction of the Planning Office.

b. Any human remains that are discovered shall be removed, the remains shall be analyzed, a report shall be prepared, and if determined to be Native American, the remains shall be reburied under the direction of a designated Native American group.
(Less-than-Significant Impact with Mitigation)

I. HISTORIC RESOURCES

1. Demolition and earth moving activity at the existing ranch complex could have a potentially adverse effect on any buried remnants of the Hispanic Period adobe structures that once occupied this site.
(Potential Significant Impact)

1. Grading and excavation in the vicinity of the ranch complex would be subject to intermittent or spot monitoring by a qualified archaeologist, with appropriate mitigations implemented in the event that cultural materials are encountered. (Note: Since the potential adobe structures are believed to be located within prehistoric site SCl-76, this monitoring would occur concurrently with monitoring for archaeological resources at that site, as described above.)
(Less-than-Significant Impact with Mitigation)

IMPACT	MITIGATION

J. VISUAL AND AESTHETICS

IMPACT	MITIGATION
1. The project would result in visual changes to some areas of the site open to public view. **(Less-than-Significant Impact)**	1. The project would be designed and landscaped in a manner to help it blend in with the natural and rural surroundings, and to reduce its visibility from off-site locations. **(Less-than-Significant Impact with Mitigation)**
2. Lighting for the project entrance, clubhouse, swim and tennis center, equestrian center, parking areas and internal roadways may produce light and glare at off-site locations. Reflective building materials may also produce glare. **(Potential Significant Impact)**	2. Project lighting would be sited and designed to minimize off-site light and glare. The project structures would be composed of non-reflective building materials and non-glare windows **(Less-than-Significant Impact with Mitigation)**
3. Grading, vegetation removal and construction activity would result in temporary scarring. Storage of construction equipment and materials may be visible from off-site locations. **(Potential Significant Impact)** cluster	3. Graded areas would be revegetated as soon as possible, and screening berms would be created along the project frontage prior to construction of the dwellings in the proposed residential subdivisions. **(Less-than-Significant Impact with Mitigation)**

K. TRAFFIC AND CIRCULATION

IMPACT	MITIGATION
1. The project would result in increased traffic generation at the project site. **(Less-than-Significant Impact)**	1. No mitigation required.
2. The project would increase the on-site parking required for the project site. **(Less-than-Significant Impact)**	2. No mitigation required. (The proposed site plans indicate that adequate on-site parking would be provided in accordance with the County Parking Standards.)

L. NOISE

IMPACT	MITIGATION
1. Traffic generated by the project would increase noise levels at existing residences. **(Less-than-Significant Impact)**	1. No mitigation required.

IMPACT	MITIGATION
L. NOISE (CONT'D)	
2. Portions of the 2 lots proposed in the vicinity of Coolidge Avenue would be exposed to traffic noise levels in excess of the 55 dBA L_{dn}, the County standard for residential uses. (However, under the proposed subdivision plan for this area, the minimum setbacks for dwellings on these lots would place them beyond the zone of potential noise impact.) **(Less-than-Significant Impact)**	2. No mitigation required.
3. Noise generated by golf course mowers would have a potentially adverse effect on nearby dwellings proposed on the project site. **(Potential Significant Impact)** Std course condition	3. The hours of mowing within 330 feet of any proposed residence would be restricted to weekdays between the hours of 8:00 a.m. and 5:00 p.m., with total noise generating activities within any hour restricted in accordance with the limits set forth in the County's Noise Ordinance. **(Less-than-Significant Impact with Mitigation)**
4. Activities at the clubhouse would increase noise levels in the interior of Hayes Valley. **(Less-than-Significant Impact)**	4. No mitigation required.
5. Noise levels would be temporarily elevated during project grading and construction. **(Potential Significant Impact)**	5. Short-term construction noise impacts would be reduced through compliance with the County's Noise Ordinance with respect to hours of operation and maximum noise levels at adjacent property lines. **(Less-than-Significant Impact with Mitigation)**
M. AIR QUALITY	
1. Construction and grading for the project may generate dust and exhaust emissions that could adversely affect local and regional air quality. **(Potential Significant Impact)**	1. Effective measures would be implemented to reduce construction-related emissions (see text for details). **(Less-than-Significant Impact with Mitigation)**
2. Traffic generated by the project would increase carbon monoxide emissions at local roadways and intersections. **(Less-than-Significant Impact)**	2. No mitigation required.
3. Emissions from project-generated traffic would result in air pollutant emissions affecting the entire San Francisco Bay air basin. **(Less-than-Significant Impact)**	3. No mitigation required.

IMPACT	MITIGATION

N. HAZARDOUS MATERIALS, PUBLIC HEALTH AND SAFETY

IMPACT	MITIGATION
1. The historic and current agricultural activities on the Hayes Valley Ranch may have resulted in potential soil contamination due to spilled or leaked hydrocarbon products, pesticides and herbicides, PCBs from electrical transformers, and other potential sources of contamination. The existing residential structures may include materials that contain asbestos. **(Potential Significant Impact)**	1. Prior to demolition of the existing ranch structures and site grading, the areas identified as having potential soil or asbestos contamination would be sampled and tested to determine whether contaminants are present in hazardous concentrations. Any soils which are found to be contaminated would be subject to remediation measures, as appropriate. If asbestos-containing materials are found to be present, they would be removed in the manner specified by law. **(Less-than-Significant Impacts with Mitigation)**
2. Any unplanned construction or grading activity that encroaches upon the on-site serpentine hillside could result in the release of airborne particles of chrysotile asbestos, potentially causing a public health hazard if inhaled. **(Potential Significant Impact)**	2. To avoid disturbance to the serpentine bedrock area, the edge of this area would be fenced or roped-off to prevent encroachment by construction equipment. **(Less-than-Significant Impact with Mitigation)**
3. Improper use, handling and storage of hazardous materials used in the construction and operation of the golf course may result in potential soil or groundwater contamination. **(Potential Significant Impact)**	3. The project would be required to obtain and implement the provisions of a Hazardous Materials Storage Permit for the proper use, handling and storage of pesticides, herbicides and other hazardous products during construction and operation of the golf course. **(Less-than-Significant Impact with Mitigation)**
4. The equestrian facility could result in potential vector and odor impacts. **(Potential Significant Impact)**	4. The equestrian facility would employ vector control measures, and would be operated in accordance with a manure management plan in conformance with State law, which would also be reviewed and approved by the County Department of Environmental Health. **(Less-than-Significant Impact with Mitigation)**

O. ELECTROMAGNETIC FIELDS (EMFs)

IMPACT	MITIGATION
1. The siting of residential lots in the vicinity of existing high-voltage power lines may potentially expose future residents to increased levels of electromagnetic fields. **(Less-than-Significant Impact)**	1. No mitigation required.

IMPACT	MITIGATION
P. WATER SUPPLY	
1. The proposed project would increase the demand for water at the site. **(Potential Significant Impact)**	1a. Increased water supplies to meet project demand for domestic water would be provided by the West San Martin Water Works, without adversely affecting existing or future users. b. Water supplies for golf course irrigation would be provided by a combination of sources, including on-site pumping of groundwater, non-potable water from Twin Valley, Inc., and backup supplies from West San Martin Water Works. This water would be provided in a manner that would not exceed the safe yields of any of these sources. **(Less-than-Significant Impact with Mitigation)**
Q. WASTEWATER TREATMENT AND DISPOSAL	
1. The proposed project would increase the demand for wastewater treatment and disposal facilities at the site. **(Potential Significant Impact)**	1. Increased wastewater from the project would be treated and disposed with new facilities to be constructed in conjunction with the project. **(Less-than-Significant Impact with Mitigation)**
2. The proposed wastewater disposal facilities may result in degradation of surface water and groundwater quality. **(Potential Significant Impact)**	2. Groundwater wells would monitor water quality up-gradient and down-gradient of the proposed spray irrigation area, with corrective action taken as necessary. **(Less-than-Significant Impact with Mitigation)**
3. The use of reclaimed wastewater for golf course irrigation would expose humans to possible physical contact with the treated wastewater, resulting in a potential public health hazard. **(Potential Significant Impact)**	3. The wastewater would be treated to levels deemed acceptable for disposal on golf courses, and the areas affected would be posted to notify golfers and employees where irrigation by treated wastewater is occurring. **(Less-than-Significant Impact with Mitigation)**
4. There is a potential for overflow of the storage reservoir, resulting in a public health hazard. **(Potential Significant Impact)**	4. The wastewater storage reservoir would have sufficient capacity to accommodate high rainfall years. **(Less-than-Significant Impact with Mitigation)**
5. The wastewater treatment and disposal system could generate odors. **(Potential Significant impact)**	5. Odor control would be achieved by mechanisms incorporated into the design of the pump stations and the treatment plant, and by measures to be undertaken at the effluent storage pond. **(Less-than-Significant Impact with Mitigation)**

IMPACT	MITIGATION

Q. WASTEWATER TREATMENT AND DISPOSAL (CONT'D)

6. The existing pond and proposed open water areas of the project, such as the wastewater storage pond and residential lake, have the potential to be sites for breeding of mosquitoes, which could create a nuisance and a potential public health problem.
(Potential Significant Impact)

6. Mosquito breeding would be controlled by several methods, as appropriate for each type of water body. These methods would include the circulation of water to prevent stagnant conditions, the introduction of mosquito fish, and the application of larvacides. The specific mosquito mitigation measures would be formulated in consultation with the Department of Environmental Health Vector Control District.
(Less-than-Significant Impact with Mitigation)

R. FIRE PROTECTION

1. Portions of the project site are located in areas designated as Extreme or Moderate Fire Hazard areas, and thus may be subject to loss of life and property in the event of a wildland fire.
(Potential Significant Impact)

1. The project would be required to implement the County Fire Marshal's conditions for fire protection, including minimum roadway standards, adequate water storage and pressure for fire fighting, installation of hydrants and automatic sprinklers, vegetation clearance and building specifications.
(Less-than-Significant Impact with Mitigation)

S. POLICE AND SECURITY

1. The project may result in increased demand for police services at the site.
(Less-than-Significant Impact)

1. No mitigation required.

T. SCHOOLS

1. The proposed residential subdivisions would generate 32 school-aged children within the Morgan Hill Unified School District, where the schools are already impacted.
(Potential Significant Impact)

1. The project's impacts to schools would be mitigated by the state-mandated school impact fee charged to the builder, and by the property tax increment for schools to be paid by the future homeowners under the existing Mello-Roos district that includes the Lion's Gate site.
(Less-than-Significant Impact with Mitigation)

IMPACT	MITIGATION

U. UTILITIES

1. The project would increase demand for electric power, natural gas and telephone service at the site. **(Less-than-Significant Impact)**	1. No mitigation required.

V. SOLID WASTE

1. The project would increase the generation of solid waste at the site, thereby reducing overall disposal capacity at local landfill sites. **(Less-than-Significant Impact)**	1. Provisions for recycling, composting and "grass cycling" would be incorporated into the project operation to reduce solid waste generation. **(Less-than-Significant Impact)**

W. ENERGY

1. The project would result in the consumption of non-renewable energy resources in both the construction and operational phases of the project. **(Less-than-Significant Impact)**	1. Energy conservation measures would be incorporated into the project in accordance with Title 24 of the California Administrative Code. The project would also incorporate other energy-efficient features in building design and construction, and in the operation of the irrigation system. **(Less-than-Significant Impact)**

TABLE OF CONTENTS

VOLUME I - EIR TEXT

TABLE OF CONTENTS - 2

VOLUME II - TECHNICAL APPENDICES B through E

VOLUME III - TECHNICAL APPENDICES F through N

LIST OF TABLES

LIST OF FIGURES

I. PROJECT DESCRIPTION

A. SITE DESCRIPTION

The Lion's Gate property consists of 1,676 acres of land located in southern Santa Clara County between the cities of Morgan Hill and Gilroy, and southwest of the unincorporated community of San Martin (see Figures 1, 2 and 3). The property is bounded on the east by Coolidge Avenue (Santa Teresa Boulevard) and Turlock Avenue, and on the west by Watsonville Road. The northern and southern boundaries of the site are generally defined by two ranges of east-west hills which form an almost enclosed valley (Hayes Valley) in the central portion of the site (see Figures 4, 5 and 6).

The series of hills on the south side of the valley are covered with oak woodland on the north-facing slopes and rise to an elevation of 1,118 feet at Lion's Peak. The hills on the north side of the valley are covered with annual grasses and rise to an elevation of 786 feet. At the western end, the valley broadens to join a larger inter-mountain valley which tracks roughly north-south. At the eastern end, the valley opens up to a gently-sloping alluvial fan which joins the southern Santa Clara Valley in the vicinity of Turlock Avenue. The ground elevations on the lower-lying areas of the property range from 300 to 400 feet.

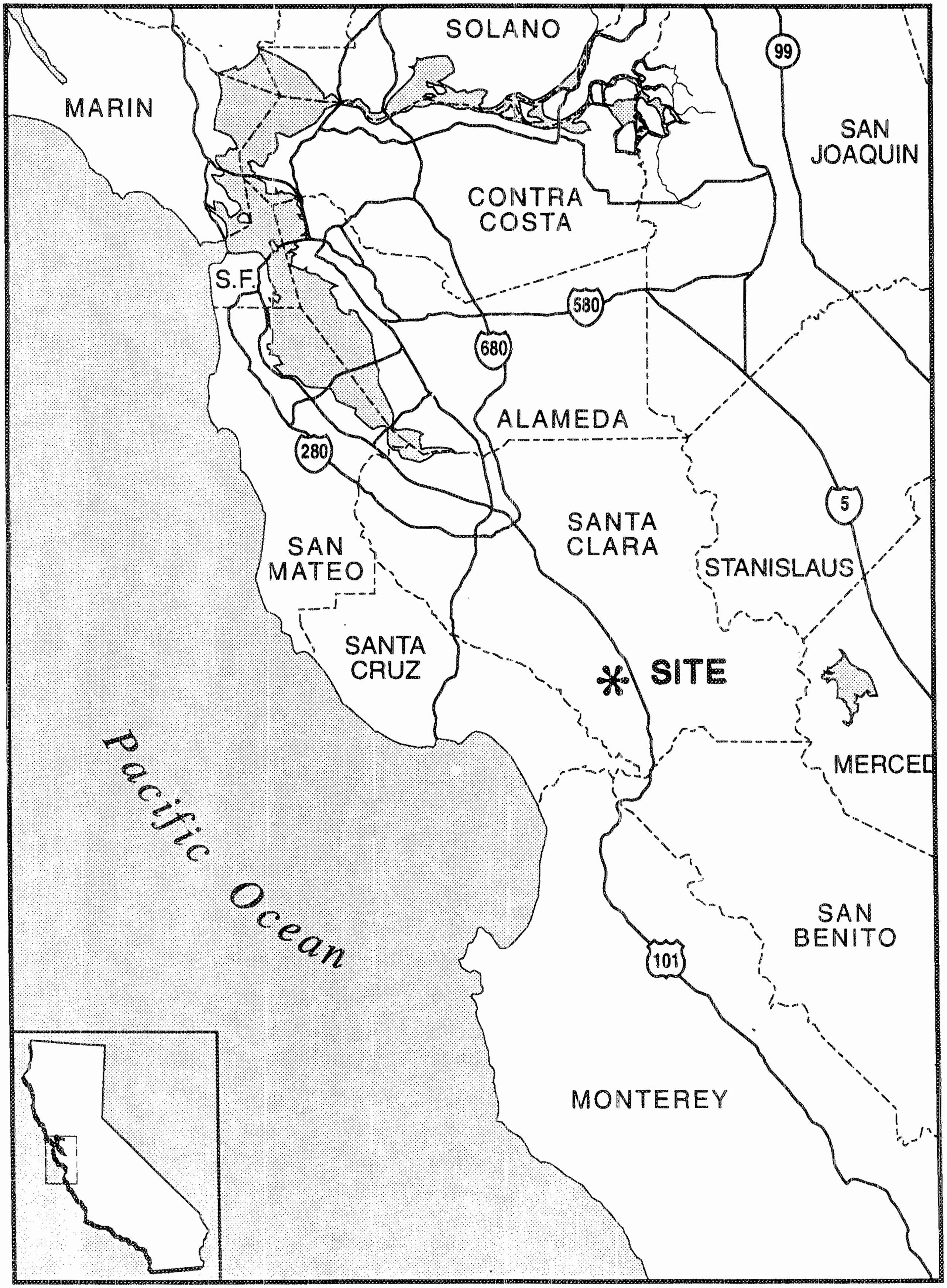
The Lions's Gate property contains the headwaters of the West Branch of Llagas Creek which drains the majority of the site and flows to the east and south into the Pajaro River drainage. The western portion of the site is drained by Hayes Creek which flows west and then north to join the main branch of Llagas Creek.

The vegetation of the site is dominated by annual grasslands which cover the floor of the valley and the slopes of the northern hillsides. The southern hillsides are covered with oak woodland on the north-facing slopes and annual grasses and scrub on the southern slopes. The grassland areas are mainly used for cattle grazing and have been occasionally cultivated for hay. Scattered oaks are found throughout the grassland area, and also along the creek channel. Outside the main valley to the east is a field south of Highland Avenue which was formerly used for growing oats, wheat, hay and alfalfa. On the north side of Highland, between the toe of the on-site ridge and Coolidge Avenue, is a declining plum and walnut orchard of approximately 25 acres.

The site is served by two main access points, with the primary access from the western extension of Highland Avenue in the east, and with a second access point located on the site's frontage along Watsonville Road to the west.

The existing structures on the site consist mainly of a ranch complex located on the extension of Highland Avenue in the eastern portion of the site. This complex includes 3 residences, a guest house, a number of barns and sheds, and an old creamery building associated with a former dairy operation. There is also a house and barn located to the east of the main ranch on the north side of Highland Avenue near Turlock. Also, there is an unused barn at the southwestern corner of the site along Watsonville Road. Other man-made agricultural features also exist on the property, including fences, corrals, stock ponds and several water troughs located near natural springs.

There are two separate high voltage power line corridors that traverse the site generally from north to south. The east-central portion of the site is crossed by a 115 kV transmission line on steel towers, and the western portion of the site is traversed by a 115 kV transmission line on wooden poles.

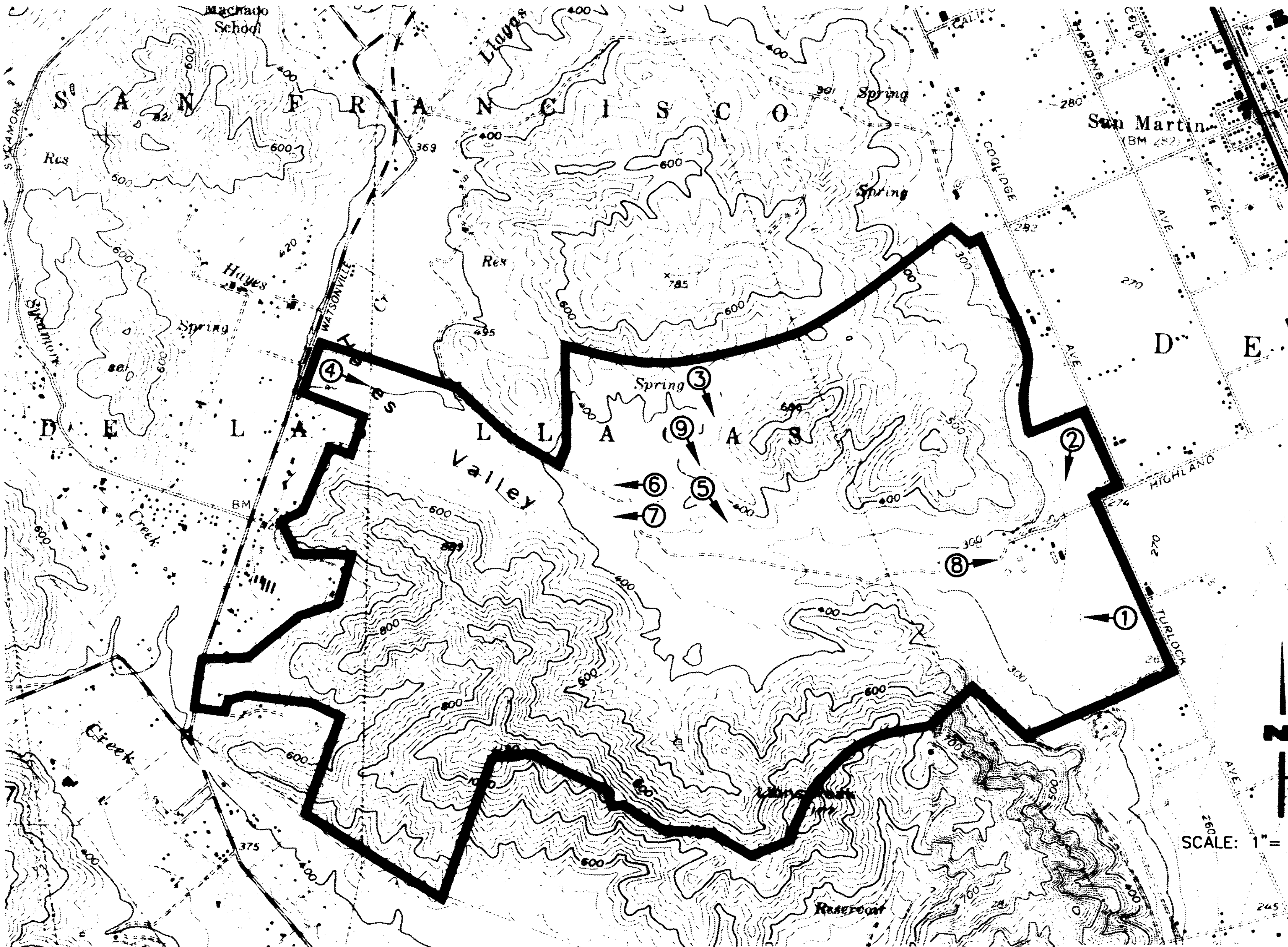


REGIONAL LOCATION

FIGURE 1

OBLIQUE AREAL PHOTO - FROM EAST

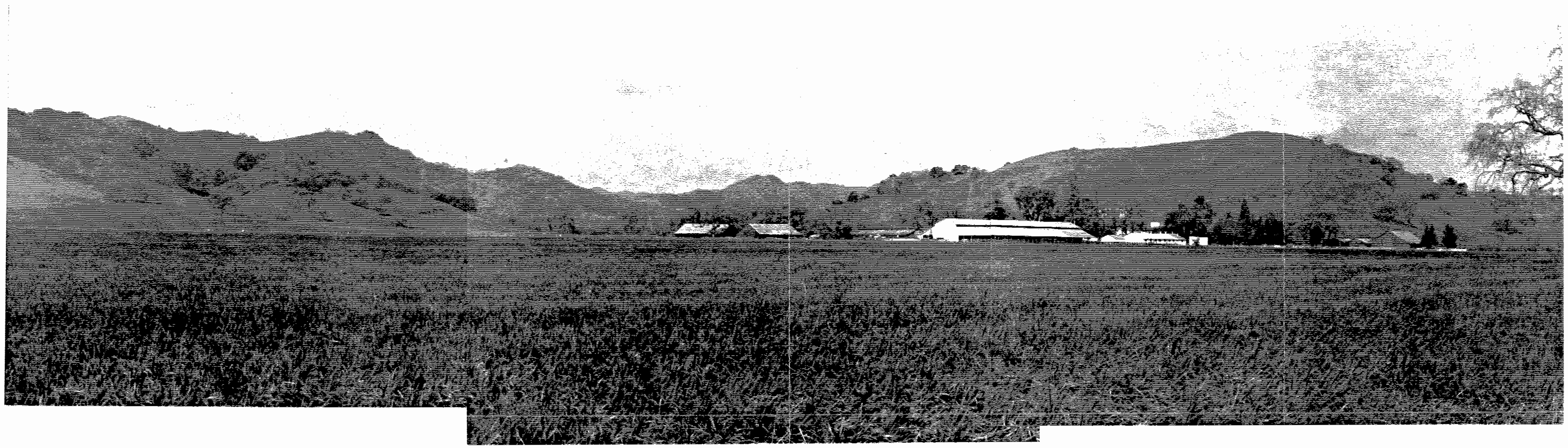
FIGURE 4



SCALE: 1"= 2000'

SITE PHOTOGRAPHS - KEY MAP

FIGURE 5

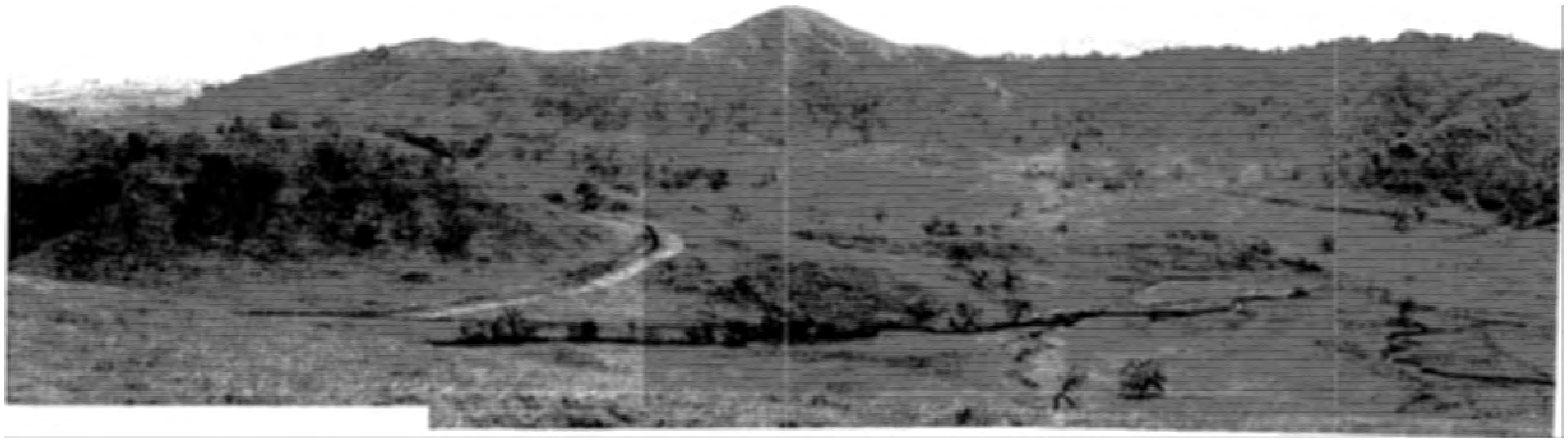


1 WESTWARD VIEW INTO SITE FROM TURLOCK AVENUE

2 SOUTHWESTWARD VIEW INTO SITE FROM COOLIDGE AVENUE

SITE PHOTOGRAPHS

FIGURE 6a



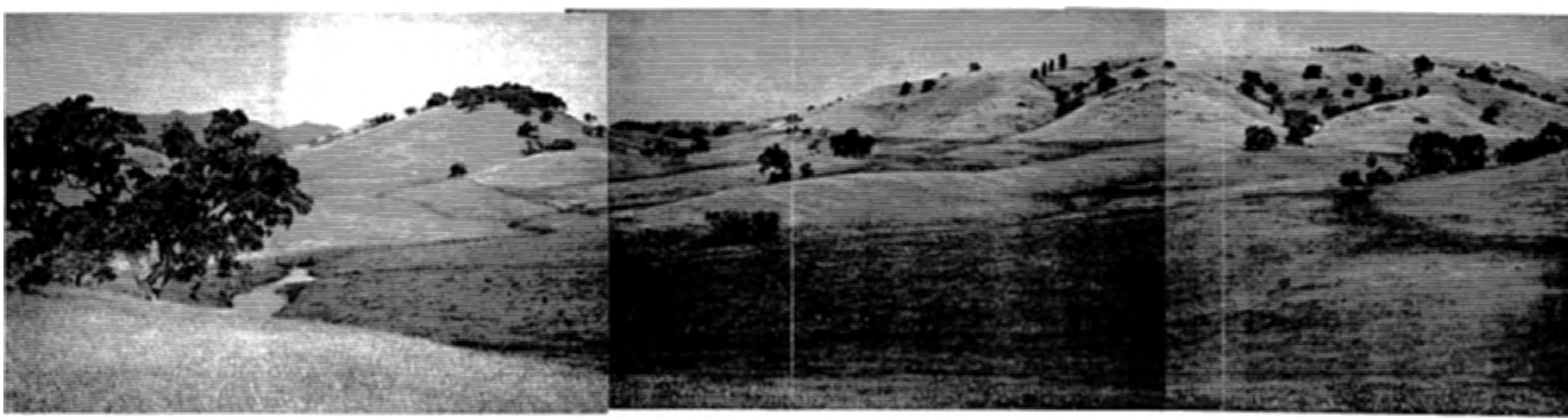
3 SOUTHWARD VIEW INTO SITE FROM NORTH RIDGE

4 EASTWARD VIEW INTO SITE FROM WATSONVILLE ROAD

SITE PHOTOGRAPHS

FIGURE 6b

5 INTERIOR VIEW OF SITE TO SOUTHEAST



6 INTERIOR VIEW OF SITE TO WEST

SITE PHOTOGRAPHS

FIGURE 6c

7 WESTWARD VIEW OVER CENTRAL POND

8 MAIN CREEK CHANNEL WEST OF RANCH COMPLEX

9 TRIBUTARY NORTHEAST OF POND

SITE PHOTOGRAPHS

FIGURE 6d

B. DESCRIPTION OF THE PROPOSED PROJECT

Overview

The proposed project consists of the following:

1. A Use Permit application for a public access championship golf course, including a clubhouse with restaurant, 45 units of overnight accommodations, a practice range, a maintenance facility, and a swim and tennis center (see Figure 7).

2. A General Plan Amendment to redesignate a total of 259 acres on two separate parcels (see Figure 8) from "Agriculture - Medium Scale" to "Hillsides," as follows:

   a) A 115-acre parcel located at the western end of the site near Watsonville Road;

   b) A 144-acre parcel located at the eastern end of the site along Turlock Avenue, south of Highland Avenue.

   The purpose of this General Plan Amendment is to permit the clustering of the allowable density from the entire site onto the most suitable areas in the eastern portion of the site while preserving the western and hillside portions of the site as permanent open space.

3. A Tentative Map and Cluster Development Permit application on the existing and proposed "Hillsides" -designated areas to permit the creation of 35 clustered residential lots in accordance with the slope-density formula of the Hillside Zoning Ordinance. This element of the project would include 1,265 acres of permanent open space, which ~~would constitute~~ over 90 percent of the Hillsides-designated area of the project site (see Figures 9a, 9b and 9c).

4. A Tentative Map and Cluster Development Permit application to permit the creation of a 6-lot subdivision on the 32-acre "Rural Residential" -designated area located at the eastern end of the site along Coolidge Avenue north of Highland Avenue.

Access to the project site would occur entirely from the east off the extension of Highland Avenue. A main access road approximately one mile in length would serve the residential cluster subdivisions in the eastern areas of the site, and would terminate at the golf course clubhouse in the central area of the site. A maintenance access road from Watsonville Road would serve the golf course maintenance facility at the western end of the golf course, and would also be available to provide emergency access for the golf course and residential subdivisions.

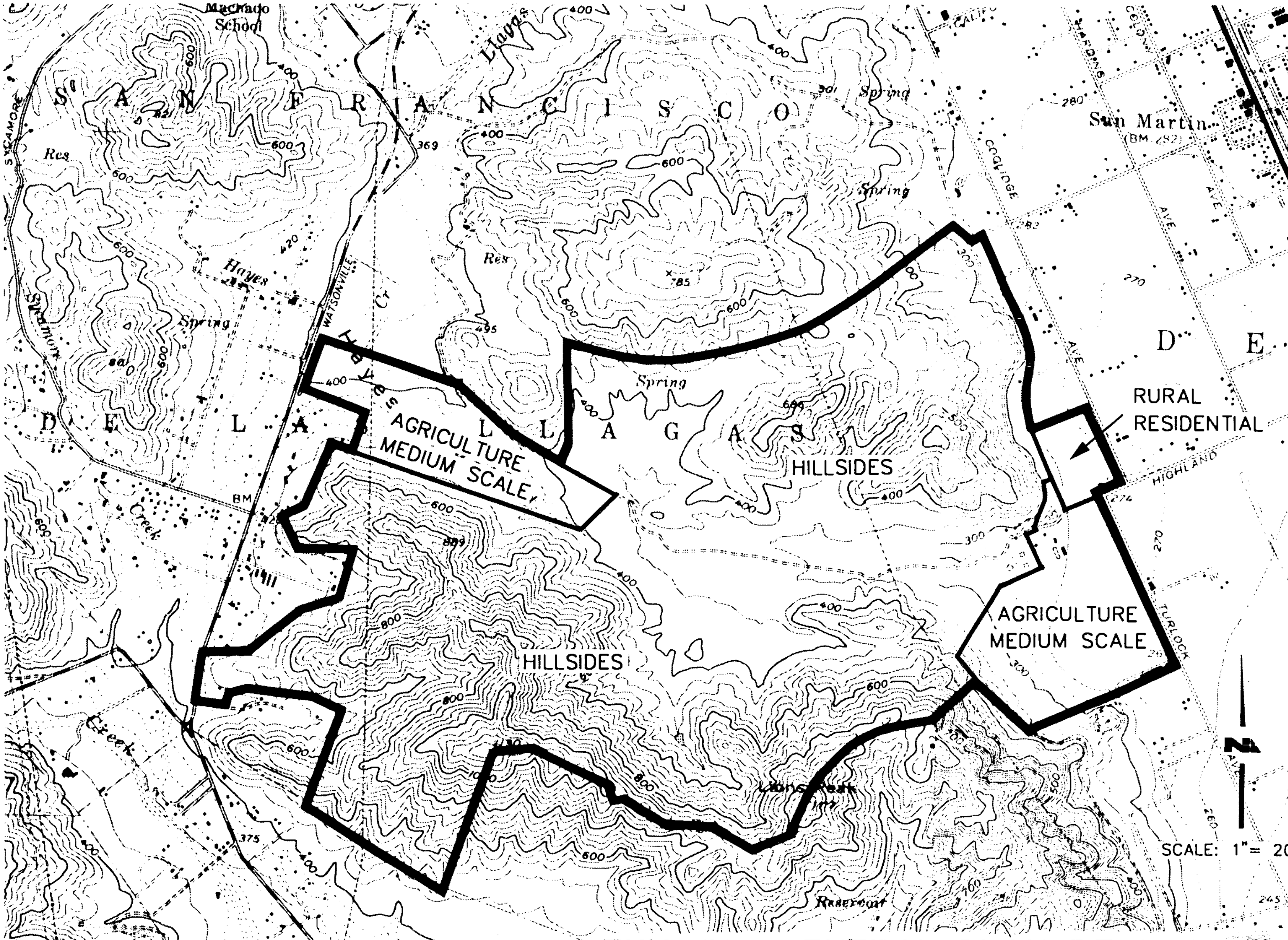
The acreage breakdown for the proposed land uses is provided in Table 1. The details of the project are summarized in Table 2 and described in the following paragraphs.

The Cluster Residential Subdivisions

The project would include two main residential clusters and related open space areas, as described below.

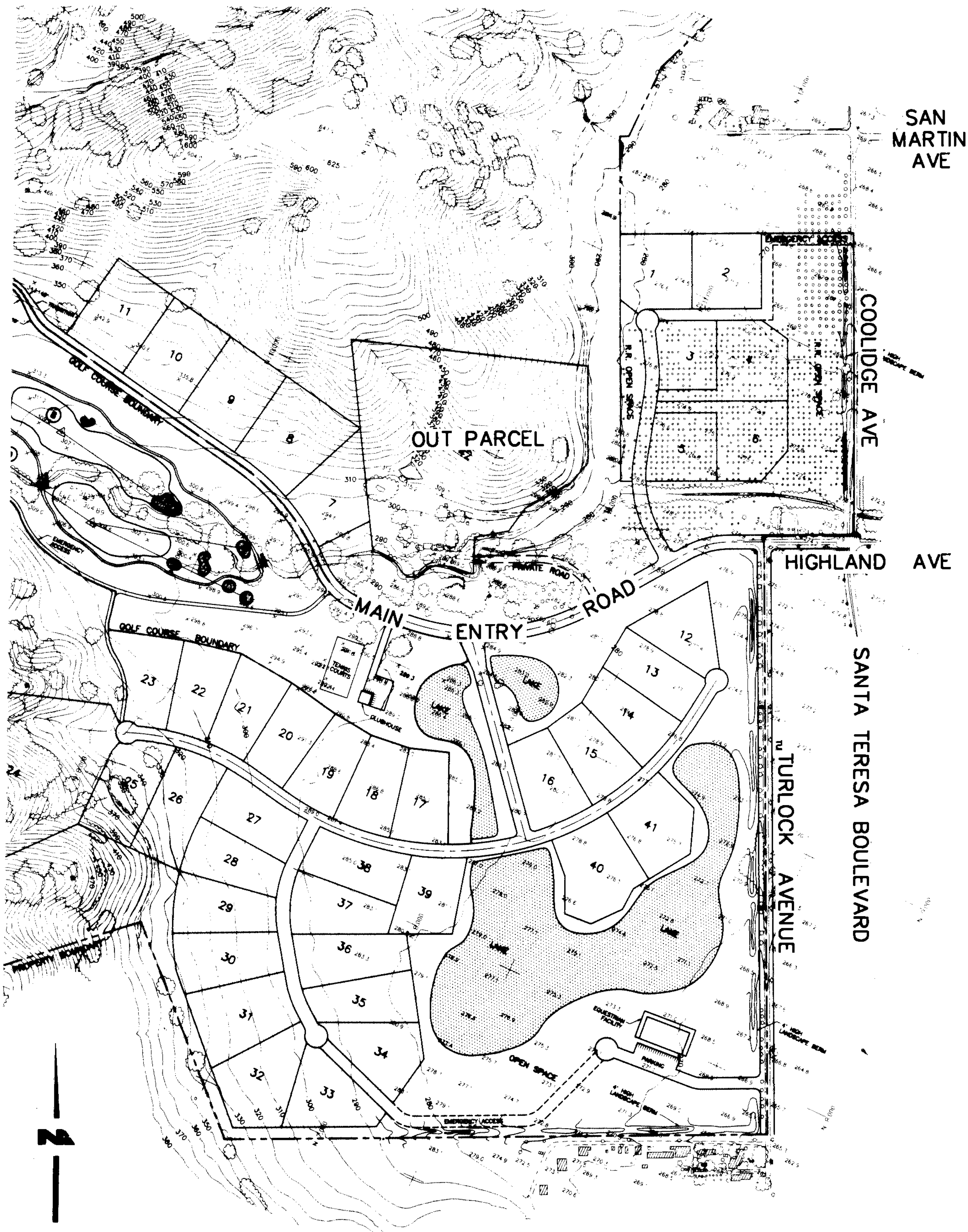
Rural Residential Cluster Subdivision

The 32-acre Rural Residential parcel is located at the eastern edge of the site, adjacent to Coolidge Avenue, north of Highland Avenue. The proposal is to cluster the 6 permitted lots in the western portion of this parcel, with lots ranging in size from 1.7 to 2.5 acres. The eastern and southern edges of the site would remain in permanent



EXISTING GENERAL PLAN DESIGNATIONS

FIGURE 8



CLUSTER RESIDENTAL SUBDIVISIONS

FIGURE 9c

TABLE 1

PROPOSED LAND USES

Land Use	Acreage
Golf Course	
• Open Area	263.2
• Clubhouse, Overnight Facilities & Parking	6.3
Residential	
• Hillside Cluster	102.8
• Rural Residential Cluster	31.5
Permanent Open Space	1,265.7
Main Access Road	6.5
TOTAL	1,676.0

open space. The old plum and walnut orchard would be removed and replaced with a 4 foot high landscaped berm along the roadway, and a vineyard of approximately 10 acres would be planted behind the berm. This buffer area would range in depth from 250 to 400 feet, comprising a total of approximately 12 acres. The southern portion of this site would contain the channel of West Branch Llagas Creek, which flows from west to east alongside Highland Avenue.

Hillside Cluster Residential Subdivision

The second cluster subdivision would consist of 35 lots in the Hillsides-designated area of the site, which would be clustered on less than 10 percent of the Hillsides area allowing the remaining 90 percent (not including the golf course) to remain in permanent open space, as required under the General Plan and the Hillside Zoning Ordinance. Most of this cluster subdivision (29 lots) would be located in the relatively level area west of Turlock Avenue and south of Highland Avenue. The lots within this area would all be 2 to 3 aces in size and would be oriented around a 20-acre lake to be excavated as part of the project. This would be a dual purpose water element, serving as both an amenity for the residential area, and as a drainage basin and storm water detention facility. The hillside area immediately to the west of this cluster would contain two partially wooded lots approximately 3 acres and 18 acres in area. However, the building envelopes for these lots have been established in areas of the lots where there is little or no tree cover. The remaining 5 lots would be located across the creek to the north and west of the main subdivision area. These lots would be located directly on the main access road and would all be 2 to 3 acres in size.

The wastewater from the residential units would be stored in septic tanks located on each lot, with the effluent pumped to a package treatment plant to be installed near the golf course practice range (see "Wastewater Treatment and Disposal" below).

Permanent Open Space Area

The Hillside cluster subdivision would include a 1,265-acre permanent open space area which would constitute over 90 percent of the Hillside zone on the site. (This assumes that the 259 acres currently designated "Agriculture - Medium Scale" in the County General Plan would be redesignated to "Hillsides.") Most of this permanent open space area comprises the hillside areas which flank the Hayes Valley on the north and south, and also includes the level pasture land in the western portion of the site near Watsonville Road. This area would include a system of informal trails for hiking and horseback riding.

A small portion (less than one acre) of the northern hillside area adjacent to the golf course driving range would provide the site for winter storage of treated effluent prior to spray irrigation on the driving range.

The permanent open space area would also include 100 acres of vineyard to be planted in two areas. A 10-acre vineyard would be planted along Coolidge Avenue, within the 250-foot setback area for the proposed Rural Residential subdivision. A 100-acre vineyard would be planted at the western end of the project, in the open field fronting onto Watsonville Road.

The permanent open space area also includes an area of approximately 40 acres in the southeastern corner of the site. This area would include: buffer areas around the residential lots, a 4-foot landscaped berm along Turlock Avenue, a 20-acre lake, and a 20-acre equestrian center (see "Drainage" and "Equestrian Center" below).

The permanent open space areas of the site would be placed in the ownership of the Homeowners Association for the project, and would not be open to the general public. The grazing of cattle on the Lion's Gate site (which currently reaches a peak of 250 head) would be discontinued upon construction of the project.

Golf Course

The central feature of the project is a public access championship 18-hole golf course designed by Robert Trent Jones Jr. The golf course follows the natural contours of the central site area and is focused on the West Branch of Llagas Creek, which would be subject to a substantial riparian habitat restoration and enhancement to be integrated into the golf course design plan (see Section *III. G. Biological Resources*, for a description of the riparian habitat restoration and enhancement plan).

The golf course playing area would be 97 acres, including 52 acres of rough. The golf course would also include a 10-acre practice range with 55 tee pads, and a 3-acre area containing a putting green and a chipping green. The practice area would be served by a 1,000 square-foot structure that would provide golf ball sales, restrooms, a snack bar window, and storage for the golf ball retrieval vehicle.

The golf course would be open to the public as a "daily fee" course. There would also be some corporate membership which would comprise a limited portion of the overall usership of the golf course. Approximately 60 corporate memberships are contemplated. (No memberships would be available to members of the public.) It is estimated that up to 50,000 rounds of golf would be played here per year. It is estimated by the applicant that corporate membership would comprise 25 percent of the total golf rounds, with the remaining 75 percent available to the public.

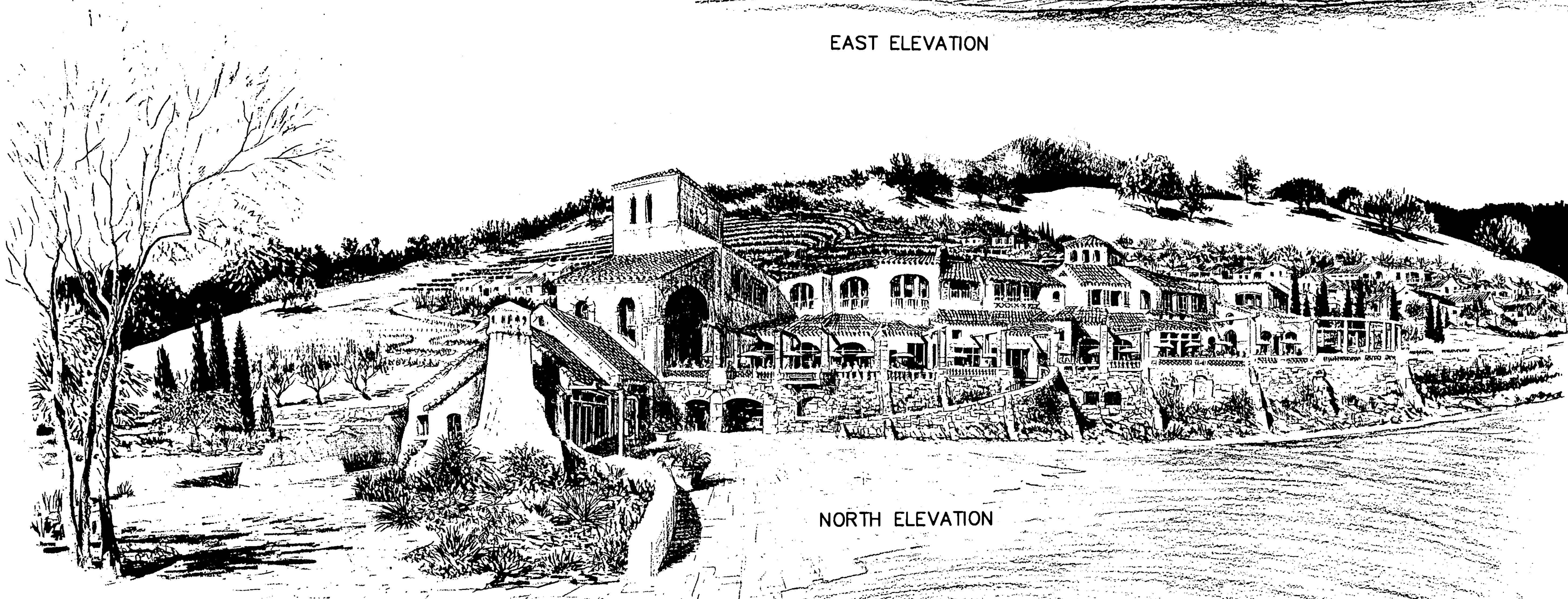
The total quantity of earth to be moved during grading for the golf course and related facilities is estimated to be approximately one million cubic yards. A total of 18 trees would require removal to accommodate the golf course. These would be replaced by over 2,500 native trees to be planted throughout the golf course and the residential areas of the project. (These are trees that have been specifically grown for the project from acorns and seeds collected from the site in 1989).

TABLE 2

PROJECT SUMMARY DATA

RESIDENTIAL	
• Rural Residential Cluster Subdivision (lots)	6
• Hillside Residential Cluster Subdivision (lots)	35
GOLF COURSE	
• Holes	18
• Clubhouse (square feet)	29,000
• Overnight Accommodations (units)	45
• Parking Spaces (Clubhouse, Overnight, Practice Facilities)	250
• Maintenance Facility (square feet)	6,000
Grading (cubic yards - cut/fill)	500,000/500,000
Tree Removal (total)	18
Tree Planting	2,500+
WATER CONSUMPTION (gallons/day) - (average/peak)	
• Golf Course Irrigation (non-potable)	334,000/677,000
• Domestic/Landscape/Washdown	57,000/114,000
WASTEWATER FLOWS (gallons/day) - (average/peak)	23,000/30,000

EAST ELEVATION



NORTH ELEVATION

CLUBHOUSE ELEVATIONS

Prepared by Elmore Bohan Design

FIGURE 10b

TABLE 3

CLUBHOUSE FLOOR AREA BREAKDOWN

FUNCTION		FLOOR AREA
First Level		
Pro Shop		1,560
Member's Lounge		2,925
Cart Storage		4,465
Men's & Women's Locker Rooms		2,395
Mechanical		370
Lobby/Stairs and Transfer Area		3,192
	Subtotal	12,907
Second Level		
Restaurant		2,920
Bar		1,280
Kitchen		2,395
Office/Restrooms		1,504
Lobby/Stairs		1,204
Terrace (5,000)		--
	Subtotal	11,303
Third Level		
Banquet Room		4,000
Banquet Kitchen		960
	Subtotal	4,960
	Total Clubhouse Floor Area	29,170

corporate members and would include up to 4 tennis courts, a medium size (smaller than olympic size) pool, and a 2,000 square-foot clubhouse with locker rooms and restrooms.

Equestrian Center

The project would include an equestrian center located on approximately 20 acres at the southeastern corner of the site with driveway access directly off Turlock Avenue. The equestrian center would be open only to project residents for the boarding of privately owned horses. No public horse rental is proposed. The focus of the equestrian center would be a covered arena structure measuring 100 by 200 feet. The arena would be surrounded on 3 sides by 20 to 30 indoor/outdoor stalls. The center would also include a hay storage area and living quarters for a caretaker/manager. Other features would include an outdoor riding ring, a training area/paddock and pasture. The access drive and 20-space parking area would be surfaced with all-weather crushed gravel. The center would have direct access to over 8 miles of private riding trails proposed for the permanent open space areas of the Lion's Gate site. These riding trails would consist of the network of existing trails and vehicle tracks that occur throughout the site. Some minor improvements may be made to these existing trails, but it is not expected that new trails would be created. Access from the equestrian center to these trails would be via the narrow strips of permanent open space extending west and north of the equestrian center along the project boundary (see Figure 9c).

In order to prevent horse manure from entering downstream water courses or groundwater, the equestrian facility would be operated in accordance with a manure management plan, as required under Title 23, Chapter 15 of the California Code of Regulations (which pertain to the protection of water quality). Under the manure management plan, debris boxes would be used to store daily stall sweepings and manure. The outdoor riding and pasture areas would have manure picked up daily with a special vacuum vehicle. Disposal of wastes at a local landfill, one which is permitted to accept manure, would occur on a daily basis or every other day. Alternatively, on-site composting of manure may be considered instead of off-site disposal. (Any proposal to compost manure would require approval from the Department of Environmental Health Solid Waste Unit.) The perimeter of the equestrian center would be fenced to prevent animals from entering nearby drainages and ponds and contaminating the water.

The equestrian center would be contoured to direct on-site drainage to a grass swale or swales which would convey runoff to a lined retention pond or basin. This pond would be located at the eastern end of the site, just west of the landscaped berm proposed along Turlock Avenue. The pond would be equipped with a sump pump to facilitate spraying the drainage water onto the pasture area. The pond would be skimmed as necessary to remove any floating material, and would be cleaned out regularly to remove accumulated sediments. The pond would be sized for the 10-year storm to prevent overflow of accumulated drainage in all but the most significant flood events (the pond would be fenced to prevent entry, and signs would be posted warning people to keep out.) Any drainage from the areas upslope of the equestrian center to the west would be directed around the facility to the proposed residential lake to the north.

The equestrian center would employ vector control measures as needed, such as baiting for flies, and rodent trapping. As discussed above, manure would be cleaned up daily and placed in debris boxes which would be emptied daily or every other day and taken to a local landfill or composted on-site.

Maintenance Facility

The maintenance facility would be located at the western end of the golf course and would be served by a separate 24-foot wide access road from Watsonville Road to the west. The maintenance facility would include a 6,000 square-foot building, with an adjacent 20,000 square-foot area of impermeable concrete for parking, washdown, and outdoor storage.

The exterior of maintenance building would utilize materials from the existing barn to give it a rural appearance. The interior of the building would be used for equipment maintenance, washing and storage. Within the maintenance building there would be separate designated areas for handling and storage of pesticides and fertilizers. The adjacent surfaced area would include parking for 12 employees and 5 visitors. A covered washbay at the rear of the building would drain to an advanced wash water filtering and recycling system to capture grease and other hazardous materials washed off the equipment and vehicles. Within the maintenance facility compound there would be separate area for above ground storage tanks for diesel and gasoline to fuel vehicles and equipment. This area would be surrounded with a concrete berm to provide secondary containment in the event of a fuel leak or spill. The entire maintenance facility site would be surrounded with a continuous 6-inch concrete curb.

The maintenance facility would be operated in accordance with the guidelines of the Audubon Cooperative Sanctuary program. The facilities would also be subject to the County's Hazardous Materials Storage Permit Ordinance, which requires the preparation and implementation of a Hazardous Materials Management Plan (see Section *III. N. Hazardous Materials, Public Health and Safety*).

Associated Improvements and Programs

Access and Circulation

<u>Main Entry Road</u>: The main access to the golf course would be via a new entry road which would extend from the current terminus of Highland Avenue at the existing ranch complex, and would continue westward for a distance of one mile to the clubhouse. This roadway would provide access to residential streets in the eastern areas of the site, and would provide direct driveway access to 5 residential lots proposed to the northwest of the main cluster residential area. The main entry road would also provide direct access to the swim and tennis center and the golf practice facilities. The roadway would require bridges at two crossing points over West Branch Llagas Creek. The roadway would be 62 feet wide and would be built to County standards. The main access road would be guard gated and private commencing westward from Turlock Avenue.

<u>Residential Access Roads</u>: The main entry road would provide connections to the residential street serving the 6-lot rural residential cluster subdivision north of Highland Avenue, and the streets serving the main 30-lot cluster subdivision located to the south and west of the existing ranch complex. These roadways would be 62 feet wide and would be constructed to County Standards for local residential streets. The roadway serving the Rural Residential subdivision to the northeast would require a bridge over West Branch Llagas Creek. The residential roadways would be private and would be gated at their intersections with the main entry road.

<u>Maintenance Facility Access Road</u>: The maintenance facility would be served by a separate 24-foot wide access road extending 4,400 feet from Watsonville Road to the west. This would be an all-weather roadway designed to handle maintenance trucks and emergency vehicles. The maintenance access road would be gated at Watsonville Road to prevent unauthorized access.

<u>Emergency Access</u>: In order to provide for emergency access to the west, a secondary access route would be created across the golf course area and would connect with the maintenance facility access road. East of the maintenance facility, this emergency route would utilize the continuous golf course path that runs along the south side of Holes 1 and 2. This dual purpose cart path would be 12 to 14 feet wide and would consist of a 6-inch slab over a 4-inch engineered subbase to accommodate emergency vehicles.

Golf Cart Paths and Bridges: Access to all golf holes would be provided by a system of concrete cart paths which would be 7 to 8 feet wide, except for the dual purpose cart path/emergency access route which would be 12 to 14 feet wide, as described above. The cart path system would include 6 bridges across West Branch Llagas Creek downstream of the existing pond, and an additional 7 bridges across the various tributaries to the main creek channel. All cart path crossings would consist of clear span bridges to be set on concrete abutment piers located outside of defined drainage channels.

Site Clearance

All of the existing ranch dwellings and structures standing on the Lion's Gate site would be removed. This does not include the structures on the 20-acre "out-parcel" (Lot 42) which is not part of the project site. The applicant indicates that attempts would be made to re-use materials salvaged from the ranch complex within the project. The existing trees and mature landscaping at the main ranch site would not be removed but would be preserved as part of the project. The old orchard on the northeastern parcel, north of Highland Avenue, would be removed and replaced with vineyards along the Coolidge Avenue frontage.

Grading and Excavation

Grading and excavation is required to recontour natural slopes for the golf course and practice range, to create the proposed lake, irrigation storage reservoir and retention basins, to prepare the site of the clubhouse, overnight units, practice range and associated parking lots, and to create acceptable grades for the internal roads, driveways and residential building pads. The estimated grading quantities for these various project elements are provided in Table 4. The preliminary grading plans are available for review at the County of Santa Clara Department of Planning and Development.

Cuts and Fills

The total estimated earthwork for the project is approximately one million cubic yards of combined cut and fill, which would be balanced on the site.

The area of the proposed clubhouse, overnight complex and parking lot would require 37,530 cubic yards of cut and 25,900 cubic yards of fill. The maximum slope angle for cuts and fills would be 2:1 (horizontal:vertical) with the majority of graded slopes having flatter slopes. No retaining walls are proposed to support fill slopes.

Temporary excavations would also be required for underground pipelines, utilities and sewage disposal systems.

All proposed grading would take place in accordance with the recommendations of a geotechnical engineer, and would be subject to the conditions of the Grading Permit to be approved by the County.

Excavations for Lakes

There are 4 lakes or ponds proposed as part of the project. These include the following: the irrigation storage reservoir located at the west end of the golf course, which would involve excavation of 68,700 cubic yards of earth; the runoff detention pond near the 18th green, which would require the removal of 7,950 cubic yards; the wastewater storage pond north of the driving range, which would entail the excavation of 69,000 cubic yards of material; and the 20-acre lake to be located at the main residential subdivision in the southeastern portion of the site, which would involve the removal of 70,200 cubic yards of earth. The excess material generated by these excavations would be used in the berms planned along Turlock and Coolidge Avenues.

Drainage

The project largely incorporates the existing natural drainage system into the design of the golf course and residential areas. In the golf course plan there are several instances where short reaches of tributary drainages would be rerouted or piped to accommodate the fairway layout. Along the West Branch of Llagas Creek, there are two locations upstream of the clubhouse site where small existing meanders would be removed in the golf plan. The natural drainage channels in the residential areas would be largely unaltered. The existing flow characteristics of West Branch Llagas Creek are not proposed to be altered in the proposed project plans.

<u>Golf Course Drainage</u>

The objective of the golf course drainage plan is to avoid having surface runoff drain directly to natural on-site drainage courses. Thus the golf course would be designed and graded to direct storm runoff toward the centers of fairways, and to off-channel retention basins and ponds. In addition, the golf course would include filter strips of roughs or natural vegetation which would provide for infiltration of storm runoff from the turfed areas. These filter strips would vary in width from 25 feet to several hundred feet, and would serve to treat stormwater and limit velocities before runoff enters natural water courses or wetland areas.

Some underground storm drains would be installed for the clubhouse and overnight complex. Surface runoff from the parking areas would be conveyed to nearby retention basins. Storm runoff collected in the basins would not be released to the creek channel but would percolate into the soil or evaporate. The retention basins would be cleaned of accumulated sediments as needed.

Except under major storm conditions, most runoff would be expected to be absorbed by the dense turf grass. Concentrated flow would only occur along internal roads, driveways, and cart paths, which would be designed to divert flows, and would include curbs, inlet structures and outlet protection as appropriate.

As discussed under "Irrigation System" below, excess irrigation water would be minimized by a computerized control system which would utilize data from an on-site weather station to calculate evapotranspiration rates for each type of grass, allowing water to be applied on an as-needed basis only.

The putting greens would drain through vegetated turf buffers at least 25 feet wide and/or into water quality control basins, dry wells, or ponds. There would be grass-lined swales providing for a minimum of 25 feet of overland flow for filtration of runoff from these subsurface drainage collection areas before discharge, or discharge would be to drywells located at least 25 feet from a wetland or riparian area. Where subsurface drainage cannot meet these criteria, filtration traps constructed of a sand/charcoal filter would be installed adjacent to the putting green.

<u>Residential Drainage</u>

The drainage from the Rural Residential subdivision located north of Highland Avenue would be conveyed directly to the reach of West Branch Llagas Creek which flows through the southern portion of this area.

The cluster subdivision south of Highland Avenue would drain to the 20-acre lake planned for this area, which would also provide flood detention storage (see Section *III. E. Hydrology and Drainage*.)

To the extent feasible, the natural drainage from the hillside area west of the main subdivision area would be intercepted by in new drainage swales and directed to the residential storm drainage system.

TABLE 4

GRADING SUMMARY

Project Element	**Quantities (Cubic Yards)** Cut	Fill
Golf Course		
Fairways, Tees, Greens, Roughs, Cart Paths	149,800	215,150
Irrigation Storage Reservoir	68,700	5,200
Runoff Detention Pond (near 18th Green)	7,950	--
Practice Range (Driving Range, Chipping and Putting Greens)	3,650	9,750
Practice Range Parking (including berms)	1,600	5,300
Clubhouse	2,130	1,600
Overnight Complex	7,100	8,100
Parking (+ Retention Basin) for Clubhouse & Overnight Units	28,300	16,200
Maintenance Facility	--	4,700
Maintenance Access Road	3,140	3,200
Swim and Tennis Center	3,020	700
Wastewater Storage Pond	69,000	--
Subtotal Golf Course	344,390	269,900
Residential		
Rural Residential Cluster (32 ac/6 lots)		
· Roads and Building Pads	3,400	2,030
· Landscaped Berms	--	55,800
Hillside Cluster Residential (35 lots)		
· Roads and Building Pads	31,700	9,500
· Lake	70,200	51,900
· Landscaped Berms	--	94,800
Subtotal Residential	105,300	214,730
Main Access Road (from Highland to Clubhouse)	48,200	14,900
Equestrian Center	1,990	1,050
Subtotal	50,190	15,950
Total Project	499,880	499,880

Equestrian Center

As noted previously, drainage within the equestrian center would be directed to a retention basin to be located at the eastern end of the site near Turlock Avenue. To the extent feasible, natural drainage originating upslope of the equestrian center would be diverted around the equestrian area and directed to the proposed lake to the north.

Landscaping and Tree Protection

In anticipation of project landscaping needs, the project applicant collected acorns and seeds from on-site trees in 1989 for the replanting program. There are now over 2,500 trees including 454 valley oaks, 1,774 sycamores, 216 black walnuts, and 128 buckeye that have been raised for this purpose. The intent is to plant the riparian species along West Branch Llagas Creek and its tributaries, and to plant the oaks throughout the golf course and residential areas as well as along the creek. The black walnuts would be used in the landscaped berms along the project frontage, where they would complement the existing row of black walnuts along Turlock Avenue.

Existing trees to be retained would be protected during grading and construction by fencing around the dripline. Irrigation systems and trenches would not be installed within the dripline. No root encountered during trenching larger than two inches would be severed, and smaller roots which are cut would be treated with appropriate sealant.

The varieties of grasses to be used in the golf course have been selected based on the following criteria: golf course performance, low water requirement, high pest resistance and low fertilizer needs, thus minimizing the need for irrigation and application of pesticides and fertilizers. The landscape concept for the golf course and the clubhouse complex focuses on the use of native and naturalized grasses, trees, shrubs, groundcovers, vines and perennials.

To prevent damage resulting from deer browsing on new plantings, the newly installed landscaping would be surrounded with protective fencing where necessary.

Irrigation System

The goal of golf course irrigation is to apply water to the turf grass that is not provided by precipitation. Irrigation allows the grass to remain healthy, resist disease invasion, insect attacks and weed competition. The total annual irrigation demand for the golf course is estimated to be 122 million gallons (374 acre-feet), with an average daily demand of 334,000 gallons. The average irrigation water demand during the summer months is estimated to be approximately 677,000 gallons per day.

Water supply for golf course irrigation would be obtained from a combination of sources, including on-site pumping of groundwater, non-potable water from Twin Valley, Inc., and backup supplies from West San Martin Water Works (see "Water Supply" below). The non-potable irrigation water would be piped to the irrigation storage reservoir to be excavated at the western end of the golf course south of the maintenance facility.

According to the environmental management plan prepared by Audubon Conservation Services (contained in Appendix E of this EIR), water application rates would be carefully managed to meet precise plant requirements and to stay below the infiltration capacity of the soil. This would avoid applying excess water that could lead to over-saturation of the soils, thus reducing the risk of surface ponding or runoff and the leaching of fertilizers and pesticides.

This optimum efficiency would be accomplished through a system of computerized field controllers that would allow site-specific irrigation for any given area depending on localized needs and conditions. A weather station would be installed at the maintenance facility to record rainfall, solar radiation, air temperature, soil temperature, and relative humidity. This information would be used to carefully determine evapotranspiration demands and irrigation requirements. Irrigation schedules would be adjusted daily in response to calculated needs for each area and each type of turf (tee, green, fairway or rough). Because of the many variables to consider, i.e., slope, soil types, rooting depth, etc., fine-tuning of the irrigation program by the golf course superintendent and irrigation technician would be essential, even with the most sophisticated irrigation system available.

Sprinkler heads would be sited so as to avoid watering areas where irrigation is not required or desired. One of the primary responsibilities of the golf course superintendent and irrigation technician would be to monitor the sprinkler heads frequently to be sure all heads are operating properly and that no head is inadvertently applying water to an environmentally sensitive area.

Irrigation during the rainy season would occur infrequently, perhaps an average of one day per week. Water requirements would be high during the 6-month grow-in period, when water would be applied at rates approximately double those estimated for the golf course once established. Although higher than normal volumes of irrigation water would be applied during the grow-in period, the water would be applied in short cycles to keep the ground moist in order to facilitate germination of the grass seed. Over-watering would be avoided to prevent drowning the young seed, so there would be little or no runoff of irrigation water.

Chemical Management

The goal of the project is to implement environmentally sensitive fertilization and pest management practices in the operation of the golf course. In order to maintain healthy turfgrass while avoiding environmental contamination, the golf course operation would follow the comprehensive Environmental Management Plan prepared for the project by Audubon Conservation Services. The full ACS report is contained in Appendix E of this EIR. The main elements of the program that relate to chemical management are described below.

Fertilization

Application of fertilizers to turfgrass is necessary to maintain the course in good playing condition. The maintenance of healthy dense turfgrass also maximizes natural pest resistance and provides an effective biofilter to prevent groundwater contamination. The thatch produced by the turf acts as an organic filter to chemically bond or immobilize pesticides until they are degraded through microbial action.

However, over-fertilization can lead to nitrogen runoff and leaching through subsoil in the form of nitrate, which could result in eutrophication of lakes and streams, as well as groundwater contamination which could pose a potential public health hazard. Nitrate movement is proposed to be minimized in the project through best management practices (BMPs). This first involves determination of precise nutrient requirements based on turfgrass types and soil characteristics, especially infiltration rates. The nitrogen fertilizer selected would be the slow release or less soluble form. Fertilizer application would be timed to coincide with the period of greatest plant uptake, and would avoid periods of potential rainfall and stormwater runoff.

Application rates would be monitored closely and adjusted as necessary to prevent exceedance of assimilation capacity. Irrigation rates would be managed to coincide with evapotranspiration, thus minimizing leaching of nutrients beyond the root zone. Soils under tees, greens and fairways would be tested regularly for potential nitrogen buildup, with application rates adjusted accordingly. During the grow-in period, only normal amounts of fertilizer would be applied in order to avoid burning the young plants. The fertilization program proposed is described in detail in the Environmental Management Plan prepared by Audubon Conservation Services, which is contained in Appendix E of this EIR.

The elevated nitrate levels contained in the irrigation water (from both Twin Valley Inc. and on-site groundwater) would be factored into the fertilization program. Thus applied nitrogen would be reduced commensurate with the nitrogen content of the irrigation water.

Pest Management

The use of insecticides, herbicides and fungicides on golf courses occurs relatively infrequently, and is typically conducted only once or twice a year. Insect problems at the Lion's Gate golf course are expected to be minimal, consisting primarily of root feeding grubs and lepidoptera larvae.

In order to minimize the potential effects of pest control, the project includes an Integrated Pest Management Program (IPM). To the maximum extent feasible, this program relies on non-chemical methods such as selecting pest resistant grasses, employing cultural practices to keep the turfgrass healthy (e.g., spiking, aerifying, vertical mowing, rolling, topdressing), avoiding excess fertilizer application, and preventing excessive moisture conditions which favor the occurrence of infectious diseases. The IPM would also reduce the use of pesticides where possible by employing biological control of pests. This involves the strategic introduction of organisms which are natural enemies of pest to be eliminated (e.g., parasitic nematodes and bacteria).

During the preparation of the Environmental Management Plan for the project, the potential pesticides (this term includes insecticides, herbicides and fungicides) to be used at the Lion's Gate Reserve were assessed using screening models and simulation models. The primary factors analyzed were: the potential quantity of a chemical that may be used at the golf course, the chemical's mobility, leaching potential, persistence and toxicity. Based on this assessment, restrictions were placed on the use of certain pesticides on the golf course (see Appendix E for the detailed assessment results).

In order to minimize the impacts of pesticide use, a number of best management practices (BMPs) would be employed. The following is a partial list of planned management practices (see Appendix E for a full discussion).

- Pesticides would be handled, applied, and disposed of by a licensed spray technician. The application equipment would be inspected for proper calibration before every pesticide application.

- Pests would be accurately identified and pesticide applications made only when and where necessary (preferably when pests are at the most vulnerable stage), using the least amount required.

- Pesticides would not be applied when soil moisture is high during the rainy season, or when storms are anticipated. No pesticides would be applied during the grow-in period.

- A controlled and designated area/facility would be provided at the maintenance facility for the proper mixing and loading of pesticides into application equipment. The facility would include an impermeable pad with controlled and contained drainage.

- Monitoring the course on a daily basis to detect symptoms of pest problems.

- A minimum 25 feet of rough around all playing areas would be provided as a buffer zone for adjoining wetland or riparian areas. No pesticides would be used in these rough area buffers.

- A minimum vertical separation of two feet would be provided between any green playing surface and the expected maximum seasonal groundwater elevation. This would reduce the potential for high groundwater to inundate the underdrain collection systems, and would allow a sufficient thickness of unsaturated soil to attenuate infiltrating compounds.

The Integrated Pest Management program would be managed by the Golf Course Superintendent, who would be responsible for all chemical applications and storage. The State of California requires that such chemical application and handling be performed by licensed individuals with a Qualified Applicator Certificate (QAC) issued by the state. The superintendent would be so licensed and would be an active member of the Golf Course Superintendents Association of America (GCSAA). The superintendent would be a full-time employee of the Lion's Gate Reserve, and must attend GCSAA training and education seminars to remain current with the association. It is likely that the country club would also employ an assistant to the superintendent who would also be a licensed applicator.

Water Supply

It is estimated that the average daily water demand for the project would be approximately 57,000 gallons for domestic purposes, and 334,000 gallons for golf course irrigation. During the summer months, the daily irrigation demand is estimated to be 677,000 gallons per day. Treated water for domestic supply for the residential areas, clubhouse, overnight complex, maintenance facility, swim and tennis center, and the equestrian center would be provided by the West San Martin Water Works. Irrigation water would be supplied by a combination of sources, including on-site pumping of groundwater, non-potable water from Twin Valley Inc., and backup supplies from West San Martin Water Works. These sources of supply would be adequate to meet the peak water demands of the project, including minimum fire flows (see Section *III. P. Water Supply*).

Wastewater Treatment and Disposal

The proposed method of wastewater treatment and disposal for the project is the use of a centralized collection and treatment operation, with treated effluent sprayed onto the proposed practice range. All of the residential lots and golf course facilities would have septic tanks for the primary treatment (settlement) of solids, with untreated effluent piped to the proposed treatment facility to be located north of the driving range. An effluent storage pond would be excavated to the northwest of the driving range, to provide for wet-weather storage of the treated effluent. The treated effluent would be disposed of by spray irrigation over the driving range, the chipping green area, and a 3 to 4-acre area in the adjacent permanent open space area to the west (see Section *III. Q. Wastewater Treatment and Disposal*). The treated effluent would be applied at rates matching the evapotranspiration rate of the turfgrass, and spray irrigation would not occur during the winter months. Thus there would be no leaching or runoff of effluent into the groundwater or on-site drainages.

The maintenance facility would not be connected to the centralized wastewater disposal system, but would have its own individual septic tank and leachfield.

Community Services District

The proposed community wastewater system would be owned and operated by the Community Services District (CSD) established for the project. To establish a CSD, either the property owner or the County must make an application to the Local Agency Formation Commission (LAFCO) to approve formation of the district. The operation of the CSD would be financed by assessing the participating property owners through their property tax bill. The establishment of a public authority such as a CSD for facility ownership and operation would assure the ability to assess and collect necessary funds for on-going system maintenance and operation. This funding would be secured against the individual residential and golf course properties in the Community Services District.

C. PROJECT OBJECTIVES

The stated objective of the sponsors of the Lion's Gate Reserve is to create and construct a premiere public access 18-hole golf facility that is unique in every aspect, while maintaining an emphasis on environmental sensitivity. The project's clubhouse and golf related 45 overnight accommodation units would be designed to serve the needs of the public and business community of the Santa Clara Valley, while the clustered 41 residential lots have been designed and situated to achieve the goals of the County's Cluster Ordinance and the long range goals of the Preservation 2020 Task Force in the preservation of over 1,200 acres of permanent open space. The 41-lot residential component will have strict CC&Rs (Covenants, Codes and Restrictions) and architectural controls to preserve the environment and rural character of the area.

It is the stated goal of the sponsors of the project to incorporate the existing natural resources of the site into the design and minimize environmental pollution or hazards in the development and operation of the golf course facility. The project sponsors state that they have shown their commitment to the achievement of this goal by implementing into the design of the project the County's Interim Environmental/Design Guidelines for golf courses, and by enrolling the project into the Audubon Cooperative Sanctuary Program to obtain the status of a "Certified Wildlife Sanctuary".

D. OTHER PROJECTS IN THE VICINITY

There are 13 projects in the vicinity of the Lion's Gate project which have been approved, but which have not yet been completed within the City of Morgan Hill and the unincorporated community of San Martin. These include: 10 residential projects with a total of 324 single-family dwellings and 33 units of senior housing; one RV park with 272 spaces; one commercial project of 27,000 square feet, and one commercial and gas station project of 22,000 square feet.

These projects were considered in evaluating the cumulative impacts of the proposed project, and have been factored into to the background conditions for the evaluation of traffic, noise and air quality impacts.

E. USES OF THIS EIR

The primary purpose of this EIR is to provide the County of Santa Clara decision-makers and the general public with a detailed project description and a thorough analysis of environmental impacts associated with the proposed project. The EIR will be used for the following discretionary approvals by the County:

- General Plan Amendment
- Rezoning
- Use Permit
- Cluster Development Permit
- Tentative Map
- Grading Permit
- Wastewater Treatment System Permits
- Architecture and Site Approval
- Design Review
- Lot Line Adjustment

In addition, the EIR will be used by responsible agencies for their separate permit approval processes, as listed below:

U.S. Army Corps of Engineers (USACE): Administration of Section 404(b) of the Clean Water Act for filling of wetlands.

U.S. Fish and Wildlife Service (USFWS): Approval of mitigation plans for the California tiger salamander and western pond turtle.

California Department of Fish and Game (CDFG): Streambed Alteration Agreement under Section 1603 of the Fish and Game Code.

Santa Clara Valley Water District (SCVWD): Permit for grading or construction within 50 feet of West Branch Llagas Creek, a District facility.

Central Coast Regional Water Quality Control Board (CCRWQCB): Approval of the wastewater treatment and disposal system; administration of NPDES General Permit for construction activity.

Santa Clara County Local Agency Formation Commission (LAFCO): Approval of Community Services District (CSD) for project.

County of Santa Clara Department of Environmental Health Hazardous Materials Compliance Division: Approval of hazardous materials handling and storage under the County's Hazardous Materials Storage Permit Ordinance.

II. CONSISTENCY WITH PLANS, POLICIES AND REGULATIONS

A. FEDERAL POLICIES

Clean Air Act

The federal Clean Air Act was enacted in 1967 to protect and enhance air quality, and to promote the public's health and welfare. Initial efforts were the establishment of national ambient standards by the U.S. Environmental Protection Agency (EPA), designation of local air pollution control districts and creation of an air quality monitoring network.

The U.S. Clean Air Act Amendments of 1977 required that each state identify areas within its borders that did not meet federal primary standards as non-attainment areas. The San Francisco Bay Air Basin is currently a non-attainment area for carbon monoxide, and until recently, for ozone. The state was required to prepare a State Implementation Plan (SIP) to show how the federal standards would be attained by 1987. Despite considerable improvement in air quality, the Bay Area did not meet the 1987 deadline for attainment of the federal air quality standards.

The federal Clean Air Act Amendments of 1990 mandate a fresh attempt at attaining the national standards, requiring that plans and strategies be developed for non-attainment areas to meet the federal standards. Failure to meet the requirements of the federal Clean Air Act could result in the imposition of sanctions (e.g., withholding of highway project funding).

Measured levels of ozone in the San Francisco Bay Air Basin have declined to the point that in January 1995 the U.S. EPA certified the Bay Area as a maintenance area for ozone. A similar redesignation request for carbon monoxide was made in 1994 and is awaiting a final decision.

<u>Consistency</u>: The proposed project would result in an increase in traffic relative to existing conditions. However, the resulting emissions would not exceed the applicable federal air quality standards. Construction activity associated with site development would generate minor temporary emissions, but would not result in exceedances of air quality standards. The project, therefore, would be consistent with the Clean Air Act. (See Section *III. M. Air Quality* for a full discussion.)

Clean Water Act (Section 404)

Section 404(b) of the federal Clean Water Act was established to preserve water quality and discourage the alteration or destruction of wetlands. This act requires the U.S. Army Corps of Engineers to evaluate the impacts of the discharge of dredged or fill materials into any water of the United States. Pursuant to the Act, the Corps requires submittal of permit applications for proposed filling of wetlands. For projects involving substantial loss of wetlands, the Corps requires an individual project permit. Minor fills may qualify under the Nationwide permit providing blanket approval for such minor losses. The U.S. Army Corps Wetlands Policy requires mitigation for any impacts to designated wetland areas.

<u>Consistency</u>: The proposed project would fall under the Corps permit authority for the filling of approximately 1.5 acres of jurisdictional wetlands on the site. It is possible that the project could qualify under the Nationwide permit, given the relatively small acreage involved. If not, an individual Section 404 permit may be required. With the implementation of mitigation measures to compensate for the lost wetlands, which would be subject to approval by the Corps under Section 404, the project would be consistent with the Clean Water Act (see Section *III. G. Biological Resources*).

Clean Water Act (Section 304(1)

Section 304(1) of the federal Clean Water Act required that the Environmental Protection Agency (EPA) develop National Pollutant Discharge Elimination System (NPDES) Permit application requirements for various storm water discharges, including those from municipal storm drain systems and from construction sites.

In 1992, the State Water Resources Control Board (SWRCB) implemented the NPDES General Construction permit for Santa Clara County. For properties of five acres or greater, a Notice of Intent (NOI) to comply with the NPDES General Permit for construction activity must be filed, and a Storm Water Pollution Prevention Plan (SWPPP) must be completed prior to commencement of grading and construction.

Consistency: Prior to grading and construction, the applicant would be required to file a Notice of Intent (NOI), and prepare a Storm Water Pollution Prevention Plan (SWPPP) for the project. In addition, the project would include structural and non-structural control measures and management practices to reduce potential effects of stormwater runoff due to construction and on-going operational activities associated with the golf course. These measures are described in Section *III. F. Water Quality*.

Endangered Species Act

The federal Endangered Species Act was passed in 1973 to provide a process for listing species as either "endangered" or "threatened," and stipulates protection for listed species. The Act defines as "endangered" any species which is in danger of extinction throughout all or a significant portion of its range. A "threatened" species is any species which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. The Act also identifies candidate species, which may qualify for listing. Section 10 of the Act establishes a process whereby "incidental taking" of a listed species may be authorized for a private project, provided the project has avoided the species to the maximum extent feasible, and that mitigation is provided for the unavoidable taking. The Act is administered by the U.S. Fish and Wildlife Service.

Consistency: According to the biological surveys conducted on the project site, there are several federally-protected species present including the California tiger salamander, the western pond turtle, Opler's long horn moth, the Santa Clara dudleya and the most beautiful (or uncommon) jewelflower. The latter three species are endemic to the serpentine grassland which occurs on the northeast hillside, which would not be disturbed by the proposed development. One of the stock ponds that provide habitat for the tiger salamander would be filled as part of the golf course. However, these potential impacts would be fully mitigated by the creation of replacement ponds and the preservation of suitable adjacent upland in the permanent open space area of the site, as discussed in Section *III. G. Biological Resources*. With the implementation of these mitigation measures, which would be subject to the approval of the U.S. Fish and Wildlife Service, proposed project would not be in violation of the federal Endangered Species Act.

B. STATE POLICIES

Section 1603 of the State Fish and Game Code

Administered by the California Department of Fish and Game (DFG), Section 1603 applies to private projects which would result in the alteration of bed, channel, or bank of any river, stream or lake and associated riparian corridors. It requires Streambed Alteration Agreements for such activities, with specific requirements for minimizing siltation and restoring damage to riparian habitat.

Consistency: A Section 1603 Streambed Alteration Agreement would be required for the proposed filling and alteration of one of the on-site ponds, and the bridge crossings and minor channel realignments of West Branch Llagas Creek. With the creation of new ponds and the enhancement of riparian habitat on the site as proposed, and with the execution of a Streambed Alteration Agreement, the project would be consistent with Section 1603 of the Fish and Game Code.

Wetlands Policy

The state wetlands policy calls for the protection of marshlands and other designated wetland areas. This policy is administered by the DFG under Sections 1601-1603 of the Fish and Game Code in conjunction with streambed alteration agreements.

Consistency: Compliance with State Wetlands Policy would occur through mitigation for any removal of wetlands as required under the federal Clean Water Act, as discussed above. Mitigations specifically required by DFG would be included as conditions of the Streambed Alteration Agreement. This would ensure that the project is consistent with the State Wetlands Policy.

California Endangered Species Act

The California Endangered Species Act (CESA) was enacted in 1984 to protect rare, threatened, and endangered species in California. These species are defined as species whose continued existence is jeopardized. CESA establishes a policy that state agencies such as DFG should not approve projects that would jeopardize listed species or cause the destruction or adverse modification of essential habitat for listed species.

Consistency: There are no state-listed species known to be present on the site, although there are several state species of special concern present, including the California tiger salamander, the western pond turtle, the American badger, potentially the burrowing owl, and other raptors. Impacts to these species would either be avoided or fully mitigated as discussed in Section *III. G. Biological Resources*. As such, the project would not be in violation of the state Endangered Species Act.

California Clean Air Act

While the state air quality standards have existed for many years, there was no legislative requirement that they be attained until 1988, when the California Clean Air Act was enacted. The Act empowers regional air quality management districts with new authority to design, adopt, implement, and enforce comprehensive plans for attaining and maintaining both the federal and the more stringent state air quality standards by the earliest practical date. Among its provisions, the California Clean Air Act provides air districts with the authority to establish new controls on mobile sources of pollution.

The area-wide plan for the Bay Area required by the California Clean Air Act was adopted in October 1991. The plan proposes the imposition of controls on stationary sources (factories, power plants, industrial sources, etc.) and Transportation Control Measures (TCMs) designed to reduce emissions from automobiles, including indirect sources, such as shopping centers, airports, etc.

Consistency: Since the proposed project would not result in the exceedance of any state air quality standard, development of the site would be consistent with the California Clean Air Act of 1988.

C. REGIONAL PLANS AND POLICIES

Association of Bay Area Governments (ABAG) Environmental Management Plan

ABAG's San Francisco Bay Area Environmental Management Plan was prepared in 1981 to address the issues of regional water quality, water supply, solid waste, and air quality in an attempt to meet state and federal standards. The plan also designates the agencies responsible for executing the appropriate activities.

<u>Consistency</u>: As discussed in this EIR, the proposed project would not result in significant air quality impacts, provides for adequate water supply, and includes mitigations for potential water quality impacts, and provides for the reduction of solid waste generation. As such, the project would be consistent with ABAG's Environmental Management Plan.

ABAG Regional Plan 1990-2010

This plan updates the ABAG Regional Plan 1970-1990, and combines policies from subsequently adopted plan elements and other ABAG actions. This plan describes regional areas, and policies and strategies for regional planning in the Bay Area. A major thrust of the plan is to reduce travel distances by promoting the construction of housing near employment sites, and recreational opportunities near population centers.

<u>Consistency</u>: The proposed project involves the establishment of a public access golf course facility within driving range of the urbanized area of Santa Clara County, which currently has a well-documented shortage of golf courses relative to demand. To the extent that the project would avoid longer distance driving to golfing opportunities further from the urbanized area, it would help implement the ABAG Regional Plan. In addition, the provision of overnight accommodations at the site would reduce trips for those who would otherwise seek lodging off-site, thus having an beneficial effect on overall traffic congestion.

1995 Draft Bay Area Air Quality Management District CEQA Guidelines

The 1995 Draft Bay Area Air Quality Management District (BAAQMD) CEQA Guidelines consist of a comprehensive guide for assessing the air quality impacts of projects and plans. The document contains an overview of air quality programs and standards, and provides criteria for determining significant local and regional air quality impacts. The guidelines define a significant impact on local air quality as a substantial increase in carbon monoxide emissions on the local street network, or exceedance of state and federal carbon monoxide concentration standards. Under these guidelines, project emissions of regional criteria pollutants such as reactive organic gases, oxides of nitrogen (precursors of ozone) and PM-10 (particulates) are considered to be significant if they exceed 80 pounds per day.

<u>Consistency</u>: Based upon the BAAQMD Guidelines, the proposed project would not result in a significant local or regional air quality impact, as discussed in Section *III. M. Air Quality*. Therefore, the project would be consistent with the BAAQMD CEQA Guidelines.

1994 Bay Area Clean Air Plan

The 1994 Clean Air Plan ('94 CAP) establishes regional policies and guidelines to meet the requirements of the 1988 California Clean Air Act. The '94 CAP mandates compliance with the state air quality standards and establishes rates of progress toward this goal. Each non-attainment area is required to submit detailed plans to provide for new control programs and schedules for their implementation.

Consistency: The proposed project would be consistent with the 1994 Clean Air Plan since it would not result in significant increases in air pollution emissions.

Santa Clara County Congestion Management Program

In accordance with Proposition 111, the County of Santa Clara completed preparation of the first Santa Clara County Congestion Management Program (CMP) in 1991 (a revised CMP was adopted in October 1995). The CMP legislation requires that all urbanized counties in California prepare a Congestion Management Program in order to obtain each county's share of the increased gas tax revenues. The CMP legislation requires that each CMP contain five mandatory elements: 1) a system definition and traffic level of service standard element; 2) a transit service and standards element; 3) a transportation demand management and trip reduction element; 4) a land use impact analysis element; and 5) a capital improvement element. Santa Clara County's CMP includes the five mandated elements, in addition to a county-wide transportation model and database element, an annual monitoring and conformance element, and a deficiency plan element.

Consistency: A CMP analysis is required when a project generates more than 100 peak hour trips, and when these trips would affect CMP roadway facilities, which consist of regional roadways. Since the project would generate close to 100 peak hour trips in the p.m. peak hour, the traffic analysis for this project was conducted in accordance with the CMP methodology. (See Section *III. K. Traffic and Circulation.*)

D. SANTA CLARA COUNTY POLICIES AND REGULATIONS

General Plan

The following discussion presents the relevant policies of the Santa Clara County 1995 County General Plan, with an analysis of the project's consistency with the applicable policies. Since the project site is largely within the Hillsides designation, the principal measure of GP consistency involves the Hillside policies, as discussed below.

Hillsides

The majority of the project site is designated "Hillsides" on the Land Use Plan of the Santa Clara Country 1995 General Plan. The "Hillsides" policies applicable to the project are as follows:

R-LU 16 — Hillsides: Mountainous lands and foothills unsuitable and/or unplanned for annexation and urban development. Lands so designated shall be preserved largely in natural resource-related and open spaces uses in order to:

a. support and enhance rural character;
b. protect and promote wise management of natural resources;
c. avoid risks associated with the natural hazards characteristic of those areas; and
d. protect the quality of reservoir watersheds critical to the region's water supply.

R-LU 18 — The range of allowable land uses shall consist of:

a. agriculture and grazing;
b. mineral extraction;
c. parks and low-density recreational uses and facilities;
d. land in its natural state;
e. wildlife refuges;
f. very low density residential development; and
g. commercial, industrial, or institutional uses, which by their nature

1) require remote, rural settings; or
2) which support the recreational or productive use, study or appreciation of the natural environment.

R-LU 19 The standard allowable density of residential development shall be that of one dwelling unit per 160 acres, unless the development is proposed as a "cluster development." If development is proposed as a residential cluster, the allowable density shall be as determined by the "20-160 acre variable slope-density formula." Residential development proposals must be designed as a cluster in order to utilize the 20-160 acre variable slope-density formula.

a. If the average slope of the parcel is 10% or less, the average area per dwelling unit shall be 20 acres.
b. If the average slope of the parcel is 50% or above, the average area per dwelling unit shall be 160 acres.

R-LU 20 Proposed cluster residential developments shall adhere to the following:

1. Developed Area: the building envelopes for all residences and the locations of all other permitted uses proposed as accessory structures shall be specified in the design, the combined area of which shall not exceed 10% of the gross acreage of the site:
   a. if the property is under Land Conservation (Williamson Act) contract, the contract must be canceled or modified to exclude the portion of the site that is to be developed;
   b. no individual parcel created for residential development shall be less than 2 acres in size;
   c. the open space area shall be privately controlled and not accessible to the public unless the area is deeded to a public agency or entity willing to undertake responsibilities of ownership, maintenance, and public access [designated trail corridors may traverse such areas if proposed as part of the Regional Parks, Trails, and Scenic Highways Plan]; and
   d. land uses allowed within the area dedicated as permanent open space shall be limited to agricultural or other limited resource-related uses, and to non-commercial recreational facilities of an ancillary nature to the cluster residential development and for use by residents only.
2. Open Space: it is mandatory that no less than 90% of the land area shall be preserved permanently as open space through dedication of an open space or conservation easement precluding any future development:
   a. those portions of the land permanently preserved as open space shall be configured as large, contiguous and usable areas;
   b. the open space may be dedicated through easements over portions of individually-owned parcels or may be configured as separate parcels owned in common or individually.

R-LU 21 Design of the cluster development shall incorporate the following basic principles:

1. Site layout shall demonstrate efficiency in the location and length of roadways, driveways, and other basic infrastructure improvements or extensions.
2. Roads shall be of adequate design, capacity, and construction to accommodate traffic associated with the development safely, efficiently, and with minimal long term maintenance needs.
3. The locations of roads, building sites, septic system leach fields, or their major features of development must be accurately identified on the proposed subdivision map, and they shall:

a. avoid areas of natural hazards and avoid adverse impacts upon natural and heritage resources.
b. be required to mitigate or reduce potentially significant adverse environmental impacts to an insignificant level, particularly regarding water quality, through such means as adequate setbacks from water resources, avoidance of areas with high percolation rates and/or high ground water tables.

4. Building sites and access roads should be located such that areas of the site which pose a significant hazard, such as landslides, very steep slopes, fault traces, or floodways, are placed within the portion of the site that is dedicated as permanent open space.
5. Roads, building sites, and other facilities shall not be allowed to create major, lasting visible scars on the landscape.
6. Structures on or near ridgelines shall be located, constructed, and/or landscaped so that they do not create a significant adverse visual impact as seen from the Valley floor.

R-LU 25 Non-residential land uses allowed in "Hillsides" areas shall be of a generally low density or low intensity nature, depending on the use, as is consistent with the basic intent of the Hillsides designation to preserve the resources and rural character of the land. Non-residential uses shall:

a. avoid or minimize any potentially significant adverse environmental impacts;
b. provide adequate access to safely accommodate potential traffic without significantly impacting local transportation routes;
c. demonstrate no significantly increased risks associated with natural hazards;
d. not create adverse visual impacts as viewed from the Valley floor or from adjacent public recreational areas; and
e. cause no significant increase in the demand for public services or infrastructure, including potential impacts on school districts.

R-LU 27 Land uses proposed for inclusion within the Hillside zoning district may be evaluated for conformity with the intent of this land use designation by various measures of land use intensity, including but not limited to:

a. wastewater generation rates;
b. traffic generation rates;
c. extent of grading, vegetation removal, drainage modifications, or other alteration of the natural environment; and
d. noise or other nuisance potential.

R-LU 28 For all uses allowed in Hillsides areas other than agricultural and single-family residential land uses, open space preservation by means of easement dedication may be required in order to:

a. protect the public health, safety and general welfare;
b. prevent or mitigate potentially significant adverse environmental impacts; and/or
c. to create perimeter areas that adequately buffer neighboring properties from adverse off-site impacts of the proposed land use.

R-LU 29 The nature and duration of an open space or conservation easement shall be commensurate with:

a. the nature of the land use;

b. the duration to which that use has been entitled through County permitting procedures; and

c. the extent of alterations made to the natural landscape.

Analysis: The majority of the project site is designated Hillsides under the County's Land Use Plan. First and foremost, the project conforms with the applicable provisions of the General Plan and Hillside zoning ordinance governing allowable uses for areas designated Hillsides. The proposed golf course represents a low-intensity, low-density recreational land use as prescribed in the Resource Conservation Area and Hillside policies of the General Plan and the Hillside zoning ordinance, which allows such uses with securance of a conditional use permit. The golf course would utilize and complement the existing rural, open space character of the project site, also in conformance with the intent of the General Plan and Hillside zoning ordinance.

Secondly, the project's proposed Hillside residential cluster subdivision conforms precisely with the General Plan policies and zoning ordinance provisions governing maximum allowable density of development. Application of the Hillside 20-160 acre slope-density formula to the project results in an average area per dwelling unit of approximately 35 acres. Clustering of the project site's Hillside residential development potential allows for efficient design and infrastructure patterns, minimal visual and environmental impacts, and preservation of the vast majority of the project site's 1600+ acres in permanent open space, as intended by the Hillsides policies of the General Plan. The location of the clustered residential development is the environmentally superior choice of alternative locations within the overall project site, and furthermore maximizes the functional value and contiguity of open space lands, consistent with the intent of Hillside policies. The project also includes permanent open space dedication for over 90 percent of the Hillside-designated areas, exclusive of the golf course itself, as required by the ~~General Plan and~~ Hillside zoning ordinance for clustered subdivision proposals.

Thirdly, the project would not result in significant impacts to the environment and would not generate a significant increase in demand for public services, as discussed in detail in this EIR.

Fourthly, the design of the Hillside cluster subdivision conforms with the policies and ordinance provisions intended to govern the design of such projects, as found within the Hillside General Plan policies, and the Hillside and Cluster ordinances (Articles 14 and 52). Further, detailed conformance with the intent of applicable policies is to be achieved through the design and conditions applied to the actual cluster subdivision required of such a project.

Fifth, the proposed ancillary development to the golf course, particularly the clubhouse/overnight accommodations, conforms with the intent of the General Plan and Hillside zoning ordinance that such developments be low in density and intensity, in keeping with the rural character of the area, and of design and location which blends harmoniously with the natural setting. The project involves 45 units of overnight accommodations. That number of units is not inconsistent with the scale of the overall project, and the proposal to situate units on the side of the lower foothills minimizes their intrusiveness and bulk. The clubhouse/overnights facility is of a clustered, unified design, rather than a scattered, sprawling layout, further consistent with the intent of GP policy and zoning. Further detailed conformance with the intent of this policy is to be achieved through architectural and site review procedures subsequent to use permit approval.

The project is the first proposed golf course to take advantage of the provision of the Hillside ordinance which allows overnight accommodations in conjunction with the project. As such, the approval of a project of this nature with the proposed number of units could potentially serve as precedent for other similar uses proposed for rural hillside areas which also involve overnight accommodations. Such uses currently allowed under Hillside zoning include "hostels, lodges, group retreats, education retreats, guest ranches, and campgrounds..." In recognition of the need for standards defining the maximum allowable density of development for such uses, the

General Plan includes recommendation R-LU(i) 9 and 10 for studies to determine allowable densities of uses which involve overnight accommodations.

Until those studies are completed and their recommendations implemented through new policies or regulations, the number of overnight accommodations approved for the Lion's Gate project will stand as the only benchmark of what the County considers an "appropriate" development density for such uses. To reiterate, the current policy of the General Plan and the Hillside zoning ordinance require that the number of overnight units proposed be consistent with the scale of overall project. The Lion's Gate proposal does not conflict with this policy, but it must be recognized that approval of the Lion's Gate project makes it even more incumbent upon the County to perform the studies called for in the General Plan before additional proposals are made. [Note: an interpretation by the Board of Supervisors in 1995 permitted the Lion's Gate and Los Gatos County Club golf course projects from having to be held up until such time as the County undertakes the studies described in R-LU(i) 9].

Sixth, the project proposes no dedication of development rights, conservation or open space easements over the lands intended for the golf course. GP policy states that such open space dedication is not mandatory, but may be required for public health and safety reasons, to mitigate environmental impacts of the course design, and to create perimeter buffer areas with neighboring properties as needed to prevent off-site impacts of the project, if any. As none of these preconditions or prerequisites exist which would require dedication of development rights or other means of open space preservation for the golf course itself, no easements are proposed, consistent with the intent of Hillside policy on the subject.

Agriculture

Approximately 260 acres of the project site is designated "Agriculture-Medium Scale" by the General Plan's Land Use map. Of the two parcels designated Agriculture, one abuts Watsonville Road at the northwestern end of the Lion's Gate project site, while the other abuts Turlock Avenue at the southeast corner of the project site (see Figure 8). The project proposes that each of these parcels' designation be changed from Agriculture-Medium Scale to Hillsides, in order to facilitate the clustering of the permitted residential density for the site on the most suitable areas for development, and to preserve the central and westernmost portions of the site in open space.

Currently applicable policies governing areas designated Agriculture include the following:

R-LU8	Santa Clara County is enriched by a special combination of the very finest soils, a very favorable, dependable growing climate, and generally adequate water supplies. Lands in agricultural uses contribute to the economy and quality of life enjoyed by county residents. This combination of factors makes it highly desirable that certain lands be preserved for their intrinsic value as agricultural land and for productive agricultural land uses.
R-LU 10	Lands designated Agriculture include those having Class I, II and III soils which generally have been in agricultural production and where agricultural uses are most appropriate.
R-LU 11	Allowable land uses shall be limited to: a. agriculture and ancillary uses; b. uses necessary to directly support local agriculture; and c. other uses compatible with agriculture which clearly enhance the long term viability of local agriculture and agricultural lands.
'R-LU 15	For areas designated 'Agriculture-Medium Scale', minimum parcel sizes shall be no less than 20 acres.

Analysis: The overall project and proposed change of land use designation for the 115-acre parcel along Watsonville Road would effectively result in no change from the current on-site land use which is grassland for grazing. This parcel has never been in cultivation for any crop other than hay, and will remain as grasslands available for hay cultivation. The subdivision and development potential for this property is the same under either the Agriculture or Hillsides land use designation, by virtue of its having an average slope of 10% or less overall. The benefit of the proposed change of designation is that all development potential may be transferred to a more preferable site for clustered residential development, leaving the 115-acre parcel in permanent open space. Without the change of land use designation, this marginally viable agricultural area along Watsonville Road, situated between scattered pockets of Rural Residential areas, might well become developed in time with inefficient 20-acre estate home sites, as agriculture and uses supportive of agriculture become less common in the northern Watsonville Road corridor. Consequently, under the proposed project, the change of land use designation is in actuality consistent with the intent of County policy that agricultural and open space lands remain in rural and in open space uses. The effect of this change is that the parcel would be preserved in its undeveloped state, and uses would be far more restricted than under the current designation and zoning for the land.

Regarding the 144-acre parcel at the southeast end of the site adjacent to Turlock Avenue, the change of land use designation is proposed in order to utilize the most suitable area within the project site for most of the proposed clustering of residential home sites. The proposed development of this parcel of land would result in the loss of approximately 100 acres of prime farmland. The impact of this loss is reduced by the fact that agricultural cultivation of this site is no longer economically feasible. (See Section *III. B. Agriculture* for a full discussion.) Furthermore, this site is isolated relative to other areas designated for Medium Scale Agriculture, and lands to the east within San Martin are designated for mixed agriculture, and residential development under the County's Rural Residential designation, indicating that medium-scale agriculture in the general vicinity does not have a long-term future under current County policy. Instead, small scale agricultural uses and residential "ranchettes" predominate the San Martin area. To the south of the southeastern boundary of the site, there is a narrow strip of land along the base of hillside area that is designated "Agriculture-Medium Scale." This area is currently in pasture and horse ranches. Thus the change to "Hillsides" on the project site is unlikely to affect agricultural production on these lands, since they are currently not in cultivation.

To reiterate, the purpose of the General Plan Amendment is to allow partial clustering of the permitted density under the Hillsides designation onto the eastern Am parcel of the project site. Under the proposed project, the portion of this parcel nearest to Turlock Avenue would become a buffer zone, thus minimizing potential interface impacts with ongoing agricultural operations to the east. This would allow the central portion of the Lion's Gate site to be developed for only the golf course and related facilities. Due to the flatness of the Am areas of the site, the overall density permitted under the Hillsides designation would be the same as the under the existing Am designation at 20 acres minimum. The ability to keep residential uses out of the central area of the site would be more efficient in terms of provision of internal roads and utilities, and would be beneficial for wildlife (e.g., allow maximum protection of upland habitat for the California tiger salamander and the western pond turtle, minimize the removal of valley oak trees, and generally minimize mortality and disturbance to wildlife.)

In summary, while the proposed project includes a change of land use designation which would result in the conversion of agricultural land to a developed state, the net overall value of this conversion may be beneficial rather than adverse.

Resource Conservation Areas

The "Hillsides" and "Agriculture" designations of the General Plan fall under a broader category of land uses designated as "Resource Conservation Areas" which encompasses all non-urban or rural land uses. Other land use designations within this category include Baylands and Ranchlands, among others. The relevant Resource Conservation Area policy states:

R-LU 3 The general intent of each "Resource Conservation Area" designation is to encourage land uses and densities appropriate to the rural unincorporated areas that also:

a. help preserve rural character;
b. conserve natural, scenic, and cultural resources;
c. protect public health and safety from natural and man-made hazards;
d. preserve agriculture and prime agricultural soils;
e. protect watersheds and water quality;
f. enhance air quality; and
g. minimize the demand for and cost of public services and facilities.

Analysis: The proposed golf course and residential development represents a low-intensity land use which would help preserve the rural character of the site, as well as conserve scenic and natural resources while protecting users and residents from natural and man-made hazards. In particular, the clustering of the proposed residential subdivisions outside the valley itself, and the preservation of over 1,200 acres of the site as permanent open space, would minimize the loss of trees, wetlands and upland habitat for the California tiger salamander and western pond turtle, as well as minimizing direct mortality and disruption to wildlife generally. The proposed project would therefore be consistent with the Resource Conservation Areas policies of the General Plan.

Rural Residential Areas

The 32-acre portion of the site located just west of Coolidge Avenue (Santa Teresa Boulevard) and north of Highland Avenue is designated Rural Residential on the Land Use Plan of the 1995 General Plan. The "Rural Residential Areas" policies applicable to the project are as follows:

R-LU 57 Residential, agricultural and open space uses are the primary uses. Commercial, industrial and institutional uses may be established only where they serve the needs of the resident population and result in a net overall reduction of travel demand.

R-LU 58 The allowable density of development shall be 5-20 acres per dwelling, depending upon the average slope of the land, as based upon the County's "5-20s" slope density formula. Minimum parcel size shall be 5 acres, unless development is proposed as a cluster subdivision. (See R-LU 59-60)

R-LU 59 Residential development may be clustered, provided that the open space portions of the development are protected as permanent open space.

R-LU 60 The minimum parcel size within a Rural Residential cluster subdivision shall be no less than 1 acre (density to be determined by 5-20 acre variable slope density formula).

Analysis: The cluster subdivision proposed for the Rural Residential area of the project site conforms with the applicable General Plan policies listed above.

Parks and Recreation

The General Plan policies on Parks and Recreation are applicable to the proposed project are set forth below. (It should be noted that the Countywide Trails Master plan, which is an element of the General Plan, is discussed in a subsequent subsection.)

Regional Parks and Public Open Space Lands

R-PR 14 Privately-owned recreational lands uses and facilities within rural unincorporated areas, including but not limited to golf courses, campgrounds, recreation vehicle (RV) parks, and similar uses, should be compatible with the landscape and resources of the areas in which they are proposed. To ensure such compatibility, potentially significant impacts often associated with such land uses should be avoided or reduced to less than significant levels, including:

a. water demand;
b. traffic generation;
c. wastewater generation and disposal;
d. alteration of natural topography, drainage patterns, habitat, or vegetative cover;
e. use of harmful chemicals, such as pesticides, and herbicides;
f. riparian area or heritage resource impacts;
g. loss of prime soils or other impacts upon local agriculture;
i. visual impacts; and
j. impacts on public services and facilities, including schools.

R-PR 15 In addition to review of environmental impacts, review of proposed golf courses and ancillary uses shall also take into account the following:

a. any pertinent joint City-County area plans;
b. applicable land use or other General Plan policies of the proximate city(s);
c. the location of the proposed site relative to city Urban Service Areas; and
d. the intended scale or "service area" of the proposed golf course (i.e., intended to primarily serve a local community or intended to serve users from a larger service area).

Analysis: The golf course element of the proposed project would be compatible with the landscape and resources of the area, and would mitigate or avoid the potential environmental impacts listed in policy R-PR 14. (Note: The golf course itself would not involve lands designated as "prime farmland".) Therefore, the proposed project would be consistent with the General Plan policies listed above.

Scenic Highways

The Regional Parks, Trails, and Scenic Highways element of the County General Plan designates Coolidge Avenue, Turlock Avenue, and the connecting segment of Highland Avenue at the eastern end of the side, and Watsonville Road at the western end of the site as scenic routes. The applicable General Plan policies on Scenic Highways are as follows:

P-PR 39 The natural scenery which exists along many of Santa Clara County's highways should be protected from land uses and other activities which would diminish the aesthetic beauty.

P-PR 40 Land use should be controlled along scenic roads so as to relate to the location and functions of these roads and should be subject to design review and conditions to assure the scenic quality of the corridor.

P-PR 43 Signs should be strictly regulated, with off-site signs and billboards prohibited along scenic routes.

P-PR 45 New structures should be located where they will not have a negative impact on the scenic quality of the area, and in rural areas they should generally be set back at least 100 feet from scenic roads and highways to minimize their visual impact.

P-PR 46 Landscaping with drought-resistant native plants should be encouraged adjacent to scenic roads and highways.

P-PR 47 Activities along scenic highways that are of a substantially unsightly nature, such as equipment storage or maintenance, fuel tanks, refuse storage or processing and service yards, should be screened from view.

Analysis: In the areas of the project site adjacent to these designated scenic roadways, open space buffers would be created. Along Coolidge Avenue, the Rural Residential cluster subdivision would be set back 300 feet from the roadway and would replace the declining plum and walnut trees with a landscaped berm and vineyards to provide visual screening and preserve the existing rural atmosphere. Along Turlock Avenue to the south, the Hillside cluster subdivision would be set back 200 to 1,400 feet from the roadway and would have a landscaped berm planted with Black Walnuts to provide further screening. Along Watsonville Road to the west, the golf course would be approximately one mile east of the roadway, and would be visually screened by a low topographical saddle across the valley. Any signs, fences or entry features near the project entrance on Highland Avenue would be subject to design review which would ensure that they are designed to be unobtrusive and aesthetically harmonious with the scenic quality of the setting. In consideration of the above, the project would be consistent with the Scenic Highways policies of the General Plan.

Resource Conservation

Water Supply, Quality, and Watershed Management

The following General Plan policies on water supply and quality are applicable to the project:

R-RC 8 The strategies for assuring water quantity and quality for the rural unincorporated areas shall include:

a. Require adequate water quantity and quality as a pre-condition of development approval.
b. Reduce the water quality impacts of rural land use and development.
c. Develop comprehensive watershed management plans.

R-RC 9 Development in rural unincorporated areas shall be required to demonstrate adequate quantity and quality of water supply prior to receiving development approval.

R-RC 10 For lands designated as Resource Conservation Areas (Hillsides, Ranchlands, Agriculture, and Baylands) and for Rural Residential areas, water resources shall be protected by encouraging land uses compatible and consistent with maintenance of surface and ground water quality.

a. Uses that pose a significant potential hazard to water quality should not be allowed unless the potential impacts can be adequately mitigated.
b. The amounts of impervious surfaces in the immediate vicinity of water courses or reservoirs should be minimized.

R-RC 13 Sedimentation and erosion shall be minimized through controls over development, including grading, quarrying, vegetation removal, road and bridge construction, and other uses which pose such a threat to water quality.

R-RC 14 Use and disposal of agricultural chemicals, such as fertilizers, pesticides and herbicides, shall be managed to minimize the threat of water pollution.

Analysis: The proposed project includes provisions for adequate water supply and the acceptable functioning of wastewater disposal systems (see Sections III. P. and Q. of this EIR), in addition to mitigation measures to minimize degradation of surface and groundwater quality during the construction phase and in the operation of the golf course. Therefore, the project would be consistent with these water-related Resource Conservation policies of the General Plan.

Habitat and Biodiversity

The following General Plan policies on Habitat and Biodiversity are applicable to the project:

R-RC 37 Riparian and freshwater habitats shall be protected through the following general means:

a. setback of development from the top of the bank;
b. regulation of tree and vegetation removal;
c. reducing or eliminating use of herbicides, pesticides, and fertilizers by public agencies;
d. control and design of grading, road construction, and bridges to minimize environmental impacts and avoid alteration of the streambed and stream banks (free-span bridges and arch culverts, for example); and
e. protection of endemic, native vegetation.

R-RC 37 Lands near creeks and streams shall be considered to be in a protected buffer area, consisting of the following:

a. 150 feet from the top bank on both sides where the creek or stream is predominantly in its natural state;
b. 100 feet from the top bank on both sides of the waterway where the creek or stream has had major alterations; and
c. In the case that neither (a) nor (b) are applicable, an area sufficient to protect the stream environment from adverse impacts of adjacent development, including impacts upon habitat, from sedimentation, biochemical, thermal and aesthetic impacts.

R-RC 38 Within the aforementioned buffer areas, the following restrictions and requirements shall apply to public projects, residential subdivisions, and other private non-residential development:

a. No building, structure or parking lots are allowed, exceptions being those minor structures required as part of flood control projects.
b. No despoiling or polluting actions shall be allowed, including grubbing, clearing, unrestricted grazing, tree cutting, grading, or debris or organic waste disposal, except for actions such as those necessary for fire suppression, maintenance of flood control channels, or removal of dead or diseased vegetation, so long as it will not adversely impact habitat value.
c. Endangered plant and animal species shall be protected within the area.

R-RC 39 Within areas immediately adjacent to the stream buffer area, new development should minimize environmental impacts on the protected buffer area, and screening of obtrusive or unsightly aspects of a project should be considered as a means of preserving the scenic value of riparian areas.

R-RC 43 Large scale grading and clearing of land should not be allowed if it will significantly degrade valuable habitat or impair surface water quality.

R-RC 44 Healthy, mature specimen trees should be protected from cutting.

R-RC 47 Impacts from new development on woodland habitats should be minimized by encouraging:

a. clustering of development to avoid critical habitat areas, where clustering is permitted;
b. inclusion of important habitat within open space areas for projects requiring open space dedication;
c. siting and design of roads, utility corridors and other infrastructure to avoid fragmentation of habitat; and
d. acquisition or avoidance of critical habitat areas.

R-RC 49 Retention and planting of native plant species shall be encouraged, especially for landscape uses.

R-RC 51 Preservation of habitat linkages and migration corridors should be encouraged where needed to allow for species migration, prevent species isolation, and otherwise compensate for the effects of habitat fragmentation.

Analysis: The proposed project has been designed to minimize impacts on biological resources. The extensive oak woodlands covering the southern areas of the site would be largely avoided by the project, with the possible exception of two proposed lots where limited tree removal would likely occur (although the building envelopes for these lots contain minimal tree cover). The ecologically sensitive serpentine grasslands on the northeastern hillsides would also be avoided and protected with perimeter fencing to prevent incursions by construction activity and future residents. The on-site creek would not be altered except for bridge crossings and minor channel realignments, and would be subject to a comprehensive riparian restoration and enhancement plan. The large specimen riparian trees would be preserved and incorporated into the project design. Very limited tree removal (i.e., 18 trees) is proposed only where it is unavoidable for project feasibility.

General Plan policy R-RC 37 recommends 150-feet setbacks for creeks which are predominantly in their natural state, and lesser setbacks for altered streams, and establishes environmental performance measures for development along degraded or altered streams. The County's interim Environmental/Design Guidelines for Golf Courses indicates a setback of 75 to 150 feet for structures, paved roadways and parking areas. Since the quality of the riparian habitat on-site has been degraded due to many years of livestock grazing, smaller buffers than 150 feet are appropriate for the project. The nearest proposed paved areas would be the clubhouse parking areas, which are proposed at a minimum of 75 feet from the creek bank. In addition, all parking lot runoff would be piped to off-channel retention basins and would not be allowed to enter the creek. With the exception of roadway crossings, no other structures or paved areas would be located within 150 feet of the creek channel. Most of the proposed turf areas would also be set back at least 75 feet from creek banks, although in a few instances the edge of turf is proposed as close as 25 feet from the channel. The biological report for the project states since that the value of much of the riparian habitat along the creek has been degraded, setbacks as small as 10 feet would be appropriate to protect habitat values in given situations. (It is important to note that the 10-foot minimum setback applies only to turf and rough areas. These turfed areas adjacent to the riparian corridor are used by wildlife, and thus would not inhibit wildlife movement along the creek.) Impacts to the affected streambeds and riparian zones would be minimized through selection of the least intrusive bridge designs and construction methods. The project would include an extensive replanting and riparian enhancement program, including the planting of over 1,700 sycamores and 454 valley oaks, many of which would be planted along the main creek channel and tributary drainages. The replacement trees were grown from acorns and seeds collected from the Lion's Gate site. Enhancement of the riparian areas would also be facilitated by discontinuation of the cattle grazing. With the incorporation of the proposed setbacks, drainage measures and habitat enhancement plan, the Lion's Gate project would meet the intent of the General Plan to protect the stream environment from adverse impacts. In consideration of the above, the project would be consistent with the Habitat and Biodiversity policies of the General Plan.

Agriculture and Agricultural Resources

The following General Plan policies on agricultural resources are applicable to the project:

R-RC 57 — Agriculture shall be encouraged and prime agricultural lands retained for their value to the overall economy and quality of life of Santa Clara County, including:

a. local food production capability;
b. productive use of lands not intended or suitable for urban development; and,
c. preservation of a diminishing natural resource, prime agricultural soils.

Analysis: As discussed previously under "Agriculture," the project would result in the loss of approximately 110 acres of "prime farmland" on the site. The impact of this loss is somewhat reduced by the fact that agricultural production is no longer economically viable on this site, and by the fact that the project includes the planting of 110 acres of vineyards in areas not currently under cultivation. The development of this area with a cluster residential subdivision would be preferable to the creation of seven 20-acre residential lots, as currently permitted, which would be a wasteful use of this land, and also would not result in the creation of an economically viable unit for agricultural production. By clustering the residential lots on the western portion of this parcel, and thereby creating an open space buffer at the edge of the project, the potential interface conflicts with agricultural operations to the east would be minimized.

Scenic Resources

The Regional Parks, Trails, and Scenic Highways element of the County General Plan designates Coolidge Avenue, Turlock Avenue and Watsonville Road as County scenic routes in the project vicinity. The following General Plan policies on scenic resources are applicable to the project:

R-RC 97 — Hillsides, ridgelines, scenic transportation corridors, major county entryways, stream environments, and other areas designated as being of special scenic significance should receive utmost consideration and protection due to their prominence, visibility, and overall contribution to the quality of life in Santa Clara County.

R-RC 99 — Signs allowable under the provisions of the zoning ordinance should be harmonious with the character of the area in which they are located and should be of the highest design standards.

R-RC 100 — Roads, building sites, structures and public facilities shall not be allowed to create major or lasting visible scars on the landscape.

R-RC 101 — Structures on ridgelines must be located, constructed or landscaped so that they do not create a major negative visual impact from the valley floor. Land should be divided in such a way that building sites, if possible, are not located on ridgelines.

R-RC 102 Development in rural areas should be landscaped with fire resistant and/or native plants which are ecologically compatible with the area.

Analysis: Most of the project would not be visible from off-site vantage points. Landscaped berms along the eastern frontage would screen much of the residential development from the east. In addition, the residential subdivisions would be clustered and set back away from public roadways behind buffer zones such that the overall effect of the project would be very unobtrusive to the overall rural scene.

Health and Safety

Noise

The following noise policies of the General Plan are applicable to the project:

R-HS 1 Significant noise impacts from either public or private projects should be mitigated.

R-HS 3 New development in areas of noise impact (areas subject to sound levels of 55 DNL or greater) should be approved, denied, or conditioned so as to achieve a satisfactory noise level for those who will use or occupy the facility (as defined in "Noise Compatibility Standards for Land Use" and "Maximum Interior Noise Levels for Intermittent Noise"). (The above referenced tables, found on pages B-53 and B-54 of the General Plan, contain detailed noise standards for various land uses.)

Analysis: As discussed in Section *III. L. Noise*, the potential traffic noise impacts along the eastern project frontage, north of Highland Avenue, would be largely avoided by clustering the Rural Residential development beyond the noise impact zone of Coolidge Avenue, as proposed. Potential noise impacts from construction equipment and power mowers would be mitigated. Thus, the project would be consistent with the Noise policies of the General Plan.

Natural Hazards

The following General Plan policies on Natural Hazards apply to the project:

R-HS 9 Development in rural unincorporated areas affected by natural hazards should be designed, located, and otherwise regulated to avoid or reduce associated risks to an acceptable level:

a. In areas of highest potential hazard, such as floodways, active landslides, fault traces, and airport safety zones, no new habitable structures shall be allowed.
b. In other areas of lesser hazards, there shall be no major structures for involuntary occupancy, such as schools, hospitals, correctional facilities or convalescent centers.

R-HS 16 No new building site shall be approved on a hazardous fault trace, active landslide, or other geologic or seismic hazard area that poses a significant risk.

R-HS 27 The County should encourage the use of fire-retardant building materials and landscaping not already required by County development and building codes when new development and rebuilding are proposed in areas of high or extreme fire hazard.

Analysis: No new structures are proposed in the vicinity of known active fault traces or landslides. The surrounding hillsides have areas of potential and existing slope stability problems which may be subject to occurrences of landsliding or debris flows, potentially resulting in hazards to proposed structures sited within or downslope of such areas. In addition, some proposed structures may be located near inactive fault contacts that could undergo sympathetic movement during a major earthquake. Potential damage from landslides would be avoided by setting structures back from known landslide deposits, by repairing landslides, or by implementing other slope stabilization measures. Earthquake damage would be avoided by setting structures back from fault traces if necessary, subject to the recommendations of the subsequent design-level geotechnical studies. All construction and grading would be performed in conformance with the detailed geotechnical recommendations.

The potential for shallow flooding at the eastern end of the site would be mitigated by the creation of a 20-acre lake for stormwater detention, by establishing dwelling pads above 100-year flood elevations, and by designing the project to allow for unobstructed passage of flood waters. Fire hazards would be avoided or mitigated through compliance with applicable codes and Fire Marshal's conditions. These would include provision of adequate water storage and fire flows, installation of hydrants, automatic sprinkler systems, spark arresters for chimneys, fire retardant roofing materials and keeping combustible vegetation a minimum distance from structures. In consideration of the above, the project would minimize the effects of potential natural hazards on the site, and thus would be consistent with the Natural Hazards policies of the General Plan.

<u>Wastewater Disposal</u>

The following General Plan policies on Wastewater Disposal are applicable to the project:

R-HS 42 All new septic systems shall be located only in areas where:

a. there is reasonable assurance that they will function effectively over a long period;
b. they can be designed to have a minimum negative impact on the environment; and
c. they will not contaminate wells, or surface and groundwater supplies.

R-HS 43 Septic systems shall not be allowed where site characteristics impede their operation, including sites with:

a. high groundwater conditions;
b. highly permeable soils where wastewater will percolate in excess of one minute per inch;
c. limited depth to bedrock; or
d. gradients in excess of 20% without appropriate studies.

R-HS 44 Alternative or specially engineered wastewater systems may be allowed for commercial or industrial uses, providing:

a. the County has approved a program which ensures that the system's long term maintenance, operating, monitoring and liability costs are provided for by the owner of the facility;
b. the proposed system has a track record of safe and effective long term operation under conditions similar to those in Santa Clara County;
c. the proposed system includes adequate measures to prevent environmental damage in the event of system failure;
d. is appropriate to the site for which it is proposed;
e. is in compliance with all the other pertinent County policies and regulations; and
f. with Regional Water Quality Control Board wastewater discharge requirements.

R-HS 45 Alternative wastewater treatment and disposal systems may be allowed for individual residential development only if:

a. a traditional septic system adequate to serve the proposed development could be constructed, if needed;

b. it can be shown that the alternative system will function more effectively than a septic tank system and be beneficial to the environment;
c. the density of the proposed residential development is consistent with the density normally allowed within that property's General Plan land use designation;
d. the proposed system has a tack record of safe and effective long term operation under conditions similar to those in Santa Clara County;
e. the proposed system is in compliance with all other pertinent County policies and regulations;
f. the system is appropriate to the site for which it is proposed;
g. the proposed system includes adequate measures to prevent environmental damage in the event of system failure, such as discharge of inadequately treated effluent to the land (e.g., surface, lakes, streams, etc.);
h. the proposed system will operate in full compliance with Regional Water Quality Control Board waste water discharge requirements; and
i. the County has approved a program which ensures that the system's long term maintenance, operating, monitoring and liability costs are provided for by the owner of the facility. Such a program may include, but is not limited to, recorded contractual obligations, permit fees or insurance policies; special permit conditions; and, performance bonds for system replacement.

R-HS 46 Alternative waste water disposal systems intended to serve two or more residences may be allowed only if:
a. they comply with all provisions of the preceding policy; and
b. there exists an appropriate public entity which has agreed to, and is financially able to, assume full responsibility for the system's long term maintenance, operating, monitoring and liability costs.

<u>Analysis</u>: The proposed wastewater treatment facilities conform with the above policies in all respects. If necessary, a traditional septic system could be constructed to serve the residential development. However, given the historically high nitrate levels in the Llagas Groundwater Basin, it would be beneficial to the environment to utilize the proposed alternative system here instead. (See Section *III. Q. Wastewater Treatment and Disposal* for a detailed discussion of the proposed treatment system.)

The wastewater system proposed for the project would require the approval of the County Department of Environmental Health and the Central Coast Regional Water Quality Control Board, which would in effect implement the above policies. Therefore, the project would be consistent with the Wastewater Disposal policies of the General Plan.

San Martin Planning Area Policies

The easterly 176 acres of the project site along Coolidge Avenue and Turlock Avenue lie within the San Martin Planning Area. The following San Martin Planning Area policies of the General Plan are applicable to the proposed project.

<u>Allowable Densities and Minimum Parcel Sizes</u>

R-LU 138 The density of development for lands designated 'Rural Residential' within the San Martin Area shall be as determined by the "5-20 acre variable slope density formula."

R-LU 139 The density of development for lands designated other than 'Rural Residential' within the San Martin Planning Area shall be determined by the allowable densities of their base General Plan land use designation.

R-LU 140 Residential development within the Rural Residential Areas of San Martin shall be allowed to cluster provided that the open space portions of the development are protected as permanent open space. The minimum parcel size within a rural residential cluster subdivision shall be no less than 1 acre.

Agricultural Land Uses

R-LU 141 Agricultural uses should be encouraged to continue.

R-LU 142 New development should be compatible with existing agricultural uses.

Analysis: The 32-acre area designated Rural Residential along Coolidge Avenue reflects the permitted density prescribed by policy R-LU 138, and is proposed to be clustered as permitted under policy R-LU 139, with the open space area protected as permanent open space. The 144-acre area along Turlock Avenue to the south would be permitted to be subdivided into seven 20-acre lots under both existing "Am - Agriculture-Medium Scale" General Plan designation and the proposed "Hillsides" designation. The clustering provision applicable to the "Hillsides" designation would actually allow density from the adjacent Hillside areas to be clustered onto this parcel, and would also allow the residential lots to be set back from adjacent farmlands, which would be consistent with the agricultural protection policies of R-LU 141 and 142.

South County Joint Area Plan Policies

The South County Joint Area Plan includes the Cities of Morgan Hill and Gilroy, and the unincorporated areas of the County south of San Jose's Sphere of Influence. The intent of the Joint Area Plan is to provide for orderly urban growth and development in a manner which is consistent with the ability to provide public facilities and services. The applicable policies of the Joint Area Plan are as follows:

SC 1-7 Urban development should occur in the cities in an orderly and contiguous pattern, managed and scheduled consistent with the ability to provide public facilities and services. Land uses in rural areas should be low-intensity and limited in number. Public services to rural areas should be appropriately limited.

SC 1-10 Urban development should occur only in the cities and where the full array of urban services can be provided.

SC 1-11 Those public services which are provided to rural areas by the County or special districts should be provided at a minimum level.

Analysis: The proposed project reflects a low-intensity rural level of development for the site consistent with policy SC 1-7. Public services would be provided by the County except for domestic water which would be provided by the West San Martin Water Works, and wastewater treatment and disposal which would be administered by a Community Services District, as provided for under Policy SC 1-11.

Countywide Trails Master Plan Update

Adopted by the County Board of Supervisors in November 1995, this document is a comprehensive update of the trails plan from the 1980 County General Plan, and has been incorporated into the 1995 County General Plan. The Plan includes trails policies and strategies, a master plan map with trail routes and bicycle-only routes, and guidelines for trail design. The Plan also includes a list of high priority trails to be developed at the earliest opportunity. The Draft Trails Master Plan map indicates 3 proposed trails within or adjacent to the Lion's Gate site. These include the following: Trail R1-A (bike) - Juan Bautista de Anza National Historic Trail Northern Bicycle Retracement Route, which is proposed as a bike trail within the right-of-way of Coolidge Avenue-Santa Teresa Boulevard to the east; Trail S7 - Morgan Hill Cross-Valley Sub-regional Trail, which is proposed as a combined hiking, bicycle and equestrian trail within the Watsonville Road right-of-way to the west; Trail S8 - San Martin Cross Valley Subregional Trail, which is proposed as a combined hiking, off-road bicycle and equestrian trail which would traverse the Lion's Gate site from east to west. The specific alignment of Trail S8 would be coordinated between the landowner/developer and the County to fit the trail route with the proposed development. Trails S7 and S8 both received priority ranking in the vicinity of the Lion's Gate project. Trail S8 from Santa Teresa Boulevard east along San Martin Avenue to New Avenue received the highest priority ranking of any of the trails proposed in the unincorporated areas of the County. Trail R1-A (bike) has not received a priority rating because it is located primarily within City boundaries.

The applicable policies of the Countywide Trails Master Plan are as follows:

PR-TS 1-7 *C-PR 24*	Encourage private developers to incorporate trail routes identified on the Countywide Trails Master Plan Map into their development project designs.
PR-TS 3.7 *C-PR38*	Development projects proposed on lands that include a trail as shown on the Countywide Trails Master Plan Map may be required to dedicate and/or improve such trail to the extent there is a nexus between the impacts of the proposed development and the dedication/improvement requirement. The dedication/improvement requirement shall be roughly proportional to the impacts of the proposed development.
PR-TS (i) 3.1 *C-PR (i) 30*	Accept and require, to the extent necessary to mitigate the impacts of the proposed development, trail and pathway easements, right-of-way dedications and/or improvements as part of land development approvals in areas planned for inclusion in the countywide trail system of the General Plan (Implementors: County, Cities).
PR-TS 6.3	Public improvement projects, such as road widenings, bridge construction, and flood control projects, that may impact existing or proposed trails should be designed to facilitate provision of shared use.

Analysis: The proposed Lion's Gate project may be required to dedicate and/or improve right-of-way for Trail S8 - San Martin Cross Valley Sub-regional Trail, as stipulated in policy P-TS 3.7. The general alignment of the proposed trail can be accommodated within the Lion's Gate site plan by routing the trail to the north and west of the proposed golf course. Provisions for sections of Trail R1-A (bike) along the Coolidge Avenue frontage, and Trail S7 along the Watsonville Road frontage of the site would be included in roadway dedications and improvements required for the on-site segments of these roadways.

San Martin Integrated Design Plan

The San Martin Community Design Plan consists of guidelines for the design of development, roadways and drainage facilities which are intended to ensure that the desired rural character is incorporated into new development and improvement projects. The plan focuses on the creation of a cohesive "village core" for San Martin, including guidelines for urban design, architecture, streetscapes, parking, landscaping, signage, lighting and fencing. The document includes detailed guidelines for clustering rural development in a manner that improves rural atmosphere and minimize visual impacts. The plan encourages the use of rural architectural styles for single-family dwellings. The plan also includes design guidelines for the safe and aesthetically pleasing integration of County trails within the circulation system.

Analysis: The two proposed cluster subdivisions at the eastern end of the site are located within the San Martin Planning Area. The proposed design of these clusters reflects the specific guidelines in the Plan including providing generous setbacks from roadways and streams, and the creation of on-site detention ponds for flood control.

Report of the Preservation 2020 Task Force

The Report of the Preservation 2020 Task Force, adopted in 1987, evaluated open space opportunities throughout the County on lands not then in public ownership or control. The report identified candidate open space and park sites according to priority of acquisition or protection. The report described techniques for implementing open space preservation, including the clustering of development to avoid viewshed areas.

The Hayes Valley was identified in the report as a candidate for preservation, although it ranked as number 26 out of 42 open space acquisition priorities, and was not listed as a park (active recreation) acquisition priority. The report listed the watershed, viewshed, and ability to buffer urbanization as primary resources to be protected at the Hayes Valley site.

Analysis: The development of a portion of the Hayes Valley site would preclude it from possible future acquisition as open space. However, under the proposed project 1,265 acres would be preserved as permanent open space and 263 acres would be maintained as managed recreational open space in the form of a golf course. Together these open space uses would comprise over 90 percent of the total site area. Thus the project would be largely consistent with the objectives of the Preservation 2020 Program with respect to the Hayes Valley site.

County Ordinances and Regulations

Zoning Ordinance

Hillside (HS) Zoning District

Most of the project site is subject to Hillside (HS) zoning. The intent of this zoning district is to:

> "preserve mountainous land unplanned or unsuited for city development in an open space manner and promote uses which support and enhance a rural character which promote wise use of natural resources, and which avoid the risks imposed by natural hazards found in these areas. Development shall be limited to avoid augmented need for public services and facilities".

Permitted uses as a matter of right within the HS zone include agricultural and certain residential uses. Uses permitted subject to securing a use permit include residential cluster subdivisions, limited retail, transportation, and cultural, educational and recreational uses, including golf courses. Section 14-4.2 of the Hillside zoning regulations specifically addresses golf courses with the following provisions:

> (b) Golf courses, including clubhouse, small golf equipment supply rental and retail store, swimming pools, tennis courts, office, maintenance building or yard, restrooms, showers, waiting room, bar and restaurant, overnight accommodations, provided such accommodations are for temporary guests only, and that the scale of such accommodations are consistent with both the scale of the golf course development and the rural character of the zoning district. Architectural and site approval shall be secured for the establishment and conduct of this use as provided in Article 51 of this ordinance.

Specific findings:

(1) The use, as designed, shall not substantially alter the natural environment.

(2) If the parcel is not served by sanitary sewers, a suitable location exists on the site which can safely handle the size of the expected sanitation waste generation. Leachfields are placed on natural slopes of 30% or less unless they meet or exceed all Health Department requirements.

The Hillside zoning district provides for clustering of residential development, with the permitted density determined by a slope-density formula which is used to derive average lot sizes ranging from 20 to 160 acres depending on average slopes. The clustering provision provides an exception to the 160-acre minimum parcel size in the interest of concentrating permitted development on the least environmentally disruptive sites, and to provide economy in road lengths and driveways. The residential lots created under a Hillside cluster permit must have 2-acre minimum parcel sizes, with 90 percent of the overall site area retained as permanent open space.

In addition, Section 14-3.2 of the Hillside Zoning Ordinance allows on-site housing for caretaker and farm labor use in conjunction with the use of the property. It has been the practice of Santa Clara County to allow labor housing in projects other than farms.

Development standards applicable in the HS zone include a height limit of 35 feet or three stories, and a minimum building setback of 30 feet from property lines, among other requirements.

<u>Rural Residential (RR) Zoning District</u>

The 32-acre parcel located west of Coolidge Avenue and north of Highland Avenue is zoned Rural Residential 5-acre minimum lot size (RR-5 ac). The intent of this zoning district is to:

> "permit rural residential development at variable densities in certain unincorporated areas of the County, and to limit the expansion of rural residential areas. Agricultural and open space uses are permitted which are compatible with residential uses..."

Permitted uses as a matter of right within the RR zone include agricultural and certain residential uses. Uses permitted subject to securing a use permit include bed and breakfast lodges, park and ride lots, recycling centers, churches, golf courses and driving ranges, swim and racket clubs, kennels, etc.

The minimum lot size for purposes of determining development density is 5 acres, although lot sizes as small as 1 acre are permitted in this zone under the cluster development permit provisions contained in Article 52 of the

County zoning ordinance. Minimum setbacks for dwellings is 30 feet from all property lines and ultimate street rights-of-way. Maximum dwelling height is 35 feet, with no more than two stories.

Exclusive Agriculture (A-20) Zoning District

There are two parcels on the Lion's Gate site that lie within the Exclusive Agriculture (A-20) zoning district. These include the 144-acre parcel at the southeast corner of the site, west of Turlock Avenue, and the 115-acre parcel located at the west end of the site, east of Watsonville Road. (The project includes a proposal to amend the General Plan designations for these parcels to "Hillsides," and to rezone them to the "HS" zoning district.)

The general intent of the Exclusive Agriculture district is to preserve and encourage agriculture, and also to retain in agricultural use those lands which may be suitable for urbanization until such time as public facilities and services can be economically provided, consistent with community plans an objectives.

Permitted uses include a broad range of agricultural activities, as well as residential, retail, cultural, educational and recreational uses, agriculture-related manufacturing, and other uses.

Lot sizes are determined by the combining district, which in this case specifies 20-acre minimum parcel sizes.

Architecture and Site Approval

All applications for use permits (except for certain uses within Agricultural districts) also require ASA approval to review the quality of architectural and site design of proposed development projects. The ASA Guidelines include detailed standards for architecture, site design, grading, landscaping, parking, signs, lighting and energy efficiency. One goal of the ASA Guidelines in Hillside zones is to promote development that blends into the natural landscape through appropriate exterior colors and landscaping.

Design Review

Article 43 of the County Zoning Ordinance contains provisions governing the construction of any building or structure within 100 feet of a designated County scenic road, including in this case Coolidge, Highland and Turlock Avenues in the east, and Watsonville Road in the west. The intent of Article 43 is to promote excellence of development, protect recreational and scenic features, and to maintain the open character of the designated scenic roads. The ordinance stipulates that any development proposed within 100 feet of a scenic road shall receive Design Review and thus be subject to the "Development Guidelines for Design Review." The intent of the Design Review Guidelines is to go beyond ASA approval to ensure that the placement and appearance of any structures and associated grading and landscaping be compatible with the character of the neighborhood, adjacent development, and the natural environment.

Analysis: The project as proposed is consistent with the applicable provisions of the County Zoning Ordinance. The proposed golf course and related facilities are permitted under Section 14-4.2 of the Hillside zoning provisions. As discussed elsewhere in this EIR, the golf course would satisfy the required findings relating to non-substantial alteration of the natural environment, and the required wastewater disposal finding. The entire project would be subject to Architecture and Site Approval, and the areas within 100 feet of designated County scenic roads would be subject to Design Review.

The project would not confirm with the intent and provisions of the A zoning district currently applicable to the 144-acre parcel adjacent to Turlock Avenue. The proposed land use designation change to Hillsides and subsequent clustered residential development would convert these lands to non-agricultural uses. The project as proposed would be consistent with the Hillside and Rural Residential zones.

Other Local Jurisdictions

Local Agency Formation Commission (LAFCO)

The Santa Clara County LAFCO has approval authority for annexations, detachments, changes or organization and formation of new governmental entities. Expansions of urban service area boundaries and governmental special districts are also subject to LAFCO approval. The proposed project would not involve any annexation, but the proposed Community Services District (CSD) for the project would be subject to LAFCO approval.

III. ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES

A. LAND USE

Environmental Setting

On-Site Land Uses

The majority of the Lion's Gate site is used for cattle grazing, except for the 144-acre field in the southeast corner of the site, and a 32-acre former plum and walnut orchard at the eastern end of the site north of Highland Avenue. The existing structures on the site consist mainly of a ranch complex located near the eastern end of the site. This complex includes 4 residences, a number of barns and sheds, and an old creamery building associated with a former daily operation. (Adjacent to the main ranch complex, on the north side of creek channel, there is a residence and outbuildings on a 20-acre parcel that is not part of the project site.) There is also a house and barn located to the east of the main ranch on the north side of Highland Avenue near Turlock. Also, there is an unused barn at the southwestern corner of the site on Watsonville Road. Other man-made agricultural features also exist on the property, including fences, corrals, stock ponds and several water troughs located near natural springs.

There are two separate high voltage power line corridors that traverse the site generally from north to south. The east-central portion of the site is crossed by a 115 kV transmission line on steel towers, and the western portion of site is traversed by a 115 kV transmission line on wooden poles.

Surrounding Land Uses

The Lion's Gate site is located adjacent to the unincorporated community of San Martin, which consists mainly of a mixture of low density residential uses, commercial uses, and a variety of agricultural operations on relatively small parcels. The South County Office Building and Courthouse is located less than one mile to the east on Highland Avenue, and the South County Airport is located just over one mile to the east. The nearest urban or suburban density development is located in the City of Morgan Hill, one mile north of the Lion's Gate site.

The land uses in the immediate vicinity of the Lion's Gate site consist of a mixture of residential and agricultural uses. To the north, the site is flanked by an estate residential development with homes built on 20-acre lots. One of these homes is located on top of the northern ridge flanking the Lion's Gate site and overlooks the central portion of the site, while all other dwellings in that development are situated on the northern slope of the ridge and beyond sight of the project site.

To the north and east of the existing 32-acre orchard parcel in the northeast corner of the site, there is a small concentration of rural residential development on lots ranging from 1 to 5 acres or larger.

The properties to the east and southeast, across Turlock Avenue, are mainly in pasture or used for the cultivation of row crops, with a few scattered residences. The nearest residences include a ranch directly opposite the site across Turlock Avenue, and a horse ranch adjacent to the site at the southeast boundary.

At the western end of the property along Watsonville Road, the existing land use pattern is characterized by low-density residential and small farms.

To the south and southwest, across the southern ridgeline, the predominant land uses include cattle ranching and smaller agricultural uses with scattered residences.

Ordinances and Regulations that Address Land Use

County Zoning Ordinance: Comprising the primary means of land use control, the zoning ordinance specifies appropriate uses and densities for unincorporated lands in the County, and establishes development standards for lot sizes, setbacks, building height, parking and so on. The zoning ordinance functions as the implementation mechanism for land use policies set forth in the County General Plan (see Section *II. Consistency with Plans, Goals and Policies* for a full discussion of land use policies and zoning provisions applicable to the project).

The zoning ordinance includes procedures for the granting of use permits for development. Use permits are approved by the Planning Commission which must make a number of required findings, and can add further findings to protect the environment. The required use permit findings are as follows:

(1) Safe access (including access for fire and emergency vehicles), adequate off-street parking and loading and unloading areas (if applicable) shall be provided;
(2) Waste and sanitation facilities shall satisfy applicable county, state and federal requirements;
(3) The use shall not adversely affect water quality;
(4) The use shall not be detrimental to the adjacent area because of excessive noise, odor, dust or bright lights;
(5) The use shall not cause traffic congestion adversely affecting the surrounding area;
(6) Erosion on the site shall be controlled; and
(7) Adequate storm drainage exists or shall be provided.

An additional required finding reads: "The proposed use will not cause a substantial adverse impact upon the environment, or will provide public benefits which outweigh the impact."

The zoning ordinance also contains specific standards to regulate bright lights, signs and development along designated scenic roads (see below).

Architecture and Site Approval (ASA): All applications for use permits (except for certain uses within Agricultural districts) also require ASA approval, to review the quality of architecture and site design of proposed development projects. The ASA Guidelines include detailed standards for architecture, site design, grading, landscaping, parking, signs, lighting and energy efficiency. For example, one goal of the ASA Guidelines in the Hillside zone is to promote development that blends into the natural landscape through appropriate exterior colors and landscaping.

Design Review for Scenic Road Corridors: Article 43 of the County Zoning Ordinance contains provisions governing the construction of any building or structure within 100 feet of a designated County scenic road (Coolidge, Highland and Turlock Avenues to the east, and Watsonville Road to the west are designated County scenic roads). The intent of Article 43 is to promote excellence of development, protect recreational and scenic features, and to maintain the open character of the designated scenic roads. The ordinance stipulates that any development proposed within 100 feet of a scenic road shall receive Design Review and thus be subject to the "Development Guidelines for Design Review." The intent of the Design Review Guidelines is to go beyond ASA approval to ensure that the placement and appearance of any structures and associated grading and landscaping be compatible with the character of the neighborhood, adjacent development, and the natural environment.

Noise Ordinance: The County's Noise Ordinance establishes noise standards to control unnecessary, excessive and annoying noise and vibration. It sets maximum noise standards for both exterior and interior settings according to sensitivity of the land use. Limits are also established for specific types of noise and generators (e.g., construction/demolition, loudspeakers, animals, etc.).

Significance Criteria

With respect to land use, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(a) Conflict with adopted environmental plans and goals of the community where it is located," "(u) Disrupt or divide the physical arrangement of an established community," and "(w) Conflict with established recreational, educational, religious or scientific use of the area."

Impacts and Mitigation

Impact 1. **The proposed General Plan Amendment would result in a potential change in the character of development permitted on portions of the site. (Less-than-Significant Impact)**

The project includes a proposed General Plan Amendment under which the approximately 260 acres of the site designated "Am - Agriculture-Medium Scale" would be redesigned to "H - Hillsides." This amendment would not alter the overall density of residential development permitted on the site. Under the "Am" designation currently in effect, these lands could be subdivided into parcels of 20 acres. Under the proposed Hillsides designation, these lands would be subject to the slope-density formula of the Hillside zoning ordinance under which permitted densities would range from one lot per 20 acres to 160 acres on a sliding scale with permitted lot sizes becoming larger with increases in average slope. Given that the lands included in the proposed General Plan Amendment consists of slopes of less than 10 percent, the resulting minimum lot size under the Hillsides slope-density formula would also be 20 acres. Thus the overall development density permitted on the site would not be altered by the General Plan Amendment.

However, under the "Hillsides" designation, the permitted density would be clustered on 10 percent of the land, with the remaining 90 percent preserved as permanent open space, instead of having the entire area divided into 20-acre parcels. The General Plan Amendment would in effect allow the inclusion of the density from the current "Am"-designated lands with the density from the larger "Hillsides"-designated area in order to create a single cluster subdivision and maximize and consolidate the permanent open space created. Under the proposed development plan, this flexibility has been used to cluster the development away from the outer edges of the site, thus creating permanent buffer zones along the Watsonville Road and Turlock Avenue frontages of the site.

By allowing the cluster subdivision to be confined to the western end of the eastern "Am" parcel and adjacent lands to northwest, the General Plan Amendment would avoid the necessity of locating the residential lots in the central valley area of the site. Thus much of the existing visual amenity and habitat value of this central area would be maintained. By avoiding the placement of residential streets and homesites in the interior valley, the proposed development plan would minimize the removal of trees, wetlands, and upland habitat for the California tiger salamander and western pond turtle, as well as minimizing direct mortality and habitat disruption to wildlife generally.

(The impact of the loss of 110 acres of prime farmland is discussed in Section *III. B. Agriculture.*)

Mitigation 1. **No mitigation required.**

<u>Impact 2.</u> **The proposed project may potentially be incompatible with existing adjacent uses. (Less-than-Significant Impact)**

Under the proposed development plan, buffer zones would be created at the eastern and western ends of the project site where there are concentrations of existing rural development. On the north site boundary, the single existing dwelling that overlooks the site from the northern ridge would be at least 1,000 feet from the proposed golf course.

The existing residences directly to the north of the proposed Rural Residential subdivision north of Highland Avenue would be 400 feet from the edge of the nearest proposed lots. The existing concentration of rural residential development directly east of the proposed Rural Residential subdivision would be over 400 feet from the nearest proposed dwelling site, with the intervening areas screened with a landscaped berm and a vineyard. Apart from temporary construction noise during site development and short-term construction traffic, the proposed lots would not result in a land use impact upon the existing dwellings in the vicinity.

The existing ranch opposite Turlock Avenue from the main subdivision would be located approximately 500 feet from the nearest proposed residential lot to the west, and approximately 500 feet from the proposed equestrian center to the southwest. The area nearest to this existing ranch would consist of the landscaped berm and proposed lake. The existing horse ranch adjacent to the southeast property boundary would be approximately 300 feet from the proposed equestrian center. For both of these existing ranches, most of the nearby project elements would be screened from view by the 4-foot high landscaped berm to be constructed along the western and southeastern project boundaries. Any potentially adverse effects from the equestrian center, such as odors or vectors, would be controlled by the management plan (as required under Title 23, Chapter 15 of the California Code of Regulations) which is described in Section *I. Project Description*, and through compliance with Article 47 of the County Zoning Ordinance, which provides for the regulation of horses in a manner that prevents nuisances from occurring. (For further discussion, see Section *III. N. Hazardous Materials, Public Health and Safety.*)

Since most of proposed site alterations would occur out of sight of surrounding vantage points, and would not involve construction on the highly visible ridges or hillsides, much of the open space character of the site would remain after project development.

The existing ranch house at the end of Highland Avenue, north of the creek, is not included as part of the project, and could be subject to potential project impacts. This dwelling would be subject to potential noise and dust during construction of the golf course, residential cluster subdivisions and main access road. These temporary construction impacts would be mitigated as discussed in Sections *III. L. Noise*, and *III. M. Air Quality*.

At the west end of the site, there are several residential/ranch properties adjacent to the project site along Watsonville Road. The nearest proposed development to these residences would be the golf course maintenance facility, which would be located 3/4 mile from the nearest existing residence. The proposed maintenance access road off Watsonville Road would be at least 800 feet from the nearest existing residence. The project would not result in potential land use impacts at the western end of the site.

The aesthetic compatibility of the project siting and design details with adjacent uses and the natural setting would be assured through compliance with Design Review Guidelines and the Architecture and Site Approval Guidelines, as required for this project.

There is a potential for off-site impacts from the project due to the generation of traffic and related noise, as well as potential visual impacts. However, as discussed under the respective subject headings of this EIR, these impacts would not be significant.

Mitigation 2. **No mitigation required.**

Conclusion. **The project would not result in significant land use impacts.**

[Note: The open space impacts of the project are discussed in Section *III. C. Parks, Recreation and Open Space*.

B. AGRICULTURE

Environmental Setting

Under current conditions, the majority of the site is used for cattle grazing. The approximately 144-acre field located west of Turlock Avenue and south of Highland Avenue has been cultivated in the past for barley, corn, alfalfa, etc., but has been used only for growing hay and grazing in recent years. To the north of this field is a 32-acre plum and walnut orchard which is in decline, and is no longer maintained. According to the applicant, active cultivation of the field and orchard areas of the property were discontinued 8 years ago because it was no longer economically feasible for the resident rancher/lessee to continue cultivation here. (See Appendix B - "Economic Analysis of Agricultural Operations.")

There are no Williamson Act contracts in effect on any portion of the project site.

An examination of aerial photographs going back to 1936 indicates that the interior of the valley has occasionally been dry farmed for hay, although grazing of annual grasses has historically been the more frequent use of the land.

The agricultural potential of the site was investigated based on the Soil Survey of Eastern Santa Clara County by the USDA Soil Conservation Service (SCS). The SCS soil mapping indicates that there are 15 soil series on the site. All of the soils are classified within 8 broad "Land Capability Classes," with Class I and II soils being the most fertile and well suited for agricultural land uses. In addition, a second land capability rating system called the Storie Index is specific to California. Under the Williamson Act, agricultural lands are considered prime if they have a Storie Index rating of 80 to 100 points.

According to the soil survey maps, the 1,676-acre project site contains approximately 220 acres of Class II soils and no Class I soils, with the remaining soils having an agricultural capability rating of III or lower. The Class II soils on the site consist primarily of Los Robles clay loams (LrC and LrA), which are found along the on-site reach of West Branch Llagas Creek, and in the field west of Turlock Avenue and south of Highland Avenue, as well as in the southeast portion of the former plum and walnut orchard north of Highland Avenue. Los Robles loams have a Storie Index rating of 81 points, indicating they are also prime soils under this rating system. The only other Class II soil type on the site is Cropley clay (CrA) which is found adjacent to Turlock Avenue and comprises the eastern portion of the on-site field. Cropley clay has a Storie Index rating of 47 points, indicating that this is not considered a prime soil under this rating system. The total area covered by these Class II soils represents approximately 13 percent of the overall area of the project site. In addition, there are approximately 200 acres of Class III soils, consisting of Keefers clay loam (KeA and KeC2), which comprise the remainder of the valley floor west to Watsonville Road. Keefers clay loams are not included in the Storie Index rating system.

Of the approximately 220 acres of Class II soils on the site, approximately 110 acres are designated as "Prime Farmland" on the Important Farmlands of Santa Clara County, a map prepared by SCS in 1976. This designated area comprises the eastern, southern and central portions of the field west of Turlock Avenue. An additional 20 acres in the western portion of the field are designated as "Additional Farmland of Statewide Importance" on the SCS map. In addition, an area of approximately 300 acres of Class II and III soils, running along the length of the valley floor, are designated as "Additional Farmland of Local Importance" on the 1992 update of the Important Farmlands map. This designation reflects the previous use of this area for dry farming of hay.

Ordinances and Regulations that Address Agriculture

County Zoning Ordinance: The "A-Exclusive Agriculture" zoning district is used to implement the General Plan policies for the "Agriculture" land use designation. The intent is to preserve and encourage agriculture for the vital contributions agriculture production makes to the economy and quality of life within the County. It provides for agricultural uses and uses compatible with agriculture, and permits lands best suited agriculture and related uses to be used for such purposes.

Agriculture Disclosure and Dispute Resolution Ordinance: Adopted in April 1993 by the Board of Supervisors, this ordinance is intended to recognize and support the right to farm agricultural lands and permit properly conducted agriculture operations within the County. This "Right to Farm" ordinance requires that an agricultural disclosure statement be included in the real estate transfer document. This disclosure statement informs the buyer that property is located in an agricultural area and they may be subject to certain inconveniences as a result of agricultural operations including noise, odor, dust, etc. The County has determined that inconveniences or discomforts associated with such agricultural operations shall not be considered a nuisance if such operations are consistent with accepted agricultural customs and standards. In cases where disputes arise regarding agricultural operations, the County has established a grievance committee to assist in the resolution of such disputes.

Significance Criteria

With respect to agricultural land, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environmental if it will: "(y) Convert prime agricultural land to non-agricultural use or impair the agricultural productivity of prime agricultural land."

Impacts and Mitigations

Impact 1. **The development of the site would result in the loss of approximately 180 acres of Class II soils, including approximately 110 acres designated as "Prime Farmland" or "Farmland of Statewide Importance." (Potential Significant Impact)**

The conversion of much of the existing field west of Turlock Avenue would represent a loss of fertile agricultural land. This site would be covered by residential lots, roadways and a lake and would not likely be used for agricultural cultivation again. (The use of a 20-acre portion of this field for the equestrian center would represent an agricultural use and would not be counted as a loss of farmland.) The development of the orchard parcel north of Highland Avenue would result in the loss of some Class II soils found on this parcel. In addition, the development of the golf course and related facilities would result in the conversion of approximately 200 acres of Class III soils in the interior of the valley. As discussed under "Environmental Setting" above, the lands at the eastern end of the site have not been in cultivation for crops for at least the past 8 years, and the lands in the interior of the site have been used only for grazing or growing hay. The continued farming for row crops and orchard crops is no longer economically viable in the eastern portions of the site. Consequently, these parcels have been left unused or have been used for grazing for the past several years.

As discussed in the report "Economic Analysis of Agricultural Operations" contained in Appendix B of this EIR, it is not economically feasible to maintain a farming operation on the

Lion's Gate site, given the high property tax rates and land carrying costs. Even assuming that this were a family farm with no long-term debt and minimal property taxes (i.e., at or below tax levels that would apply if these lands were covered by Williamson Act contracts), a farming operation here would only cover costs at best, with no return on investment. This is due to several factors including the relatively high cost of labor and supplies in Santa Clara County, the relatively low yields per acre, and because the small size of the operation cannot achieve economics of scale under which fixed overhead costs can be spread over a large operation.

Therefore, although the loss of prime farmland resulting from this project represents a potential significant impact, the severity of the impact is reduced by the fact that this land is no longer economically viable for agriculture.

The project is unlikely to initiate the conversion of other agricultural lands nearby. All of the adjacent agricultural lands to the east are designated Rural Residential in the 1995 County General Plan. This designation allows for 5-acre minimum lot sizes, and represents an acknowledgement of the general parcelization pattern of the San Martin area into lot sizes which are too small to be viable for agricultural operations. A number of the nearby parcels to the south and east of the project site currently do not have Williamson Act contracts in effect, indicating a general intention by the owners to convert these properties to non-agricultural uses within the foreseeable future.

Mitigation 1. **The loss of approximately 110 acres of prime farmland would be offset by the planting of vineyards in areas not proposed for development.**

As noted under "Project Description," 10 acres of vineyard would be planted along the eastern project frontage on Coolidge Avenue. Additionally, approximately 100 acres of vineyard would be planted in the field at the western end of the project along Watsonville Road. The planting of the vineyards, combined with the fact that agricultural cultivation of this property is not economically viable, as discussed above, would reduce the impact of the loss of agricultural land to non-significant levels.

<u>Impact 2</u>. **The residential lots proposed at the eastern end of the site would potentially create land use conflicts with nearby agricultural operations. (Potential Significant Impact)**

Ongoing agricultural operations occur to the east across Turlock Avenue. The proximity of residential uses and productive farmland often leads to nuisance complaints from new residents about agricultural practices related to spraying, odors, dust, and noise. In turn, farmers often complain about trespassing, vandalism, damage to crops, urban pets, and other infringements on farming operations. These potential effects are somewhat limited at the project site, since the interface conflicts with agricultural lands would be confined to the eastern edge of the site. In the southeast corner of the project, the proposed equestrian center would be located adjacent to the existing horse ranch to the south. Given the similarity of these activities, no interface conflicts are anticipated along this boundary.

As noted above, a number of the nearby parcels to the south and east of the project site currently do not have Williamson Act contracts in effect, indicating a general intention by the owners to convert these properties to non-agricultural uses within the foreseeable future.

Mitigation 2. **The creation of buffer zones along the eastern edge of the site would minimize the potential for interface conflicts with existing farming operations.**

The cluster residential subdivision proposed for the on-site field south of Highland Avenue would be set back from 200 to 1,400 feet from Turlock Avenue. In the Rural Residential subdivision proposed for the orchard site north of Highland Avenue, the nearest lot would be approximately 300 feet west of Coolidge Avenue. These setback distances would create an open space buffer zone adequate to mitigate potential conflicts between the proposed residential uses and the existing agricultural operations. In addition, the landscaped berms proposed along the eastern site frontages would further reduce potential interface conflicts. Although no interface conflicts are anticipated between the proposed equestrian center in the southeast corner and the adjacent horse ranch, a 4-foot landscaped berm is also proposed for this boundary. (See Section *III. N. Hazardous Materials, Public Health and Safety* for a discussion of potential odor and vector problems.)

In addition, under the County's Right-to-Farm Ordinance, purchasers of residential lots in the project would be required to be notified of the nature of farm nuisances in the real estate transfer documents.

Conclusion. **The conversion of Class II soils to residential uses proposed for the project would represent a potential significant impact. The severity of the impact is reduced because these on-site soils are no longer economically viable for agricultural production. In addition, the planting of vineyards on the project site would off-set the loss of prime farmland, which combined with the lack of economic viability of cultivation at the property reduces the impact to less-than-significant levels. The potential land use conflicts between the residential and equestrian uses proposed in the project, and the existing agricultural operations in the vicinity would be mitigated to less-than-significant levels by open space buffer zones and landscaped berms along the eastern and southeastern edges of the site, as proposed in the project.**

C. PARKS, RECREATION AND OPEN SPACE

Environmental Setting

Much of the project site is in a natural or semi-natural open space condition. The site offers a variety of open space experience, from the expansive views available from the low hillside areas in the north, to the extensive oak woodland covering the southern ridges of the site.

Previous Parks and Open Space Planning Efforts Involving Hayes Valley

Hayes Valley Reservoir: In the early 1970s, the Hayes Valley site was under serious consideration as the site of the proposed "Hayes Valley Reservoir." Under the plan proposed at that time, dams would have been constructed at the eastern and western ends of the valley to create a water surface area of 400 acres. The reservoir would have been a major storage facility for the Santa Clara Valley Water District, with a planned capacity of 45,000 acre-feet. The reservoir was also the focus of a major recreation planning effort by the Santa Clara County Parks and Recreation Department. A broad variety of recreational facilities were envisioned for the reservoir and the surrounding hillside areas including boating, fishing, swimming, picnicking, camping, horseback riding, bicycling and hiking. The main activity area was planned for the Watsonville Road side of the site, while a smaller center on the east side near the existing ranch was to include horse stables and a group camp area. The Hayes Valley Reservoir concept was ultimately abandoned by the Water District and the County Parks and Recreation Department.

Preservation 2020: In 1987, the County of Santa Clara adopted a planning document guiding open space acquisition entitled Open Space Preservation: A Program for Santa Clara County, a report prepared by the Preservation 2020 Task Force (April 1987). The report identified candidate open space and park sites according to priority of acquisition or protection. The Open Space Preservation report ranks the Hayes Valley area as number 26 of 42 open space acquisition priorities, and does not list it as a park (active recreation) acquisition priority. The report listed the watershed, viewshed and ability to buffer urbanization as its primary resources to be protected at the Hayes Valley site. The report also described techniques for implementing open space preservation, including the clustering of development to avoid viewshed areas.

County Parks

The Santa Clara County Parks and Recreation Department operates 6 parks within a 10-mile radius of the Lion's Gate site. These include Uvas Reservoir, Chesbro Reservoir, Uvas Canyon Park, Mount Madonna Park, Coyote Lake and Anderson Lake. A seventh County facility, Uvas Creek Park Preserve, is operated by the City of Gilroy. These facilities are described below.

Uvas Reservoir, located 2.5 miles west of Hayes Valley along Uvas Road, contains 430 acres of parkland with opportunities for non-power boating, picnicking and fishing.

Chesbro Reservoir, located 4.5 miles to the north at the head of Paradise Valley, contains 650 acres of parkland used for sailing, fishing and rowing.

Uvas Canyon Park, a 1,220-acre park located approximately 10 miles west of Hayes Valley near the Santa Cruz County line, offers camping, picnicking and hiking opportunities along 7 miles of developed trails.

Mount Madonna Park, located approximately 9 miles to the southwest, contains over 3,300 acres of scenic terrain with opportunities for camping, picnicking and extensive trails for hiking and horseback riding.

Coyote Lake, a driving distance of approximately 10 miles east of Hayes Valley, encompasses a 1,400-acre park with opportunities for sailing, power boating, jet skiing, fishing, picnicking and shoreline camping.

Anderson Lake, a driving distance of approximately 9 miles northeast of Hayes Valley, comprises a 2,100-acre park with picnicking, boating and fishing opportunities. It is also the southern terminus of Coyote Creek Parkway, a 15-mile linear park popular with bicyclists, rollerbladers and hikers, as well as equestrians in the southern portion.

Uvas Creek Park Preserve, located 6 miles south of Hayes Valley outside Gilroy, consists of a 132-acre preserve containing a 1.9-mile long paved trail, and is operated by the City of Gilroy.

Henry W. Coe State Park

This 67,000-acre state park is located in the Mount Hamilton Range approximately 15 miles northwest of Hayes Valley. The only vehicular access to the park entrance is via a winding road leading east from Anderson Lake. Intended for low-intensity use, this state park offers opportunities for hiking, backpacking, car camping, swimming, fishing and horseback riding.

Regional Trails

There are no developed trails in the vicinity of the Lion's Gate site, outside the trails within the 8 parks described above. The recently adopted Countywide Trails Master Plan Update of the County General Plan shows proposed trails and/or bike paths running along several existing roadways in the vicinity, including Coolidge Avenue/Santa Teresa Boulevard to the east, Watsonville Road and Uvas Road to the west, and Day Road to the south. In addition, the plan shows a proposed trail traversing the Lion's Gate site generally from east to west. The Master Plan policies require that development projects on lands that include a planned trail may be required to dedicate and/or improve such a trail to the extent there is a nexus between the impacts of the proposed development and the dedication/improvement requirement. (For further discussion, see Section *II. Consistency with Plans, Policies and Regulations*, under the subheading Countywide Trails Master Plan Update.)

Scenic Highways

The Regional Parks, Trails and Scenic Highways element of the County General Plan designates Coolidge Avenue/Santa Teresa Boulevard and Watsonville Road as scenic roads. These roads are also designated as County scenic roads per Section 43 of the County zoning ordinance, which stipulates that any development proposed within 100 feet of a scenic road be subject to the County's Design Review guidelines and procedures.

Ordinances and Regulations that Address Recreational Resources

County Zoning Ordinance: Article 43 of the Zoning Ordinance contains special provisions for development proposed along County-designated scenic roads, which in this case applies to Coolidge Avenue/Santa Teresa Boulevard and Watsonville Road. Under Article 43, any development or structures (including signs, fences and lighting) proposed within 100 feet of the scenic road is subject to the Design Review process to ensure compatibility with the scenic roads (see Section *III. J. Visual and Aesthetics* for further discussion).

The County has no planning-based ordinances for parks and recreation, such as a parkland dedication ordinance. However, the County may require the dedication of a conservation easement as a condition of project approval, as provided for under Policy R-LU 28 of the 1995 County General Plan (see Section II for further discussion).

Significance Criteria

With respect to recreational resources, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(w) Conflict with established recreational, educational, religious or scientific uses of the area."

Impacts and Mitigations

<u>Impact 1</u>. **The proposed golf course and residential uses would result in the loss of approximately 410 acres of semi-natural open space. (Potential Significant Impact)**

The development of the golf course and its related facilities would involve 269 acres of land in the central valley area of the site, while the residential subdivisions and roadways would occupy approximately 141 acres. Approximately 16 percent of the total site area would be converted to golf course uses, and 8 percent would be converted to residential uses. This acreage consists primarily of fields, an abandoned orchard, grazing land and approximately 20 acres of partially wooded hillsides (although the proposed building envelopes for the two proposed woodland lots are located in areas with little no tree cover). The Hayes Valley site was identified as a low priority (rated #26 out of 42) for open space preservation by the County's Open Space 2020 Task Force. The report cited the property's value as watershed, viewshed, and ability to buffer urbanization as primary resources to be protected. The remaining 1,265 acres of the property would remain in permanent open space, as required under the Hillside clustering provisions of the zoning district.

Mitigation 1a. **The project would provide approximately 263 acres of managed recreational open space in the form of a public golf course. The golf course would provide an added recreational opportunity in the County.**

The proposed project would provide additional recreational opportunities which would be open to members of the public. The project would help alleviate the well-documented shortage of golf courses in the County.

Mitigation 1b. **The remaining 1,265 acres of natural and semi-natural area of the site would be preserved as permanent open space as a condition of the cluster development permit.**

Approximately 1,265 acres of oak woodland and grassland on the site would be preserved as permanent open space. This open space area would be managed and maintained by the Homeowners Association for the project, and would not be open to the general public.

Mitigation 1c. **A trail easement for the 2 to 3 mile on-site segment of the proposed San Martin Cross-Valley Trail would be dedicated in conjunction with the project. Segments of two additional trails along the project frontages on Coolidge Avenue and Watsonville Road would be dedicated and improved in conjunction with required roadway dedications and improvements.**

Conclusion. **With implementation of the above mitigation measures, the project impacts on open space and trails would be reduced to less-than-significant levels.**

D. GEOLOGY AND SOILS

The following discussion of site geology and soils is based on the reports listed below:

- Pacific Geotechnical Engineering, Geologic Feasibility Evaluation, Clubhouse and Overnight Lodges, The Lions Gate Reserve, San Martin, California, December 1995.

- Pacific Geotechnical Engineering, Geologic Feasibility Investigation, Golf Course Maintenance Building, The Lions Gate Reserve, San Martin, California, December 1995.

- Pacific Geotechnical Engineering, Preliminary Geologic Feasibility Evaluation, Homesites on Parcels #24, 25 and 26, The Lions Gate Reserve, San Martin, California, December 1995.

- ENGEO Incorporated, Geologic Input to EIR, Lion's Gate Property, Hayes Valley, Santa Clara County, April 13, 1993.

- Wahler Associates, Geologic Input to Draft Environmental Impact Report, Lion's Gate Development, April 17, 1990.

- Kaldveer Associates, Supplemental Geological Reconnaissance Investigation for Proposed Hayes Valley Dams, Santa Clara County, August 4, 1989.

- Terratech, Inc., Pre-purchase Site Assessment of Geologic Hazards, Ground Water Supply and Environmental/Toxic Contamination, Hayes Valley Property, Santa Clara County, January 20, 1988.

These reports are contained in Appendix C of this EIR.

Environmental Setting

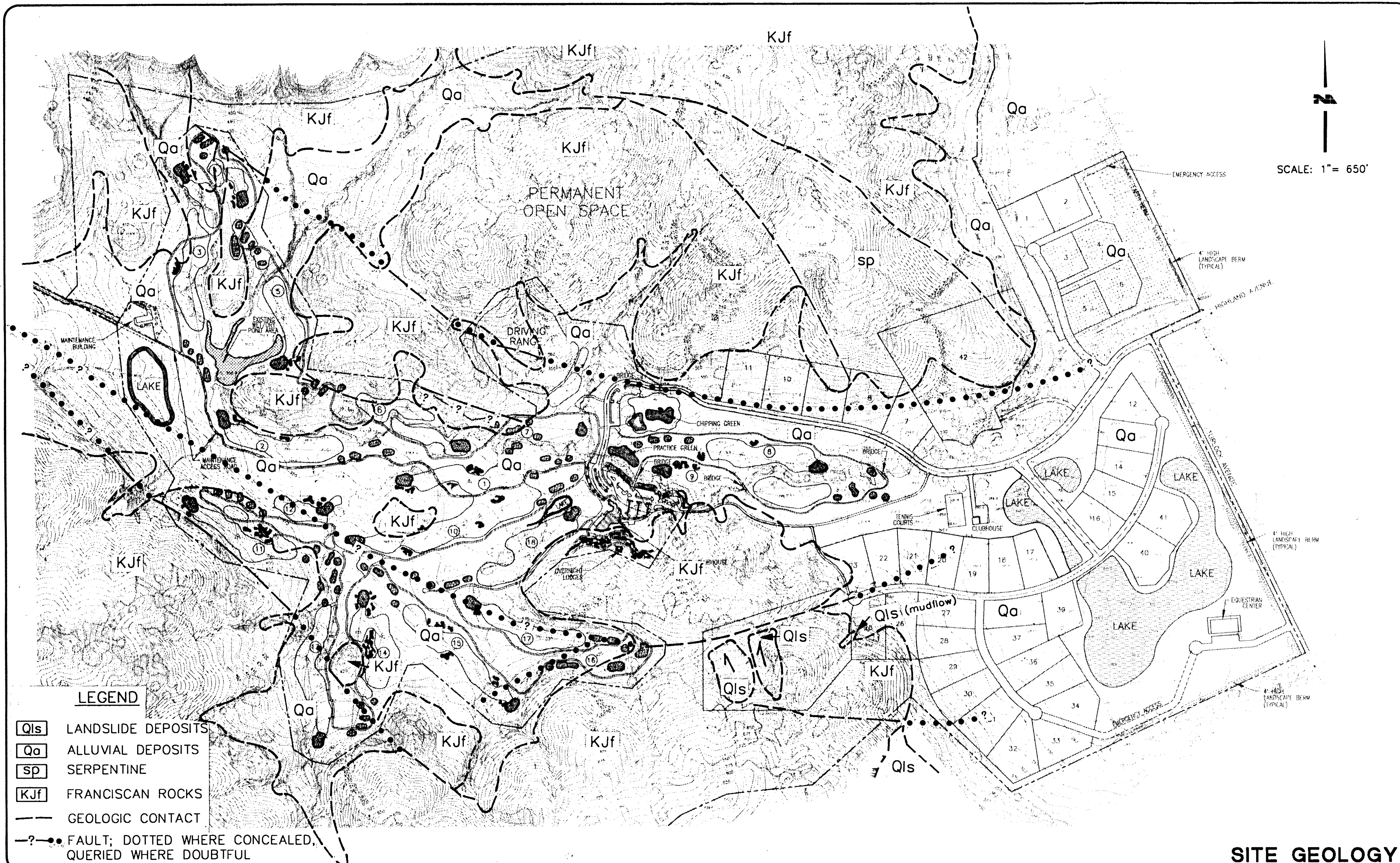
Topography

The site includes an approximately 2-mile long east-west trending valley (which varies in width from one-half mile to nearly one mile, flanked by hillsides to the north and south). The valley narrows to the east and opens into the southerly reach of the Santa Clara Valley. Most of the surface drainage from Hayes Valley flows out through the eastern end of the valley via the West Branch of Llagas Creek. A low topographic divide exists near the western end of the valley. West of this divide, site drainage flows via Hayes Creek northeasterly to the main branch of Llagas Creek.

The hills on both sides of Hayes Valley are moderately steep and increase from base elevations of 300 to 400 feet along the valley floor to 1,100 feet on the ridges on the south side of the valley, and to 800 feet on the northern ridges.

Geologic and Soil Conditions

The site is located in the eastern foothills of the Santa Cruz Mountains, within the Coast Ranges geomorphic province. The bedrock underlying the ridges on the north side of the valley consists of a mixture of sandstone, greenstone, chert, shale and limestone, and other rocks of the Franciscan Complex, which are intruded here with large masses of serpentinite (see Figure 11). The bedrock underlying the ridges of the south side of the valley



Source: Wahler Associates

SITE GEOLOGY

FIGURE 11

consists primarily of Franciscan greenstone. The bedrock areas are covered by sandy to clayey soil. Clayey soils are generally moderately to highly expansive. Thickness of soil in bedrock areas ranges from one to two feet along ridges, and 8 to 10 feet in colluvial swales.

The alluvium beneath the main valley floor consists of interlayered, poorly sorted gravel, sand, silt, and clay deposits derived from the erosion of Franciscan bedrock materials which form the surrounding hillsides. The major soil types found on the valley floor include Keefers clay loam, Los Robles clay loam, Gilroy clay loam and Vallecitos rocky loam, along with Cropley clay and Maxwell clay at the eastern end of the site. These soils are composed of stiff to hard sandy clay, gravelly clay and clayey gravel and have good strength characteristics. Soil depth on the valley floor ranges from 45 to 95 feet.

Faults and Seismicity

Seismically, the site and region are dominated by the potential release of earthquake-generating energy stored along the active San Andreas system which forms the boundary between two tectonic plates. In the south Bay Area, movement along this boundary is distributed across a complex system of faults which include the San Andreas (7.4 miles southwest), the Calaveras (5.6 miles northeast), and the Hayward (16 miles northeast). In addition, the Sargent-Berrocal fault (4.3 miles southwest) and the Coyote Creek fault (5 miles northeast) are considered by most geologists to be active. All of these faults are considered capable of generating large magnitude earthquakes that could cause high intensity groundshaking at the Lion's Gate site.

Two inactive fault traces cross the northern and southern portions of the valley, in a roughly parallel alignment from southeast to northwest. These traces are believed to be the eastern-most extension of the Ben Trovato fault, which is not designated as potentially active under the Alquist-Priolo Earthquake Fault Zoning Act. There is no data to indicate that these on-site fault traces have been active in the recent geological past.

Based on backhoe trenching and seismic refraction studies undertaken at the site in 1990, Wahler Associates concluded that the faults on-site are inactive. (A previous report by Terratech in 1988 indicated that the on-site fault traces might be "active," based on interpretation of aerial photographs. However, the subsequent Wahler report was quite firm that their subsurface fault investigation found no evidence to support a belief that on-site fault traces might be active. The recent evaluations by Pacific Geotechnical Engineering in 1995 also concluded that these faults are not active.)

Other faults have been mapped on and adjacent to the property as displacing Franciscan bedrock and separating Franciscan bedrock from serpentinite. Faults are common in bedrock of the Franciscan Complex and are interpreted as the result of ancient, inactive deformation.

Landslides and Soil Stability

The site is relatively free of major landslide features, except for two active or dormant landslides near the southeasterly corner of the property. There is also a mudflow in this area of the site, which probably occurred as a result of the heavy rains of 1982.

In the northwest corner of the site, there is an area with many small landslides, and there are also several shallow landslides in the colluvial soils along the south-facing slopes of the northeastern hillside area. There are no deep bedrock landslides identified on the property.

Adjacent to the valley floor on both sides, the lower slopes and drainage ravines are covered with deposits of colluvial soil (a poorly consolidated, organically rich soil composed of weathered bedrock material). The colluvium deposits represent accumulation of soil and bedrock debris by slopewash, creep, landsliding, and other mass wasting processes. The thickness of these deposits generally increases downslope. Due to their unconsolidated nature, these deposits are generally unstable and susceptible to accelerated erosion and gulleying. Since the colluvium generally includes clay materials, these deposits also tend to be expansive and may creep downhill.

Active erosional down-cutting is occurring in the central portion of the main valley (where there are gulley banks as deep as 8 feet) and in some of the steeper canyons. Elsewhere, localized gulleying is occurring on some of the steep slopes underlain by thick soil or landslide deposits.

Groundwater

Within the alluvium area of the valley floor, groundwater has been measured at most places at depths of 13 to 20 feet, after a heavy rainy season. In some places, groundwater has been measured within several feet of ground surface. These levels vary with the season and the rainfall amounts.

In the surrounding hillsides, several active springs and seeps exist. Most of these springs appear to be associated with major geologic transition zones, such as faults, shear zones and geologic contacts between bedrock units (e.g., between Franciscan and serpentine bedrock). Some of these springs have been developed into shallow wells to provide stock water, or to form ponds.

Serpentine/Asbestos

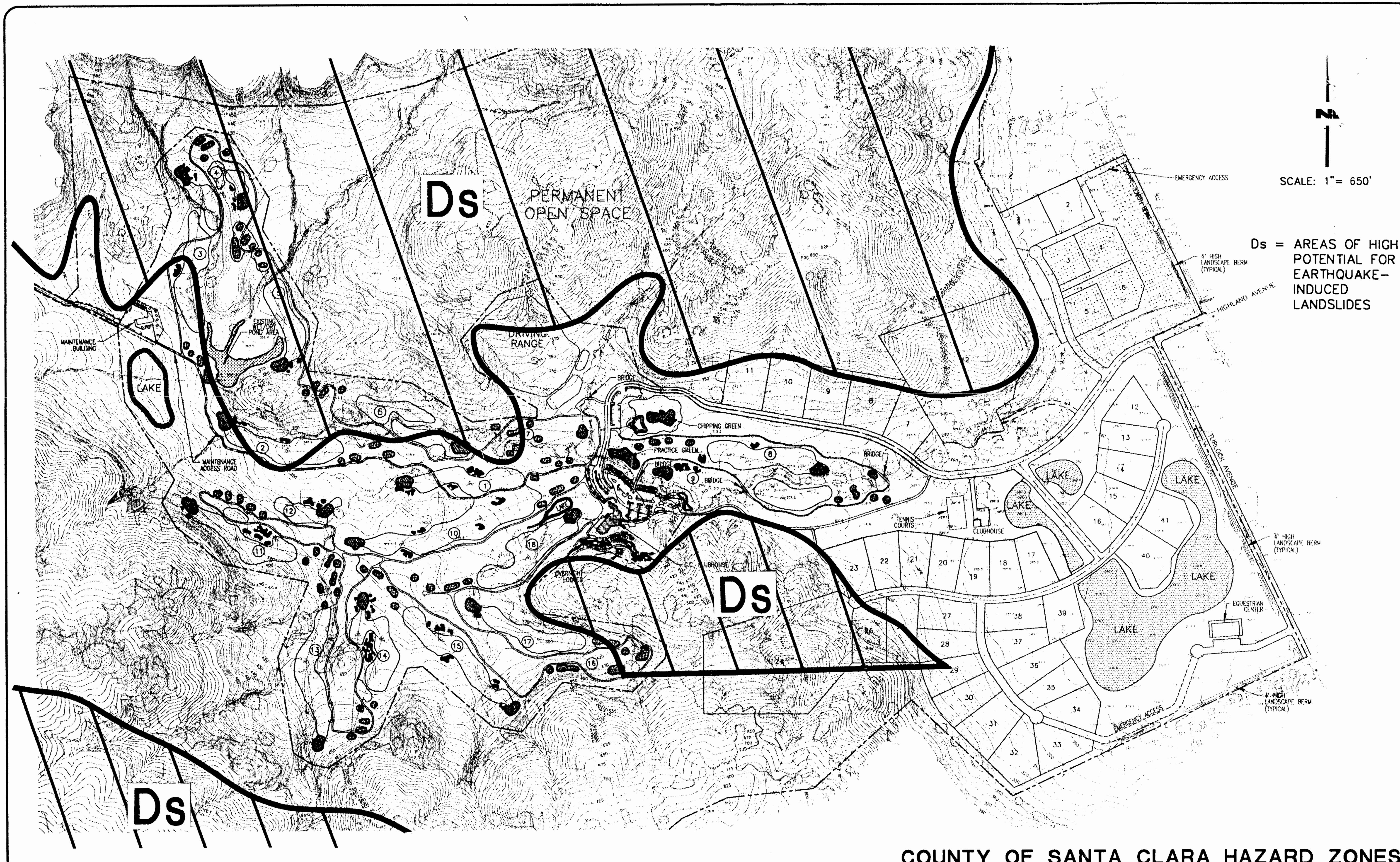
In the northeastern hills of the site, an area of approximately 75 acres is underlain by serpentinite bedrock. Most serpentinite in the region contains tiny veins of chrysotile, an asbestos mineral. When disturbed and released into the air, as may occur as a result of grading activity, the windborne chrysotile is considered to be a potential health hazard if inhaled.

Ordinances and Regulations that Address Geology and Soils

<u>Geologic Ordinance</u>: This ordinance stipulates the minimum level of geologic studies required for proposed projects based on the official County Geologic Hazard Maps of the project. Portions of the project site are designated on the County Geologic Hazard maps as "Ds" zone, which indicates a high hazard for potential earthquake-induced landsliding (see Figure 12). No portion of the site lies within the County's "Dr" hazard zone, which reflects the high potential for ground displacement along fault traces. Likewise, no potion of the site lies within an Alquist-Priolo Earthquake Fault Zone mapped by the State Geologist.

The Geologic Ordinance requires the County Geologist to determine whether or not detailed geologic investigation is needed in such designated hazard areas prior to project approval. The required geologic reports must be reviewed and approved by the County Geologist prior to project approval. The ordinance also requires that all building permits in such areas be reviewed and signed by the County Geologist who may require additional studies.

<u>Grading Ordinance</u>: This ordinance establishes minimum standards for grading projects in order to control erosion and sedimentation, as well as to prevent slope destabilization and scarring of hillsides. It regulates grading through the grading permit approval process, and establishes standards for the construction and maintenance of cuts and fills, and the clearing of vegetation. It also requires the revegetation of cleared areas and the installation of proper drainage control to minimize instability.



COUNTY OF SANTA CLARA HAZARD ZONES

Source: County of Santa Clara

FIGURE 12

Uniform Building Code: The UBC, which is adopted by the County, provides minimum standards to safeguard life, health, and property by regulating the design, construction, quality of materials, and location and maintenance of buildings and structures. The UBC contains the latest seismic standards.

Significance Criteria

With respect to geologic impacts, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(r) Expose people or structures to major geologic hazards."

Impacts and Mitigation

Impact 1. **Potential secondary ground rupture or sympathetic movement along inactive faults crossing the site may result in minor damage to structures, roadways and utility lines. (Potential Significant Impact)**

The previous limited fault investigation on the Hayes Valley site by Wahler Associates in 1990, concluded that both of the on-site fault traces are inactive. Therefore, the potential hazard due to primary ground rupture (as might occur along an active fault trace) is considered to be minimal at the project site. Secondary ground rupture or *sympathetic movement* along one of the inactive faults on-site could conceivably occur as the result of the strong groundshaking caused by the occurrence of a large earthquake originating on one of the nearby active faults (e.g., Sargent or San Andreas faults). In the event of a large nearby earthquake, sympathetic movement of a fault within bedrock materials at depth might propagate through the overlying sediments to break the ground surface; but where bedrock covers significant thickness (more than 5 feet) of alluvium or colluvium, the displacement at the ground surface would be considered unlikely, although broad tilting and deformation are possible. Any displacements at the surface of the bedrock from such sympathetic fault movement would likely be small, up to a maximum of several inches. The risk of minor damage to structures, roadways and utility lines crossing on-site fault traces as a result of secondary ground displacement is negligible, but remotely possible. The areas of the project that could be potentially affected by the on-site fault trace include proposed Lots 7 through 11, 20 through 24, and 30 and 31 (see Figure 11). The clubhouse and overnight accommodations complex would not be affected.

Mitigation 1a. **Where proposed structures for human occupancy are determined to be underlain by an inactive fault trace, appropriate setback distances for those structures may be required.**

Detailed fault investigation would be undertaken where structures for human occupancy are planned for areas suspected of being underlain by faults. These studies would determine the potential for surface displacement along the on-site fault traces, with implementation of recommendations as to appropriate measures for site planning, building design, and utilities engineering. The previous fault study (Wahler, 1990) was relatively general and did not address specific proposed building sites.

Based on the findings of such explorations, the project geologist could recommend that habitable structures be located off the faults, or in the event of potential sympathetic movement, that a setback zone be established. An appropriate setback distance would be established in discussions between the County Geologist and the project geologist. There is adequate space on all of the proposed lots to accommodate any changes in building locations. Alternatively, the project geologist may conclude that there is no risk of offset along the fault contacts due to the thickness of alluvium, indicating no need for mitigation or avoidance.

Mitigation 1b. **Potential for rupture of water, wastewater or utility lines would be reduced by measures such as the use of pipes with flexible or telescoping couplings, double pipe, and other measures.**

If the studies determine that a potential risk exists for rupture of water, wastewater or utility lines, the potential for rupture can be reduced by measures such as the use of pipes with flexible or telescoping couplings, double pipe, and the use of sand as backfill material in pipe trenches where they cross the fault trace. If rupture occurs, the amount of water or effluent spilled can be minimized by the use of automatic shut-off valves installed at both sides of the fault crossing.

<u>Impact 2</u>. **Strong ground shaking occurring on the site during a major earthquake may cause severe damage to project buildings, bridges and other structures. (Potential Significant Impact)**

Historically, major earthquakes centered on the Hayward, Calaveras and San Andreas faults have resulted in moderate to severe ground shaking at the Hayes Valley site. It is expected that a major earthquake will cause severe ground shaking at the site during the life of the project facilities.

Ground shaking will cause dynamic loading resulting in stress to buildings and structures. However, structures designed and built in accordance with the Uniform Building Code should respond well except during the most severe potential ground shaking. The foundation soils at the site are generally strong and dense and should respond satisfactorily under the stresses imposed by strong ground motion.

Seismic shaking can also induce secondary ground failures such as liquefaction, lateral spreading, and landsliding. (These issues are discussed subsequently.)

Mitigation 2. **Structural damage to buildings resulting from ground shaking would be largely prevented by following the requirements of the Uniform Building Code. Bridges and other structures would be designed in accordance with seismic design loads as determined by the project geologist.**

<u>Impact 3</u>. **Seismic shaking could induce ground failure resulting from liquefaction, potentially causing damage to buildings and other structures. (Potential Significant Impact)**

Ground failure due to liquefaction occurs in areas where saturated, sandy loose soils can liquify when shaken. This results in the soil losing its shear strength as it essentially transforms to a liquid state (similar to quicksand), thereby causing sudden differential settlement of structures located above the liquified soil. The greatest potential for liquefaction exits in cohesionless soils with high groundwater.

The floor of Hayes Valley may be underlain by alluvial deposits which typically are potentially liquefiable. Liquefaction potential is actually considered to be low, however, because the on-site alluvial soils are moderately consolidated, and are typically cohesive and dense in nature. To date, soil borings taken on the site indicate that soils have too high a clay and/or gravel content for liquefaction to occur. However, there may be isolated pockets of liquefiable material present on the valley floor.

Mitigation 3. **If liquefiable material is found at building sites, mitigation would involve subexcavation of the liquefiable material and replacement with engineered fill, or alternative measures as recommended by the project geologic engineer.**

Site-specific geotechnical studies would be conducted prior to permit approvals to determine if liquefaction potential exists in the proposed development areas. The engineering recommendations of those studies would provide the specific mitigations to be implemented for liquefaction, as necessary.

Impact 4. **Seismic shaking could induce lateral spreading, potentially causing damage to buildings and other structures. (Potential Significant Impact)**

Ground shaking can also result in lateral spreading, which is the lateral displacement of flat-lying alluvial material toward an open area, such as a steep bank of a stream channel. Considering the narrowness of the creek channel, and given on-site soils of cohesive, dense alluvium, the risk of lateral spreading is low.

Mitigation 4. **The risk of damage from lateral spreading would be minimized by getting planned structures back from stream banks, in accordance with the recommendations of a geologist.**

The setback distance appropriate for on-site structures would depend on localized soil conditions, and would be determined during geotechnical studies required prior to project development.

Impact 5. **The presence of unstable slopes and existing landslide deposits on the project site may pose a hazard to proposed structures, and may be affected by project grading. (Potential Significant Impact)**

Several minor shallow landslides have been mapped along the lower south-facing slopes of the northeastern hillside area of the site, in the vicinity of the proposed practice range. Landslides have also been mapped near the southern hillsides of the site, in the vicinity of the proposed overnight units, and at the sites of proposed residential Lots 24, 25 and 26. These areas of the site lie within the "Ds" area of the County's Geologic Hazard Maps (see Figure 12), indicating a high potential for earthquake-induced landslides. It is possible that new landslides could occur within these generally unstable areas.

The existing and potential landslide areas of the site could be naturally destabilized by intense rainfall or seismic ground shaking. Also, the water issuing from existing springs in the northern hillside areas tends to destabilize hillside soils and contribute to landsliding.

Unstable slopes and landslides could also be destabilized by activities proposed for the project such as large-scale grading which could cut into unstable slopes or load unstable areas with new fill materials.

In addition, the spray irrigation of the practice range with treated effluent, which is proposed as an alternative wastewater disposal method, could destabilize existing slide deposits in this area by increasing pore pressures within the slide masses.

Due to concerns about potential landsliding affecting the feasibility of the proposed overnight units, and Lots 24, 25 and 26, feasibility-level geotechnical evaluations of these areas were conducted by Pacific Geotechnical Engineering in December 1995. With respect to the overnight units, it was found that two landslide deposits located upslope of the complex could become reactivated and impact the proposed structures. It was concluded that, while further design-level geotechnical studies would be required, it appears that this landslide hazard "can be mitigated or repaired in conventional fashion without exorbitant cost" (see mitigation measures below). (The feasibility report on the clubhouse and overnight complex is contained in Appendix C.)

With respect to the potential for mudflow that might have an impact on the proposed improvements on Lots 24, 25 and 26, it was found that development of these three lots is constrained by potential debris flow and landslide activity. However, there are areas within each of the proposed lots where structures could be sited at suitable distances from the area of high landslide potential. Structures could be sited closer to the areas of potential debris flow and landsliding if appropriate mitigations are implemented. (The feasibility report on Lots 24, 25 and 26 is contained in Appendix C.)

Mitigation 5. **Potential damage from landslides would be avoided by setting structures back from known landslide deposits, by repairing the landslides, or by implementing other slope stabilization measures to prevent new landslides.**

Existing landslides and areas of potential slope instability that may be affected by proposed grading, construction and spray irrigation would be subject to detailed geologic and geotechnical investigations as required under the County's Geologic Ordinance, prior to issuance of a grading permit. These studies would provide specific recommendations to mitigate potential landslide hazard.

Typical measures for landslide repair include selective removal of landslide debris, keying into bedrock, constructing engineered fills and buttress fills, and constructing surface and subsurface drainage galleries to reduce the potential for failure.

With respect to the potential debris flow impacts at Lots 24, 25 and 26, the feasibility report by Pacific Geotechnical Engineering identified possible mitigation measures such as a deflection wall or berm, detention basin or possibly an energy-dissipation fence. For the potential slump-flow landsliding hazard on these lots, the report identifies mitigation measures such as regrading the slope of the face of the alluvial fan, excavating and recompacting the landslide debris, and establishing drainage controls.

The specifics of the mitigation approach would be determined during the detailed geological and geotechnical investigation required under the County's Geologic Ordinance.

Impact 6. **Potential debris flows originating in the hillside areas of the site could cause damage to proposed structures and the golf course. (Potential Significant Impact)**

There is a potential for debris flows to occur along the many narrow drainage ravines which run up the hillsides on both sides of the valley floor.

Debris flows are shallow, rapid, muddy landslides that occur with little or no warning during or within several hours after high-intensity rainstorms. Debris flows often originate in natural soil near the tops of, or along the flanks of, steep, narrow drainages or in fill on steep slopes. Unlike slow-moving landslides (which usually affect only the area immediately surrounding the ground failure), debris flows often travel hundreds of feet and impact areas well below the unstable hillsides on which they originate. As experienced during the unusually wet winter of 1982-83, debris flows can be extremely destructive. The potential for debris flows occurring along a given drainage depends primarily on whether accumulations of potentially unstable soil exists in their upper reaches. The areas of the proposed project which are potentially subject to the effects of debris flows include the practice facilities and the westerly residential area.

Mitigation 6. **Where a potential for debris flow is present, the hazard would be mitigated by removing accumulations of soil from the potential source areas, or by constructing debris deflection, channeling and containment facilities at the mouths of the potentially affected ravines.**

Areas of known debris flow hazard would be addressed in detailed geologic and geotechnical studies which would provide measures to improve the stability of these areas to an acceptable level. Implementation of those measures would occur prior to construction of planned improvements.

To reduce the destabilizing effects of the springs in the northern hillsides, subdrainage systems would be installed in the hillside areas immediately upslope of the proposed development areas.

The design of proposed cuts and fills would be prepared by a qualified engineer on the basis of site-specific geotechnical data and slope stability analysis.

Impact 7. **Expansive soils present on the site may cause movement or heaving, potentially resulting in damage to foundations, concrete pads and pavements. (Potential Significant Impact)**

The majority of the near-surface soil on the site consists of silty or sandy clay, which is moderately to highly expansive. The higher clay content gives the soil the capacity to absorb and release large amounts of moisture with associated volume changes. During the rainy season these soils swell as water is absorbed, and during the dry season they shrink as water is removed by evapotranspiration. Highly expansive soils are evident during the dry season by the formation of open shrinkage cracks on the ground surface.

The expansion (or swell) of soils could exert pressures against foundation elements, and on slopes that could result in creep of the soils. The shrinking of soils could result in consolidation beneath foundation elements. Structures built on foundations that are not designed for such soil movements can be deformed and damaged.

The north-central area of the site contains colluvial materials which are potentially highly expansive. Any development proposed for this area, such as the proposed maintenance facility, would require special attention during design and construction of building foundations and pavements, but would probably not require site plan modifications.

Mitigation 7. **The potential damage to foundations and pavements would be avoided by following the requirements of the Uniform Building Code, and may necessitate removal of the expansive soils from areas where buildings, slabs-on-grade or pavements are planned to be constructed.**

Site-specific geotechnical studies would be conducted prior to permit approvals to determine if expansive soils are present within the proposed development areas. To mitigate potential foundation problems associated with expansivity of soils, the project geotechnical engineer may recommend that all foundations bear on low expansivity subsoils or bedrock, necessitating the removal of any expansive soils from those areas. This would result in reduced foundation requirements and lower foundation costs. If removal of expansive soils is not possible, the foundations should be designed to accommodate movements caused by the expansive soils.

Any locations where the internal access road traverses expansive soils would require stripping of the expansive soil in the foundation subgrade.

Impact 8. **Areas with potential soil creep may cause damage to foundations, concrete pads and pavements. (Potential Significant Impact)**

Where expansive soils are present on sloping ground, seasonal expansion and contraction causes soils to move downslope, generally at a rate measured in millimeters per year. While this rate is very slow, it has a progressive and degenerative effect on structures that are not designed to accommodate or resist the forces involved.

There are several areas of suspected or observed soil creep, primarily on the steep slopes with thick soil cover to the south of the proposed overnight facilities. These areas are characterized by shallow erosion and sloughing, leaning trees or fences, and slightly irregular or hummocky surface. The deposits of colluvium along the lower slopes and drainages are subject to soil creep which can exert pressure on downslope structures and foundations.

Mitigation 8. **Protection from potential surface sliding and soil creep would be provided by preventing surface water from draining onto potentially unstable slopes, through subsurface drainage control, and by providing for resistance to higher lateral pressures in the design of footings and walls.**

The potential damage due to soil creep would be evaluated during detailed geologic and geotechnical investigations, followed by implementation of recommended mitigations as appropriate.

Impact 9. **Removal of vegetation and project grading may result in erosion and sedimentation of downstream water bodies. (Potential Significant Impact)**

The removal of vegetation and topsoil during grading may reduce infiltration capacities of the soils, thereby increasing the volume and velocity of surface runoff. This would potentially result in increased erosion, potential gullying and stream channel erosion. Increased sediment loads may adversely affect aquatic habitats downstream. (See Section *III. F. Water Quality*).

Mitigation 9. **Implement erosion control practices during grading and construction.**

The project would be subject to detailed erosion control measures to be specified in the County's Grading Permit conditions and also in the Storm Water Pollution Prevention Plan which will be required for the project. (Specific measures to control erosion and sedimentation are described in Section *III. F. Water Quality*.)

Impact 10. **Shallow groundwater conditions in areas of the site may adversely affect below-ground structures and utilities. (Potential Significant Impact)**

The relatively shallow groundwater conditions are expected to affect below-ground structures including basements and utilities located at depths greater than 10 feet below the original ground surface in spring areas and in the valley floor area. Excavation for stormwater retention basins or ponds, requiring cuts greater than a depth of 10 feet, may encounter groundwater.

Shallow groundwater conditions may limit the use of leachfields in the low-lying valley areas, or in the vicinity of perennial springs and hillside drainages.

The spray irrigation of treated effluent over the practice range would add water to this area. However, groundwater levels would not be affected since treated water would be applied to match evapotranspiration (ET) rates of the turfgrass, and no spray irrigation would occur in winter.

The installation of water wells for golf course irrigation could draw down the water table. Land subsidence or settlement can occur as a result of groundwater withdrawal and lowering of the water table in poorly consolidated alluvial sediments. Since sediments underlying Hayes Valley are moderately to well consolidated, minimal subsidence or settlement is anticipated to result from moderate irrigation pumping.

As discussed in Section *III. P. Water Supply*, on-site wells would be used to augment irrigation water supplies from Twin Valley, Inc. However, on-site pumping would not exceed the estimated safe yield of 280,000 gallons per day based on an average daily use. Therefore, the on-site water table in not expected to be lowered as a result of supplemental irrigation pumping at the site.

Mitigation 10. **Groundwater problems would be minimized by avoiding subsurface construction during or just after the rainy season, and through implementation of grading and drainage measures to improve surface and subsurface drainage.**

The grading and drainage plan would include provisions for improving surface and subsurface drainage to alleviate the seasonal groundwater problem.

Impact 11. **Any unplanned construction or grading activity that encroaches upon the on-site serpentine hillsides might result in the release of chrysotile asbestos, potentially causing a public health hazard. (Potential Significant Impact)**

There are no plans for development or grading to occur within any part of the serpentine hillside, and the project plans have been carefully prepared to avoid encroachment into this area. However, a portion of the proposed residential cluster subdivision would be constructed directly adjacent to the southern edge of the serpentine area. Unless this edge is properly marked and fenced, there is potential for grading activity to inadvertently encroach upon the serpentine area.

Mitigation 11. **To avoid disturbance of the serpentine bedrock area, the edge of this area would be fenced or roped-off to prevent encroachment by construction equipment.**

In addition, signs would be posted along this construction boundary warning of the potential hazard. Also, construction workers would be educated about the serpentine area and of the importance of preventing soil disturbance there.

Conclusion. **Implementation of the above mitigation measures would reduce the potential geologic and seismic impacts resulting from the project to less-than-significant levels.**

E. HYDROLOGY AND DRAINAGE

This discussion is mainly based on the Hydrology and Drainage Study prepared by Schaaf & Wheeler in November 1995. The full report is included as Appendix D of this EIR.

Environmental Setting

Area-Wide Drainage

The project site is located in the Llagas Creek watershed which drains from the eastern slopes of the Santa Cruz Mountains and the western slopes of the Mount Hamilton Range south to the Pajaro river and Monterey Bay near Watsonville. The major tributaries of Llagas Creek are Little Llagas Creek, Madrone Channel, Coralitos Creek, San Martin Creek, Church Creek, and West Branch Llagas Creek. Llagas Creek and its tributaries drain a total of approximately 105 square miles upstream of its confluence with the Pajaro River south of Gilroy.

The climate of the south Santa Clara Valley is similar to that of the San Francisco Bay Area. Summers are warm and dry while winters are mild and moderately wet. Nearly 90 percent of the annual rainfall occurs in the late fall or winter months, with January normally being the wettest. The mean annual precipitation varies within the Llagas Creek watershed from a high of over 50 inches in the Santa Cruz Mountains to a low of 14 inches on the valley floor. The basin-wide average is approximately 20 inches per year.

Stream flows in Llagas Creek are regulated by Chesbro Reservoir, which is owned and operated by the Santa Clara Valley Water District. The reservoir has a total storage capacity of approximately 8,100 acre-feet. The reservoir is operated for water supply purposes, but does provide some incidental flood control benefit due to peak flow attenuation.

The upland areas of the Llagas Creek watershed have soils developed on sedimentary rock, basic igneous rocks and serpentine rocks. The main soils are of the Los Gatos, Gaviota, Vallecitos and Haymen associations. They range in depth from shallow to deep, and are located on steep to very steep slopes. The vegetative cover includes grasses, oak, pine, brush and hardwoods. The infiltration rates of water in the upland areas is generally slow. The upland soils are classified as having a high to very high erosion potential.

The upland portions of the Llagas Creek watershed have very little development at this time, and the County General Plan calls for only limited development in the future with mostly open space. On the valley floor, most of the Llagas Creek channel and its tributaries are leveed or perched channels with channel banks higher than adjacent areas on one side or both sides of the stream channel. Therefore, overflows from the channel tend to flow away from and parallel to the channel.

Based on information from the Federal Emergency Management Agency (FEMA) Flood Insurance Study for Santa Clara County, there are extensive areas of floodplain from Llagas Creek and its tributaries. The most serious of these are within the City of Morgan Hill from West Little Llagas Creek, and in the City of Gilroy from West Branch Llagas Creek.

The Santa Clara Valley Water District and the Soil Conservation Service have completed a flood control project for the Llagas Creek watershed. The downstream reach from Bloomfield Road to the Ronan Channel has been improved to 100-year design standards, and the reach from the Ronan Channel to Route 101 has been improved to 10-year design standards. In addition, 100-year design channels have been provided in the urban areas of Morgan Hill and Gilroy. Improvements in Gilroy included diversion of West Branch Llagas Creek to the Ronan

Channel, and channel improvements upstream to Day Road. The project was designed to eliminate most flooding in Gilroy south of Day Road. This project has been completed, and FEMA is in the process of changing the Flood Insurance Rate Maps for this area.

Site Drainage and Flooding Conditions

The project site drains to two separate drainages. The western portion of the site drains to the west to Hayes Creek near Watsonville Road while the majority of the site drains via the east to the West Branch Llagas Creek. A network of intermittent and ephemeral streams flow from the higher elevations on the perimeter of the central valley into the West Branch of Llagas Creek. The Creek has 8 primary tributaries, 4 of which drain the hills north of the valley and with the other 4 originating on the southern ridgeline. These tributary streams flow during winter and spring months for varying periods and are dry the remainder of the year. West Branch Llagas Creek discharges to the Ronan Channel which joins Llagas Creek near Highway 152 east of Gilroy. Hayes Creek drains to Llagas Creek near Watsonville Road, south of Morgan Hill. The are no detailed floodplain studies for Hayes Creek. The area is designated as Zone D on the Flood Insurance Rate Map. Zone D is defined as an area of undetermined flood hazard.

The existing Flood Insurance Rate Maps for West Branch Llagas Creek do not include detailed floodplain studies upstream of Golden Gate Avenue, approximately 2 miles south of Highland Avenue. The stream channel on the project site is designated as Zone A, approximate 100-year floodplain. At Turlock Avenue, the floodplain is shown as approximately 300 feet wide along the channel north of Highland Avenue.

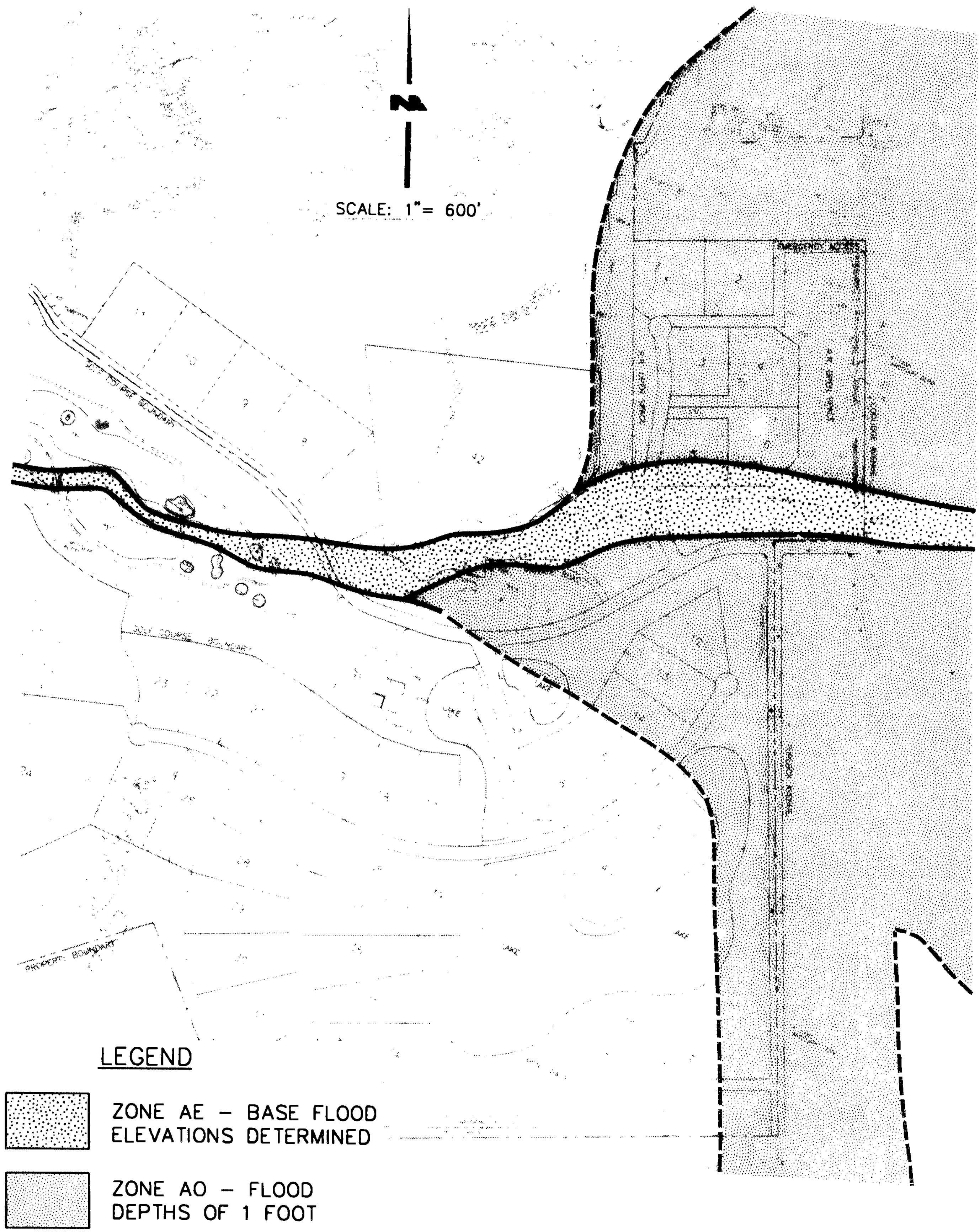
West Branch Llagas Creek has been restudied by FEMA to update the existing Flood Insurance Rate Maps. The draft work maps are currently in the review process and are not expected to be become effective until late 1996. The SCVWD is using the revised maps as the best available information in the interim. The proposed 100-year floodplain for West Branch Llagas Creek near Highland Avenue is significantly larger on the revised maps than on the current maps. The proposed floodplain includes shallow flooding from the channel commencing at the ranch complex on the project site and including the area south of Highland Avenue, west of Turlock Avenue, and the area north of Highland Avenue west of Coolidge Avenue (see Figure 13).

The hydrology for the detailed floodplain study shows an estimated 100-year peak flow rate of 850 cubic feet per second for West Branch Llagas upstream of the on-site overflows upstream of Turlock Avenue. An estimated 400 cfs overflows Highland Avenue toward the south upstream of Turlock Avenue. An additional 355 cfs overflows from the channel toward the north upstream of Coolidge Avenue. The northern overflow crosses Coolidge Avenue north site and flows overland to the east and south to the West Branch Llagas Creek channel at Highland Avenue. The majority of the overflow to the south flows overland to the south and east and crosses Turlock Avenue to rejoin the West Branch Llagas Creek floodplain between Highland Avenue and Golden Gate Avenue. A portion of the overflow continues south along the west side of Turlock Avenue.

Ordinances and Regulations that Address Drainage and Flooding

<u>County Drainage Manual</u>: This manual contains guidelines for design and installation of drainage facilities for projects. Projects must demonstrate that drainage will be handled adequately in order to avoid drainage and flooding problems. These guidelines ensure that there are no on- or off-site drainage problems associated with a project.

<u>Grading Ordinance</u>: The ordinance requires that all drainage structures and devices be consistent with the adopted County Drainage Manual and its standards. It outlines disposal requirements for both on- and off-site drainage; provides for slope protection and erosion control; and the design of dikes, swales and ditches.



100-YEAR FLOODPLAIN

FIGURE 13

Land Development Regulations: The County Land Development Engineer reviews all projects to ensure no on- or off-site drainage impacts would occur as a result of the proposed project.

Zoning Ordinance: For projects requiring a use permit, Section 47-5(d) of the Zoning Ordinance ensures that adequate storm drainage exists or shall be provided as a part of the project; and that no on- or off-site drainage impacts would result from the project.

Special Flood Hazard Area Ordinance: This ordinance applies to all areas of special flood hazard (i.e., within the 100-year flood zone as established by FEMA) within the unincorporated area of Santa Clara County. No new development shall occur, or structure or improvement shall be constructed in a flood zone without compliance with this ordinance.

Significance Criteria

With respect for flooding and drainage impacts, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environmental if it will: "(g) Cause substantial flooding, erosion or siltation."

Impact and Mitigation

Impact 1. **The project would potentially result in increased downstream flooding during the 100-year and 10-year storms. (Potential Significant Impact)**

The proposed residential development on the project site would increase the amount of impervious area on the site and therefore increase the runoff from the site.

The cluster residential development area south of Highland Avenue would be served by storm drains which would discharge to the 20-acre lake proposed for the main subdivision area. The overflows from the lake would discharge via storm drains to West Branch Llagas Creek upstream of Coolidge Avenue. In addition, there are approximately 73 acres of hillside area upstream of this residential development area. Drainage from this area would also be collected by the storm drain system and discharge to the lake. The total area of this drainage area is approximately 240 acres.

The golf course would also be located entirely within the West Branch Llagas Creek watershed which drains to the east. There would be no development in the western portion of the site which drains to the west to Hayes Creek. The West Branch Llagas Creek watershed upstream of Turlock Avenue is approximately 1,060 acres or 1.66 square miles. The golf course development would include approximately 240 acres, the majority of which would be landscaping and turf. The upstream hillside areas would not be affected. The existing creek channel and pond would be largely maintained in their existing configurations. A new pond would be constructed west of the existing pond to serve as an irrigation water reservoir and to detain runoff from the undeveloped area upstream. The new pond would include approximately 9 acre-feet of detention storage.

To analyze potential drainage and flooding impacts, the project site was divided into the following 3 drainage areas: the cluster residential subdivision south of Highland Avenue; the area upstream of the existing pond; the area upstream of the proposed new irrigation reservoir; and the area downstream of the pond golf course reservoir. Discharge rates were estimated for the 10-year and 100-year storms for existing and project conditions.

The results of the flooding analysis show that the proposed golf course would reduce the flow from the site to West Branch Llagas Creek. The golf course would decrease the estimated peak runoff from the watershed because the proposed irrigated turf would maintain a dense layer of thatch which would act as a sponge and reduce runoff, whereas the existing unirrigated range grasses tend to be sparse, with exposed dirt between grass clumps, which does not retain as much runoff. The estimated 100-year peak flow from the golf course area would decrease from 780 cubic feet per second to 765 cubic feet per second, a decrease of 2 percent. The 10-year peak flow rate would decrease from 375 cubic feet per second to 360 cubic feet per second, a decrease of 4 percent.

The proposed golf course irrigation reservoir would also act as a detention facility to reduce the estimated peak flow rate from the western portion of the watershed. For purposes of analysis, the existing pond was assumed to be full at the start of the storm and to have minimal effect on the flood hydrograph. The proposed irrigation reservoir was assumed to be full to spillway elevation at the start of the storm, and to have a 12-foot wide spillway. The estimated storage capacity of the pond is 9-acre-feet with 3 feet of flow over the spillway. The detention storage in the irrigation reservoir would reduce the estimated 100-year peak flow at the pond from 59 cubic feet per second to 39 cubic feet per second, a reduction of 20 cubic feet per second. However when routed downstream and combined with the larger watershed downstream, the detention storage reduces the peak by approximately 10 cubic feet per second. This is due to the difference in timing between the peak flow in the upper watershed and the lower portion of the watershed. The peak flow from the upper watershed is delayed by the travel time along the creek channel and arrives after the peak from the lower watershed. Therefore the peaks do not add directly. The detention storage in the upper watershed acts to increase the timing difference of the upper watershed.

The proposed golf course grading would also include local detention areas to contain runoff from the turf areas for water quality purposes. These would also act to reduce runoff from the site, particularly for small storms. The effect of these detention areas on larger storms would depend on the design and placement of each area and whether the upstream hillside areas would drain to the detention areas or directly to the creek. Therefore, the effects of potential detention storage on the golf course other than the larger pond were not considered in the hydrograph analysis.

The flooding analysis indicated that the proposed cluster residential development would result in a potential increase in the peak runoff from the development site. The 100-year peak flow from the entire watershed would increase from 236 cubic feet per second to 301 cubic feet per second, an increase of 28 percent. The 10-year peak flow rate would increase from 120 cubic feet per second to 160 cubic feet per second, an increase of 33 percent. The increase in peak runoff is due to both the increased impervious area in the development, and the more efficient drainage system which collects runoff faster than the existing overland flow conditions.

However, the cluster residential subdivision would include a proposed lake, and runoff would be drained to the lake, then released to West Branch Llagas Creek. Only the proposed equestrian center in the southeastern corner of the site would be below the lake elevation and would drain toward Turlock Avenue. There is no storm drain system along Turlock Avenue, but runoff flows along the road under existing conditions.

The residential cluster subdivision is located in a drainage area of 240 acres, which would drain to the proposed lake. Without the lake, increased peak runoff from the cluster residential subdivision would potentially increase the peak flow in West Branch Llagas Creek downstream .

Mitigation 1. **The on-site lake proposed for the southern residential cluster subdivision would be designed to provide sufficient detention storage for increased peak runoff resulting from site development. With this pond, the peak flow rates leaving the project site during the 100-year and 10-year storms would be lower than under existing conditions.**

The potential increased runoff from the residential area during the 100-year event would be 65 cubic feet per second, without the proposed lake. The proposed lake would have a normal water surface elevation less than the top of bank elevation of West Branch Llagas Creek at the outfall from the pond. The outfall would have a flap gate to prevent high water levels in the creek from discharging back into the pond. The outflow from the pond would only occur when the water level in the creek is low. Therefore, the outflow from the pond would not contribute to the existing flood problems from the creek channel.

The proposed pond in the residential development would include an overflow spillway release for larger flood events, and an active detention storage volume between the normal water level and the spillway crest. Based on a preliminary design which includes 2 feet of active detention storage below the spillway crest and one foot of storage above the spillway crest, the proposed pond could contain approximately two-thirds of the total runoff from the residential development area and the upstream hillside area during the 10-year 24-hour design storm. The pond would release approximately 30 cfs over the spillway to Turlock Avenue during the 10-year storm. This would be significantly less than the existing condition peak flow rate of 120 cfs. For smaller flood events there generally would be no spill from the pond, and runoff stored in the pond would be released to the creek after the high water levels in the creek have receded. The outlet to the creek would release approximately 20 cfs to drain the active storage volume of the pond in 24 hours after the storm.

During the 100-year 24-hour flood event, the total runoff to the lake would be approximately 125 acre-feet. With no outlet release to the creek during the storm, the pond would overflow to Turlock Avenue once the active storage has filled. The estimated peak overflow would be 140 cfs for the 100-year flood. The existing peak runoff from the site during the 100-year event is estimated to be 236 cfs. Thus, although the shallow flooding along Turlock Avenue that occurs during the 100-year event under current conditions would not be eliminated, it would be substantially reduced by the flood control elements to be incorporated into the project.

The only potential adverse effect of increased peak runoff from the hillside cluster residential development site would be to increase the peak flow in West Branch Llagas Creek downstream of the project. Due to the operation of the outlet from the pond, this could only occur once the high water levels in the creek have receded and the potential for downstream flooding has passed. Therefore, there would be no increase in downstream flooding. The low flows in the creek would continue for a longer time after a storm due to the releases from the detention pond. This should not be a significant impact.

The equestrian center area in the southeast portion of the project site would not drain to the pond in the residential development area. Due to the site topography, there would be a berm between the equestrian center and the pond to contain the pond. The maximum height of the berm would be approximately 7 feet. The equestrian center would continue to drain to Turlock Avenue and ultimately to West Branch Llagas Creek. Because of the limited impervious area associated with the equestrian center, there should be no increase in runoff from the area after the project. In addition, the proposed equestrian center would include a detention pond for water quality purposes.

Impact 2. **Portions of the residential cluster subdivisions would be subject to shallow flooding (one foot average depth) during a 100-year event, and the proposed dwellings could also potentially obstruct this sheet flow through the site. (Potential Significant Impact)**

Based on the revisions to the existing Flood Insurance Rate Map, shown in Figure 13, the West Branch Llagas Creek would overflow to the south upstream of Turlock Avenue (i.e., at the on-site ranch complex). For the 100-year flood, approximately 400 cubic feet per second would cross through the northeastern portion of the cluster residential development, in particular through Lots 12, 13 and 14 at the northeast corner of the subdivision. This mapped overflow crosses the site and Turlock Avenue to rejoin West Branch Llagas Creek 500 to 1,000 feet downstream of Highland Avenue. The overflow is indicated as shallow flooding with an average depth of one foot, indicating that the proposed lots would be prone to flooding. In addition, grading for the residential lots in the overflow area could adversely affect the sheetflow through the area if the flow is obstructed. Similarly, grading for the access road the project and landscaping along Turlock Avenue could affect the sheetflow across the site.

The revised flood maps also show an overflow to the north from West Branch Llagas Creek upstream of Coolidge Avenue. For the 100-year flood, approximately 355 cubic feet per second would cross through proposed the rural residential development north of Highland Avenue and west of Coolidge Avenue. The overflow would flow overland to rejoin West Branch Llagas Creek at the culvert under Highland Avenue. Part of the overflow is designated as shallow flooding with an average depth of one foot, and a small sliver along the north boundary is indicated for flood depths of 0.5 to 2.5 feet. All six of the 5-acre lots are within the mapped 100-year floodplain area and thus would be prone to flooding. Also, grading for the residential lots and cul-de-sac in the floodplain could have an adverse affect on the sheetflow if flow is obstructed.

Mitigation 2. **Potential impacts to the residential subdivisions from shallow flooding would be mitigated by constructing building pads on fills raised above flood elevations. The potential obstruction of sheetflows by the proposed development would be mitigated by balancing fills with cuts within the flood-prone areas.**

The potential impact of placing a portion of the proposed residential development within the 100-year floodplain areas would be mitigated by balancing the grading within the 100-year floodplain. This would mean that fills required to elevate building pads above flood elevations would need to be balanced by cut areas to allow flood flows between the buildings. This procedure is generally most effective in shallow flooding areas with limited building coverage as in the proposed project. If the buildings cover a large percentage of the floodplain and are in deeper flood area, and effective balance between cut and fill would be problematic. For instance, if a building obstructs 50 percent of the floodplain in 3 feet of flood depth, the building pads would have to be elevated 3 feet, and the remainder of the floodplain would have to be excavated 3 feet to balance the cut and fill. This would lead to an elevation difference of 6 feet between the building pads and the adjacent ground. In the proposed project, the building densities would be very low with 2 to 3 acre residential lots. Thus, building elevations of 1 to 2 feet above existing grade would become 2 to 3 feet or less above the new ground elevations because of the larger area available to balance the fill.

Conclusion. **With implementation of the above mitigations as proposed in the project, the potential flooding impacts of the project would be reduced to less-than-significant levels.**

F. WATER QUALITY

Overview

The water quality of streams, creeks, ponds, and other surface water bodies can be greatly affected by nonpoint sources of pollution carried in contaminated surface runoff. Unlike pollutants that come from a point source (e.g., sewer pipe, industrial outfall), nonpoint pollutants are washed from streets, parking lots and other exposed surfaces into storm drains. Storm runoff flows untreated from storm drains into local creeks and ultimately to Monterey Bay. This urban runoff contains a number of pollutants including the following:

- Metals and contaminants from vehicle exhaust, tire compounds, motor oil, brake lining particles, and weathered paint. These include copper, lead, zinc, chromium and nickel.
- Oils and grease from fuels and lubricants released via leaks and spills from automobile engines, transmissions, radiators, or improper dumping of oil.
- Pesticides, herbicides and fertilizers used in landscape maintenance that can be carried away from over-application on irrigated areas.
- Solvents and household chemicals such as paint thinners, oil and water-based paints, degreasers, detergents, bleach and drain cleaners, when released into storm drains, streams or onto streets.
- Bacteria and plant nutrients from sewage, animal waste, litter, decomposing vegetation, and septic tank leaks.

During construction, surface water quality degradation can result from runoff of sediments, as well as construction materials and wastes, as described below.

- Sediments consisting of soils eroded from ground surfaces exposed during grading and vegetation removal.
- Construction Materials including trace metals in building products, paint or preserved wood; synthetic organic compounds in adhesives, cleaners, sealants, and solvents.
- Construction Wastes including wash water from concrete mixers; paints and painting equipment cleaning activities; oil, grease and fuel leaks and spills from vehicle operation, storage and maintenance; wood and paper materials from packaging of building products; solid wastes from tree and shrub removal during land clearing; and sanitary wastes.

Pollutants in runoff can have an adverse impact on wildlife and aquatic habitats of local creeks and downstream waterbodies. Nutrients from fertilizer, organic matter or detergents can result in excessive or accelerated growth of vegetation or algae, and can create odors. Substances which require oxygen for decomposition, such as organic matter, litter and algae, depress the dissolved oxygen levels in waterbodies thereby interfering with breathing of aquatic organisms. (This process is referred to as eutrophication.) Bacteria and viruses can result in public health threats. Several oil and grease compounds are toxic to aquatic organisms. Several heavy metals are toxic to aquatic organisms and can bioaccumulate. Sediment discharge can reduce clarity, and cause turbidity which also interferes with respiration of aquatic species. Sedimentation of stream channels can also impair fish reproduction by covering gravel riffles used for breeding, and can also have a negative effect on riparian vegetation.

Discharge of sediments can also result in the increased presence of heavy metals because sediments facilitate the transport of heavy metals through adsorption, whereby metals adhere to soil particles. The accumulation of sediments or silt loading can obstruct natural flow patterns, and can also reduce the capacity of stream channels, which can result in increased flood hazards over time.

Environmental Setting

The groundwater quality in the San Martin area is characterized by high levels of nitrates originating from septic disposal systems, animal wastes and agricultural fertilizers. The nitrate levels in the groundwater on the Lion's Gate site are indicated to be in the range of 7 to 43 mg/l. (The federal drinking water standard is 45 mg/l, as NO3.) Ongoing cattle grazing is the source of the vast majority of existing nitrate loading at the Lion's Gate site. The only other potential source, decaying vegetative matter, contributes a negligible share to overall nitrate loading under existing conditions.

Water quality data for surface runoff in the immediate project area is not available.

Ordinances and Regulations that Address Water Quality

National Pollutant Discharge Elimination System (NPDES) Program. Projects disturbing more than five acres of land during construction are required to file a Notice of Intent to comply with the State NPDES General Construction Permit for discharges of storm water associated with construction activity. Under this program, projects on sites of five acres or greater must prepare and implement a Storm Water Pollution Prevention Plan (SWPPP). Proposed construction projects need to follow best management practices to limit erosion and sedimentation and the introduction of other pollutants, such as solvents, fertilizers, concrete and vehicle fluids into waterways. These construction-phase best management practices include: stabilizing cleared areas during the wet season; use of silt fences and erosion control measures; cleaning spills and drains for equipment impacts; and covering drains, inlets, and catch basins.

Santa Clara County Grading Ordinance: Under the ordinance, final grading plans are to include specifications for erosion and sediment control, slope protection and revegetation of exposed slopes.

Significance Criteria

With respect to water quality, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect in the environment if it will: "(f) Substantially degrade water quality."

Impacts and Mitigation

Impact 1. **During grading and construction, erosion of exposed slopes, and pollutants from equipment may result in water quality impacts to downstream water bodies. (Potential Significant Impact)**

The planned construction of the golf course and related facilities would require substantial earthwork for roads, pipelines, ponds, and recontouring for the golf course. Consequently, the erosion hazard and potential for sedimentation during construction is high. The greatest soil erosion hazard would exist during and immediately following construction when finished grades are unvegetated.

Discharge of hydrocarbons and other toxic substances can also occur during the construction phase, if fuels, oils or washwater from equipment washing or sanitary facilities leak or are spilled. These pollutants would potentially be carried by runoff to nearby drainage courses.

Mitigation 1. **The final golf course grading plan would be required to conform to all drainage and erosion control standards adopted by Santa Clara County and would require approval by the County. A comprehensive erosion control program and Storm Water Pollution Prevention Plan (SWPPP) would be required to be implemented during grading and construction, and would include the measures listed below.**

Prior to clearing grading for the golf course, erosion control barriers would be installed adjacent to natural wetlands and riparian areas to prevent erosion and siltation. These barriers would be kept in place until after turf buffer strips are established and all cleared areas have adequate turf cover to prevent erosion.

After construction is completed, all drainage culverts should be inspected for accumulated sediment. Where sediment has accumulated, these drainage structures should be cleared of debris and sediment.

Prior to construction, a Storm Water Pollution Prevention Plan (SWPPP) would be prepared in conformance with the NPDES permit requirements. Typical mitigation measures to be implemented during the grading and construction phase would include the following:

- Schedule earthwork to occur primarily during the dry season to prevent most runoff erosion. In the event that earthwork activity occurs during the rainy season, separate this activity from street gutters and storm drains by ditches, berms or filtration barriers, such as hay bales.

- Protection of downstream storm drain inlets from sedimentation.

- Installation and maintenance of silt fences, straw bales and/or desilting basins along all drainages during construction until landscaping is installed and all bare slopes vegetated.

- Seeding of all bare slopes after grading (seeding to occur in October).

- Revegetate surfaces and install erosion control facilities prior to the onset of winter storms.

- Drain large areas of exposed soils to on-site sedimentation ponds to settle out most sediment before the runoff is released.

- Sweep the streets surrounding the construction area daily to collect sediment deposited on the streets before it is washed into the storm drains or channels.

- Application of water to exposed soils regularly during the dry season to prevent wind erosion.

- Protection of all finished slopes for erosion.

- Implementation of protective measures to prevent runoff of fuel, oil, lubricants, solvents from areas used for construction vehicle and equipment storage, washing and maintenance. (Provisions for fuel storage are addressed in Section *N. Hazardous Materials, Public Health and Safety.*)

- Implementation of proper handling and disposal practices for construction materials and waste.

These erosion control measures would be included as conditions of the grading permit for the project. Their effective implementation would be monitored by County grading inspectors. In addition, implementation of the Storm Water Pollution Prevention Plan for the project would be subject to inspection by the Regional Board and the Santa Clara Valley Water District.

Impact 2. **After project completion, concentrated runoff from paved surfaces may result in isolated areas of erosion. (Potential Significant Impact)**

Project development would alter drainage patterns on the site, with the impervious surfaces of roads, driveways, cart paths and parking areas resulting in localized increases in the velocity and volume of runoff. In addition, several tributary swales would be piped within proposed fairways. At places where this concentrated runoff is discharged to the natural drainage courses, high flow rates may result in scouring and downstream sedimentation.

Mitigation 2. **Outfall areas would be protected with channel armoring to prevent erosion and scouring.**

Where storm drain lines discharge into natural channels, the outfall areas would be protected with rip-rap and/or energy dissipating structures. Open channel drainages would be grass-lined (if calculated velocities permit) or armored to prevent channel erosion. All transition or outfall locations would be protected from scour.

Impact 3. **The project would generate urban nonpoint contaminants which may be carried in stormwater runoff from paved surfaces to downstream waterbodies. (Potential Significant impact)**

The introduction of traffic and parking areas would increase the accumulated hydrocarbon by-products and heavy metals from automobiles, which would be flushed into drainages and streams. At the maintenance facility, washwater, lubricants and hazardous materials may be generated. Unless controlled, these urban pollutants would contribute to cumulative nonpoint contaminant loads in downstream drainages and waterbodies.

Mitigation 3. **The project would include stormwater controls at the parking lots and maintenance facilities.**

Sheet flows over the clubhouse and practice range parking lots would be collected and piped to nearby stormwater retention basins. The collected runoff would not be discharged into the West Branch Llagas Creek, but would percolate into the soil or evaporate. The retention basins would be cleaned of accumulated sediments and debris as needed.

At the maintenance facility, the adjacent paved areas would be surrounded by a 6-inch curb, with all rain water, wash water, lubricants and other pollutants draining to an advanced water filtering and recycling system.

The remaining roadways and cart paths within the project would not accumulate significant quantities of urban pollutants.

<u>Impact 4</u>. **The project may result in degradation of groundwater quality from fertilizers and pesticides used on the golf course. (Potential Significant Impact)**

Golf course fairways and greens are fertilized regularly and intensively. Typical yearly application rates are 3 lbs./1000 square feet for fairways and 4 to 6 lbs/1000 square feet for tees and greens. (At the Lion's Gate project, much of the required nitrogen would be contained in the irrigation water, with the amount of applied fertilizer reduced accordingly.) The rough areas usually undergo a one-time fertilization during construction. Nitrogen is the primary fertilizing agent and is of concern for both surface and groundwater quality. Adverse conditions would be created by overwatering, excessive application of fertilizers, poor timing of irrigation or chemical application (i.e., before a storm or during the cool wet season). Nitrogen losses to subsoils and groundwater are in the form of nitrate which can result in degradation of water quality and contribute to human health problems (in drinking water).

Nitrogen loss to groundwater occurs when nitrogen is not taken up by the plant, absorbed by the soil or volatilized, and seeps past the root zone of the turf grass and slowly migrates to groundwater. Sandy tees and greens, the most heavily fertilized areas of the golf course, are especially susceptible to subsurface nitrogen leaching. Fairways and rough areas are commonly fertilized with less nitrogen and are not as susceptible to potential leaching.

The pesticides which are in common use for golf courses are not very persistent or mobile (i.e., biodegradable and not water soluble and thus less susceptible to migrating through the soil and into the groundwater regime) compared with pesticides used in agriculture, with residues usually undetectable one to two weeks after application. By contrast, pesticide and nitrate concentrations have been found at elevated levels in tens of thousands of wells in agricultural areas.

To study the impacts of golf courses on groundwater, the U.S. EPA conducted a 2-year groundwater well monitoring study of four golf courses on Cape Cod in 1986-87 (Cohen et al, 1990). The results of that study are summarized below.

The hydrogeology of Cape Cod is characterized by a shallow, unconfined, highly transmissive aquifer, high recharge, and sandy soils, making it a highly vulnerable environment for potential groundwater contamination. The monitoring wells for the study were installed at or immediately down gradient of tees and greens, the areas of heaviest chemical application, and in fairways. The wells were also placed where the shallowest depths to groundwater occurred.

The results of the well monitoring study showed that none of the currently registered turf pesticides were detected in concentrations greater than one-fifth of the health guidance level (HGL). The study did detect concentrations of chlordane residues above the HGL, but this pesticide has not been in use since the 1970s. With regard to nitrate, the study found the highest concentration of nitrate-N at courses using water-soluble nitrogen fertilizers, and the lowest levels where slow-release nitrogen was in use. When nitrogen applications were significantly reduced in the second year of the study, the groundwater concentrations of nitrate-N were also significantly reduced.

Since the time that the Cape Cod study was completed, the author of that study conducted a review of 13 subsequent studies of 25 golf courses in eight states, representing a variety of climates and hydrogeologic settings. The main findings were that pesticide detections in ground and surface waters were rare but they did occasionally occur, and that no impacts to ecosystems were detected as a result of use of turf chemicals (Cohen, 1994).

In another study, the potential for fertilizers leaching through the sandy base material of golf greens was studied under laboratory conditions at the University of Georgia. The study found that when fertilizer is properly applied, the amount of nitrogen that reaches groundwater is negligible. Similar findings have been made in other university studies, which indicated that less than one percent of applied nitrogen traveled to a depth of 4 feet (Kenna, 1994).

In a 1990 review of research on nitrogen fertilizers applied to turfgrasses, Dr. Martin Petrovic noted that nitrate-nitrogen concentrations in soil water leaching through the surface soil exceeded drinking water standards of 10 ppm only on sandy soils when one of the following conditions exist: 1) high levels of soluble nitrogen are applied, greater than 3 lbs. N/1000 sq. ft. at one time; or 2) very frequent (daily) irrigation is practiced coupled with application of water soluble nitrogen sources.

Mitigation 4. **The project would follow irrigation and chemical management practices under which water, nutrients and chemicals would be applied on an as-needed basis only, minimizing potential for leaching into the groundwater table. Monitoring wells would be installed to sample for the presence of golf course chemicals, with corrective action taken if necessary.**

The project would include implementation of a comprehensive Environmental Management Plan under which the need for irrigation water and chemicals would first be reduced through measures such as: selecting species that are drought resistant, pest resistant and have low nitrogen requirements; and minimizing fertilization during winter when growth rates are low.

A computerized irrigation control system would calculate precise water needs based on evapotranspiration, so little or no water would seep below the root zone. (See Section *I. Project Description* for a detailed description of the irrigation system practices proposed for the project.)

Fertilization

The potential for nitrate movement would be minimized through best management practices (BMPs). This first involves determination of precise nutrient requirements based on turfgrass types and soil characteristics, especially infiltration rates. The nitrogen fertilizer selected would be the slow release or less soluble form. Fertilizer application would be timed to coincide with the period of greatest plant uptake, and would avoid periods of potential rainfall and stormwater runoff.

The elevated nitrate levels contained in the irrigation water (from both Twin Valley Inc. and on-site groundwater) would be factored into the fertilization program. Thus applied nitrogen would be reduced commensurate with the nitrogen content of the irrigation water.
Application rates would be monitored closely and adjusted as necessary to prevent exceedance of assimilation capacity. Irrigation rates would be managed to coincide with evapotranspiration, thus minimizing leaching of nutrients beyond the root zone. Soils under tees, greens and fairways would be tested regularly for potential nitrogen buildup, with application rates adjusted accordingly.

Pest Management

The use of insecticides, herbicides and fungicides on golf courses occurs relatively infrequently, and is typically conducted only once or twice a year. Insect problems at the Lion's Gate golf course are expected to be minimal, consisting primarily of root feeding grubs and lepidoptera larvae.

In order to minimize the potential effects of pest control, the project includes an Integrated Pest Management Program (IPM). To the maximum extent feasible, this program relies on non-chemical methods such as selecting pest resistant grasses, employing cultural practices to keep the turfgrass healthy (e.g., spiking, aerifying, vertical mowing, rolling, topdressing), avoiding excess fertilizer application, and preventing excessive moisture conditions which favor the occurrence of infectious diseases. The IPM would also reduce the use of pesticides where possible by employing biological control of pests. This involves the strategic introduction of organisms which are natural enemies of pest to be eliminated (e.g., parasitic nematodes and bacteria).

During the preparation of the Environmental Management Plan, the potential pesticides (this term includes insecticides, herbicides and fungicides) to be used at the Lion's Gate Reserve were assessed using screening models and simulation models. The primary factors analysed were: The potential quantity of a chemical that may be used at the golf course, the chemicals' mobility, leaching potential, persistence and toxicity. Based on this assessment, restrictions were placed on the use of certain pesticides on the golf course (see Appendix E for the detailed assessment results).

In order to minimize the impacts of pesticide use, a number of best management practices (BMPs) would be employed. The following is a partial list of planned management practices (see Appendix E for a full discussion).

- Pesticides would be handled, applied, and disposed of by a spray technician licensed by the State. The application equipment would be inspected for proper calibration before every pesticide application.

- Pests would be accurately identified and pesticide applications made only when and where necessary (preferably when pests are at the most vulnerable stage), using the least amount required.

- Pesticides would not be applied when soil moisture is high during the rainy season, or when storms are anticipated. No pesticides would be applied during the growth period.

- A controlled and designated area/facility would be provided at the maintenance facility for the proper mixing and loading of pesticides into application equipment. The facility would include an impermeable pad with controlled and contained drainage.

- Monitoring the course on a daily basis to detect symptoms of pest problems.

- A minimum 25 feet of rough around all playing areas would be provided as a buffer zone for adjoining wetland or riparian areas. No pesticides would be used in these rough area buffers.

- A minimum vertical separation of two feet would be provided between any green playing surface and the expected maximum seasonal groundwater elevation. This would reduce the potential for high groundwater to inundate the underdrain collection systems, and would allow a sufficient thickness of unsaturated soil to attenuate infiltrating compounds.

Although higher than normal volumes of irrigation water are applied during the grow-in period, the water is applied in short cycles to keep the ground moist in order to facilitate germination of the grass seed. Over-watering is avoided to prevent drowning the young seed, so there would be little or no runoff of irrigation water. No pesticides are applied during the grow-in period, and only normal amounts of fertilizer are applied to avoid burning the young plants. Thus there is little or no potential for increased runoff and non-point source contamination during the grow-in period.

The Integrated Pest Management program would be managed by the Golf Course Superintendent, who would be responsible for all chemical applications and storage. The State of California requires that such chemical application and handling be performed by licensed individuals with a Qualified Applicator Certificate (QAC) issued by the State. The superintendent would be so licensed and would be an active member of the Golf Course Superintendents Association of America (GCSAA). The superintendent would be a full-time employee of the Lion's Gate Reserve, and must attend GCSAA training and education seminars to remain current with the association. It is likely that the country club would also employ an assistant to the superintendent who would also be a licensed applicator.

<u>Monitoring</u>

Four new wells would be installed for sampling and testing groundwater for the presence of golf course chemicals. As described in the Environmental Management Plan, groundwater monitoring would occur in three phases as follows: pre-construction monitoring to establish background levels; monitoring during construction; and monitoring during golf course operations. (See Appendix E for a detailed description of the monitoring program).

In the event that unacceptable levels of golf course chemicals are detected in the groundwater samples, the first action would be to immediately terminate usage of the chemical detected in the sample. The next step would be to take additional samples in the affected area to ensure that the test result was not an anomaly and to confirm that a problem exists. Upon such confirmation, the agencies to be notified would include the Santa Clara Valley Water District, the Regional Water Quality Control Board, the County Department of Environmental Health and the County Planning Office. A proposal would be submitted by the golf course operator to the regulating agencies as to appropriate corrective action. Such action could include a reduction in chemical applications in the affected area, a change in the chemicals used, or other changes to the chemical application management plan. It is expected that any contamination could be mitigated by such operational changes, and that complete shut down of the operation would not be necessary to correct the problem. (See Appendix E for further discussion.)

<u>Impact 5</u>. **The project may result in water quality impacts to surface water from fertilizers and pesticides used on the golf course. (Potential Significant Impact)**

As discussed above, the use of fertilizers and pesticides would be minimized through the proposed computerized irrigation system and the integrated pest management program. In addition, the elevated nitrate levels contained in the irrigation water (from both Twin Valley Inc. and on-site groundwater) has been factored into the fertilization program detailed in the Environmental Management Plan (see Appendix E); thus, the potential for chemicals to carried away in storm runoff would be minimized. The principal threat to surface water quality from golf course chemicals would occur in the event of: (a) a significant rainfall event immediately following chemical application; or (b) spillage in the area where chemicals are handled and stored. There could be a potentially significant impact on the surface water quality of local streams in the unlikely event that either of these occurred.

Mitigation 5. **The potential for surface water quality impacts from golf course chemicals would be mitigated by infiltration into turf and rough areas, the use of grass filter strips, maintenance of setbacks from streams, and strategic installation of subdrains and retention basins. Surface water quality would be sampled and tested periodically, with corrective action taken if necessary.**

Under all but the most severe storm conditions, overland flows across the dense turfgrass would be sufficiently slow that water on the fairways would infiltrate into the turfgrass before it could move horizontally. This has been confirmed by several studies, which also found that there was a negligible potential for nutrients to pass beyond the root zone or to be transported by runoff to surface waters (Beard, 1994). In addition, the turfed fairways would be surrounded by roughs which would provide additional filtration for any runoff from the adjacent fairways. However, as discussed in the detail in Section *I. Project Description*, the golf course would be designed and graded to direct storm runoff away from natural drainages and would instead convey runoff toward the centers of fairways and natural filter strips, as well as off-channel retention basins and ponds located throughout the golf course.

The potential for surface water quality impacts is greatest at greens and sand traps which are underlain by sandy base material, and which are subject to greater applications of fertilizers and pest control chemicals. These areas would be provided with buffer strips at least 25 feet wide near wetland and riparian areas. They would also be installed with subdrain systems to collect irrigation and rainwater infiltrating the sandy base material. The outflow locations for these subdrains would be strategically sited to divert drainage back onto the golf course.

To ensure that golf course chemicals are not reaching natural drainage courses, the quality of these surface waters would be sampled and tested periodically, and compared with baseline water quality established by pre-project sampling and testing. (See Appendix E for detailed description.)

The potential for spills of chemicals to reach natural water bodies is virtually nil since all storage and handling of chemicals would occur at the maintenance facility, and would be handled by operators licensed by the State. The impermeable surface material, the 6-inch perimeter curb, and the advanced water filtration and recycling system to be utilized at the maintenance facility would ensure that these chemicals are properly contained and disposed of in the unlikely event of a spill. Even in the event of an earthquake, the potential for a toxic spill would be slight, as discussed in Section *III. N. Hazardous Materials, Public Health and Safety*.

Impact 6. **The equestrian center could result in impacts to groundwater and surface water quality if manure or stall sweepings accumulate in stormwater runoff. (Potential Significant Impact)**

Mitigation 6. **The equestrian center would be operated in accordance with a manure management plan and an erosion control plan; and runoff from the facility would be directed to an on-site detention pond.**

The equestrian center would be operated in accordance with a manure management plan, as required under Title 23, Chapter 15 of the California Code of Regulations (which pertains to water quality). Under the management plan, manure would be cleaned up daily and placed in debris boxes to be picked up daily or every other day and taken to a local landfill. The outdoor riding and pasture areas would have manure picked up daily with a special vacuum apparatus. The perimeter of the equestrian center would be fenced to prevent animals from entering nearby drainages and ponds and contaminating the water.

The equestrian center would be contoured to direct on-site drainage to a grass swale or swales which would convey runoff to a lined retention pond or basin. This pond would be located at the eastern end of the site, just west of the landscaped berm proposed along Turlock Avenue. The pond would be equipped with a sump pump to facilitate spraying of the drainage water onto the pasture area. The pond would be skimmed as necessary to remove any floating material, and would be cleaned out regularly to remove accumulated sediments. The pond would be sized to retain storm runoff and prevent overflow of accumulated drainage for all but the most significant flood events. (The pond would be fenced to prevent entry, and signs would be posted warning people to keep out.) To the extent feasible, drainage from the areas upslope of the equestrian center to the west would be directed around the facility to the proposed residential lake to the north.

As required under Article 47 of the County Zoning Ordinance, an erosion control plan would be prepared and implemented for the equestrian center.

Impact 7. **The soils in the existing livestock corrals may contain accumulated nitrogenous compounds which could result in impacts to surface and groundwater quality. (Potential Significant Impact)**

The soils in the existing corrals located just south of the ranch complex are likely to have higher accumulations of nitrogenous compounds than other natural areas of the site. This represents a potential additional source of nitrogen discharge into groundwater (via leaching) or surface water (via erosion) if the soils are improperly handled.

Mitigation 7. **The potentially affected soils would be sampled for nitrogen content and incorporated into the grading of the golf course in a manner that makes maximum benefit of the fertilizer value of the soil.**

Prior to site grading, the soils in the existing corral area and a control site would be sampled and analyzed for nitrogen content, including nitrate and Total Kjeldahl Nitrogen, to determine the level of nitrogen build-up as compared with native soils on the site. Based on these results, the soils would be removed and incorporated into the grading of the golf course in order to make maximum benefit of the fertilizer value of the soil while protecting against runoff or leaching of nitrogen into groundwater or surface water.

<u>Conclusion</u>. **With the implementation of the above mitigation measures, the potential water quality impacts resulting from the project would be reduced to less-than-significant levels.**

[Note: The potential water quality impacts associated with wastewater disposal are discussed in Section *III. Q. Wastewater Treatment and Disposal*.]

G. BIOLOGICAL RESOURCES

The following discussion of biological resources is based on numerous field surveys conducted on the Hayes Valley site over the past several years. The findings and recommendations of those surveys are contained in the reports listed below. These reports are contained in Appendix F of this EIR.

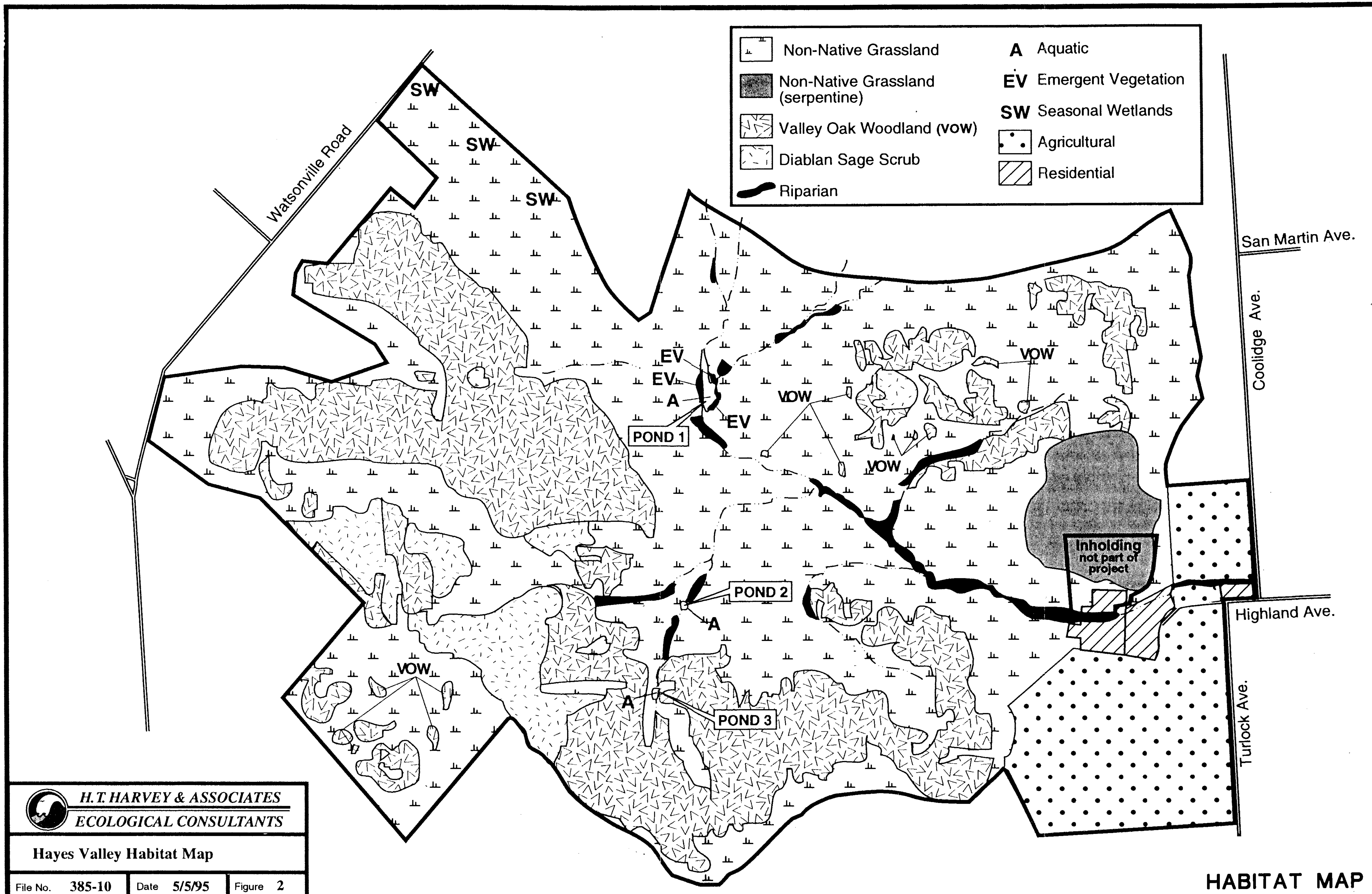
- H.T. Harvey and Associates, Hayes Valley Biological Resources Report, November 30, 1995.
- H.T. Harvey and Associates, Hayes Valley Golden Eagle Nest Survey, July 31, 1989.
- H.T. Harvey and Associates, Special-Status Species Surveys - Hayes Valley, August 13, 1992.
- LSA Associates, Inc., California Tiger Salamander and Western Pond Turtle Mitigation Plan, Lion's Gate Project, Santa Clara County, California, November 1995.
- LSA Associates, Inc., Conceptual Creek Revegetation/Enhancement Plan, Lion's Gate Development Project, Santa Clara County, March 1996.
- LSA Associates, Inc., Determination of Jurisdictional Wetlands on the Lion's Gate Property, Morgan Hill, California, May 13, 1994.
- LSA Associates, Inc., Lion's Gate Wetlands Mitigation, Letter to Bert Verrips, Nolte and Associates, December 18, 1995.
- Center for Conservation Biology, Status of Lepidoptera of Conservation Concern at the Proposed Lion's Gate Development Site, July 31, 1992 and December 13, 1993.
- Center for Conservation Biology, Status of the Bay Checkerspot Butterfly and Opler's Longhorn Moth at the Proposed Lion's Gate Development Site, July 12, 1994.

Biotic Habitats

Ten different habitats were identified within the Hayes Valley site. These include non-native grassland (non-serpentine substrate), non-native grassland/wildflower field (serpentine), Diablan sage scrub, valley oak woodland, valley oak/sycamore riparian woodland, aquatic, emergent vegetation, seasonal wetland, orchard/cropland and residential/developed (see Figure 14). The approximate sizes of these habitats are shown in Table 5. Lists of the vascular plant species observed and vertebrate species either expected to occur or observed on the project site during field surveys are contained in Appendix F of this EIR.

Non-native Grassland (non-serpentine substrate)

Vegetation. Over 50 percent of the site (approximately 874 acres) consists of non-native grassland, which occupies the valleys and many of the south- and west-facing slopes of the site. Much of the grassland on-site is used as cattle pasture. This community is dominated by annual non-native grasses, including wild oats, Italian ryegrass, farmer's foxtail, and Mediterranean barley. Other common components include ripgut brome, soft chess, black mustard, American vetch, Italian thistle, and red-stem filaree. Native species such as Ithuriel's spear, California poppy, and the native perennial purple needlegrass bunchgrass are also scattered in mixed stands



HABITAT MAP

FIGURE 14

TABLE 5

BIOTIC HABITATS

Habitat Type	Acres	Percent of Total
Non-native Grassland (non-serpentine)	873.7	52.1
Non-native Grassland/Wildflower field (serpentine)	33.5	2.0
Valley Oak Woodland	480.0	29.0
Diablan Sage Scrub	82.0	4.9
Valley Oak/Sycamore Riparian Woodland	18.6	1.1
Aquatic	5.6	0.3
Emergent Vegetation	0.7	0.0
Seasonal Wetlands	4.0	0.2
Orchard/Cropland	164.0	9.8
Residential/Developed	13.9	0.8
TOTAL	1,676.0	100.1

throughout the site. Several depressions and swales within the grassland support Mediterranean barley, a species indicative of higher moisture levels.

Wildlife. These non-native grasslands provide habitat for many species of wildlife. Reptiles may be conspicuous during warmer months of the year, especially along the rocky hillsides adjacent to the valley or under fallen trees, branches, or other debris found along the drainage running through the valley and in other areas of the site. Species expected to occur in non-native grasslands include the western fence lizard, western skunk, gopher snake, and striped racer. Several rodent species use burrows for cover and nesting chambers. An abundant rodent throughout the low-lying portions of the site is the California ground squirrel. Botta's pocket gopher, which creates extensive underground tunnels in its search for bulbs, roots, stems, and tubers, is also common on the site. The burrow systems created by rodents may also be used by amphibians, such as the California tiger salamander and western toad, both of which were observed on-site. Burrowing Owls, which have not been observed on the site since 1988, also use California ground squirrel burrows for nesting and cover.

Several species of birds use grassland habitats throughout the year. Savannah Sparrows and Western Meadowlarks build their nests directly on the ground in grasslands. A Western Meadowlark nest was found on the valley floor, and Meadowlarks were observed throughout the grasslands.

Seeds produced by annual and perennial grasses provide food for migrating and wintering songbirds, such as American Goldfinches. Goldfinches pluck seeds from flowers and grass stalks. Small rodents, such as the western harvest mouse, also use grass seeds and stalks as food sources. Networks of runways may be formed through the grasses as a result of California voles clipping grasses and herbs at their bases. Mammalian predators, such as the coyote and bobcat hunt for mice, gophers, ground squirrels, and black-tailed hares in these grasslands. Northern Harriers may hunt for small mammal prey over low hills and valleys on the site. Golden Eagles and Red-tailed Hawks commonly forage in the valley, especially where there is a high occurrence of ground squirrels. Forbs, such as clover, miner's lettuce, and phacelia provide important forage for black-tailed deer during the spring and early summer.

Non-native Grassland/Wildflower Field (serpentine substrate)

Vegetation. Non-native grassland occupies serpentine hills in the northeastern portion site. The grassland (serpentine substrate) is primarily dominated by wild oats, with soft chess and Italian ryegrass as sub-components. Purple needlegrass is also present, sometimes in small distinct clumps, or as a sub-dominant with other grasses. Native and non-native forbs including California poppy, field bindweed, rose clover, western larkspur, owl's clover, white Mariposa tulip, and blue dicks are also scattered throughout the grasses.

Patches of wildflower field habitat occur within the matrix of non-native grassland in the easternmost serpentine area only. These patches occur where the soils are very thin and rocky. The wildflower fields are dominated by native annual forbs, with both native and non-native grasses existing as a minor sub-component. Typical species include goldfields, most beautiful or common jewelflower, purple owl's clover, California plantain, Ithuriel's spear, Chile trefoil, deerweed, serpentine linanthus, white Mariposa tulip, soap plant, sticky calycadenia, California poppy, one-sided bluegrass, wild oats, and soft chess.

Rocky serpentine outcrops are also scattered throughout the easternmost serpentine area. These outcrops support a sparse cover of mostly native species, including Santa Clara Valley dudleya. Uncommon jewelflower is often found on outcrop edges. Other common species of the outcrops include popcornflower, California gilia, buckwheat, and stunted wild oats, and soft chess.

Wildlife. Serpentine grasslands support vertebrate wildlife species similar to that of non-native grasslands (non-serpentine substrate). However, the grasslands frequently support an invertebrate fauna that is specifically adapted to serpentine based soils, including the Bay Checkerspot Butterfly, and Opler's longhorn moth. Based on several years of spring surveys conducted since 1985, it has been determined that only Opler's longhorn moth exists on the serpentine grasslands of the site, while the Bay Checkerspot Butterfly is not present. (While the host plants and nectar sources for the Bay Checkerspot Butterfly are present on the site, the microclimatic conditions would preclude sustained survival of the butterfly on the site, as discussed subsequently.) Several avian species would be expected to occur in this habitat, including the Killdeer, Horned Lark, Lincoln's Sparrow, and Spotted Sandpiper. Small mammals, such as the western harvest mouse, ornate shrew, and California vole would also be found in this habitat, especially in and at the edges of dense vegetation.

Valley Oak Woodland

Vegetation. Valley oak woodland is present mostly on the northeast- to northwest-facing slopes of the Hayes Valley. The canopy cover ranges from open and savanna-like (mostly at the lower elevations) to almost closed (at the higher elevations). Valley oak is the dominant tree of this woodland, occurring in almost pure stands in the lower elevations of the site. Also present are blue oak, coast live oak, and California buckeye. The understory is primarily herbaceous in many locations, and consists of several species of non-native grasses, including wild oats, farmer's foxtail, and bedstra. Poison oak is often the only understory shrub. Woodland openings and understories in the steep, southern portion of the site often include small patches of Diablan sage scrub.

Wildlife. Oak woodland habitat is one of the most diverse and productive habitats for wildlife in central California. These woodlands function as escape cover, thermal cover, migration corridors, and nesting and foraging habitat for a diverse wildlife community. Rotting logs and loose rocks in damp shady areas provide important habitat to a variety of reptiles and amphibians. The arboreal salamander, western skunk, and southern alligator lizards are expected to occur in this habitat. Additionally, the common kingsnake uses rocks and downed logs for cover. This species forages on amphibians, reptiles, birds, and mammals in this habitat. Other snakes likely to use forested habitats of the site include the California whipsnake and western rattlesnake.

The oak woodland community provides habitat for a variety of avian species. The proximity of this habitat to the grassland communities in the valley increases their ecological importance. For example, birds such as the Red-tailed Hawk and American Kestrel forage in grasslands and often require adjacent woodlands to roost and nest. Several Red-tailed Hawks and American Kestrels have been observed on the site.

Oak acorns provide food for several species, including the Scrub Jay and Acorn Woodpecker. Insects that live beneath the tree bark or on foliage provide food for many bird species, including the Plain Titmouse, Bushtit, and Hutton's Vireo. Yellow-rumped Warblers and Ruby-crowned Kinglets are commonly seen in winter foraging for insects among oak branches. Several bird species depend on standing dead or partially dead trees (snags) for nesting, feeding, and shelter. These include American Kestrel, Western Bluebird, Acorn Woodpecker, White-breasted Nuthatch, and Nuttall's Woodpecker. Northern Flickers are also commonly found in oak woodland habitat. A Lewis' Woodpecker, an uncommon species for the region, was observed nesting on the site in 1994.

An inactive Golden Eagle nest was detected on the north side of the valley floor in a coast live oak in 1989, and appears to have been active during previous years. An immature Golden Eagle was observed flying over the site in 1988. Up to five Golden Eagles have been observed simultaneously on-site. In 1992 eagles did not nest on-site, but used a nest site along the south side of Lion's Peak, off-site approximately 0.25 miles southeast of the property line. The pair fledged two young in 1992. The nest was again active in 1993, and the pair successfully fledged one young in 1993. The nest site was not active in April, 1994, and the nest had partially fallen. A single Golden Eagle exhibiting territorial behavior was observed in the same drainage, which indicates that a pair was probably nesting in the vicinity.

Oak woodland habitats support a diverse assemblage of mammals, including black-tailed hare, California ground squirrel, western gray squirrel, deer mouse, and Botta's pocket gopher. Typically, a relatively high diversity of predators forage in these woodlands due to an abundance of small birds and mammals. These predators include the Red-tailed Hawk, Cooper's Hawk, Sharp-shinned Hawk, coyote, red fox, gray fox, raccoon, and striped skunk.

This habitat is preferred by black-tailed deer, because it generally provides a diversity of food plants and cover for reproduction. Forbs are important forage for deer during the spring and early summer. Beginning with the fall rains, grasses become an important component of the deer diet. Additionally, the mast, or acorn drop, in fall is considered an important dietary component for both deer and wild pig in California. This oak woodland provides the puma, an ambush predator, substantial cover for hunting its primary prey, the black-tailed deer and to a lesser extent, wild pigs. However, no wild pigs (or evidence of their presence) have ever been observed on the site by the resident rancher.

Diablan Sage Scrub

<u>Vegetation</u>. Diablan sage scrub occurs primarily in the southern region of the site well beyond the proposed development area. A few small patches, however, occur in more northern locations. The relatively large stands on the steep southern hillsides intergrade with and often include patches of oak woodland. The Diablan sage scrub of the site is characterized by a dense cover of California sage interspersed with sticky monkey flower. Deerweed and purple needlegrass are often present on the community borders and in the occasional canopy

openings. The scrub community of the higher elevations in the southern portion of the site may also include manzanita and coyote brush.

Wildlife. Wildlife species commonly associated with this habitat include the Rufous-sided Towhee, California Thrasher, Fox Sparrow, and Wrentit. Species which were observed foraging on-site in this habitat included Western Meadowlarks and Savannah Sparrows. A Sage Thrasher, a species normally found in the Great Basin and desert areas of California, was observed at the site in 1994. The black-tailed hare, which would normally be abundant in scrub habitat, was not observed during surveys. A California horned lizard was observed at the edge of sage scrub habitat bordering oak woodland on-site during a past survey. Other reptiles commonly found in this habitat on-site include the western fence lizard, southern alligator lizard, and western rattlesnake.

Valley Oak/Sycamore Riparian Woodland

Vegetation. Valley oak/sycamore riparian woodland occurs intermittently along several of the drainages of the property. This vegetation type consists of plants which are either found only in association with water, or are more abundant along water courses than in the immediately adjacent vegetation. The valley oak/sycamore riparian woodland of the site consists almost exclusively of very large, mature relatively widely spaced valley oak and California sycamore trees located along the banks of the streams. Red willow is occasionally present. Riparian woodland is most abundant along the largest creek of the site, the west branch of Llagas Creek, which flows through the eastern two-thirds of Hayes Valley. The woodland understory (and the creek banks outside the tree canopies) is primarily occupied by species commonly found in the non-native annual grassland, and generally lacks both understory shrubs and seedling sapling trees. Typical herbaceous species include soft chess, Mediterranean barley, farmer's foxtail, Italian thistle, ripgut grass, and red-stem filaree. California rose, a native shrub, occurs very occasionally in the understory. Wetter areas directly adjacent to the water's edge support hydrophytic species, which are found only in association with water. Watercress, sedges, curly dock, toad rush, hyssop loosestrife, common monkeyflower, and spike-rush grow here.

The strip of riparian woodland which runs through the agricultural field in the eastern portion of the property is different in character than other riparian woodland of the site. The tree canopy is denser, often closed. Small to moderate-sized valley oaks are dominant; California black walnut and cherry are also present.

Scattered clusters and individual riparian trees are generally infrequent, but present, along the tributary creeks which drain the hills surrounding Hayes Valley. Species composition at the water's edge and adjacent to it is similar to that described for the larger valley creek, although the extent of such vegetation is more limited.

Wildlife. Riparian woodlands typically constitute important movement corridors for both resident and migratory wildlife, connecting a variety of habitats throughout the region. They are used by some raptors for nesting and roosting, even where other habitats are used for foraging. Riparian areas of greatest value to wildlife are floristically and structurally diverse. The riparian habitat of Hayes Valley has been modified by years of livestock grazing. Trees are generally widely spaced, creating an open canopy, and almost no regeneration of trees has occurred. A well-developed multilayered shrub understory is generally absent. Despite the degradation caused by cattle on the slopes and lack of forbs and shrubs on the banks, this habitat is important to the native wildlife of Hayes Valley. Nonetheless, the value of these woodlands is greatly reduced when compared with a less disturbed riparian woodland.

A variety of reptiles and amphibians may be expected to occur in riparian habitats of the site. Leaf litter, downed tree branches, and fallen logs provide cover for the California newt, western toad, and Pacific treefrog. Several lizards also occur here, including the western fence lizard, western skunk, and southern alligator lizard. Snakes common to riparian habitats include the western rattlesnake, racer, and common kingsnake. Western pond turtles occurring in the ponds on-site may also nest along the main creek drainage.

The oaks, sycamores, and other mature trees may attract a number of avian species to the riparian habitat. Acorn Woodpecker, Nuttall's Woodpecker, and Northern Flicker excavate nest holes in dead tree branches. Nest holes abandoned by woodpeckers are used by Western Screech Owls, Ash-throated Flycatchers, European Starlings, and other cavity-nesting species. Small songbirds, such as Bushtits, Warbling Vireos, and Wilson's Warblers may build their nests within the dense understory of willows. Other species, such as the Scrub Jay, Northern Oriole, and Bewick's Wren are also commonly found in riparian situations. Larger raptors, such as the White-tailed Kite, Red-shouldered Hawk and American Kestrels which were both observed on-site, prefer to situate their nests in the higher canopy of cottonwoods and buckeyes. A Downy Woodpecker was also observed foraging among branches and tree trunks for insects.

A variety of mammals may occur in riparian woodlands. Small mammals, such as the ornate shrew, California vole, and Audubon's cottontail may find refuge in tall grass or brushy thickets along stream banks. Predators, such as coyote and long-tailed weasel are attracted to wooded riparian habitats by an abundance of prey. Black-tailed deer and, occasionally, pumas use these on-site habitats.

Aquatic

Vegetation. The aquatic habitat of the site includes 7 stock ponds and the seasonal flow in the numerous intermittent creeks of the site. Approximately 5.6 acres of aquatic habitat are present on-site; the ponds occupy approximately 1.3 of these acres. The largest pond (pond 1) is located near the center of the site along the main creek channel (see Figure 14). Two smaller ponds are located to the south of the large pond adjacent to a tributary of the main creek.

Wildlife. Amphibian and reptile species that have been observed in or near the stock ponds on- site include the western pond turtle and California tiger salamander. Many species of birds, especially ducks, may use the stock ponds for feeding, bathing, and roosting. Bird species commonly found at the edges of ponds include Great Blue Heron, Great Egret, and Green Heron. Some species observed on the open water include the Mallard, Wood Duck, and American Coot.

Emergent Vegetation

Vegetation. The margins of aquatic areas frequently support a variety of vascular plants, some of which are hydrophytes adapted to aquatic conditions, and others which may tolerate seasonal inundation but flourish best when inundation or soil saturation are no longer present. The emergent vegetation on-site consists almost exclusively of spike-rush. Pond 1 is bordered by a dense fringe of this species varying in width from approximately 1 foot to 200 feet. Small areas of pond 2 are bordered by a thin fringe of spike-rush, and several small clumps (approximately 2 feet by 4 feet) are located within the pond. Two seasonal tributaries which feed pond 1 also support stands of emergent vegetation within their banks. Several other wetland species, including iris-leaved rush and watercress, grow within the tributaries.

Wildlife. Several wildlife species may inhabit emergent vegetation, and use the rushes for cover. Pacific tree-frogs were observed in pond 1 during site visits. The dense vegetation would provide cover and adequate moisture for the common garter snake, which preys on tree frogs and other small vertebrates. Red-winged Blackbirds would be attracted to the dense stands of rushes during the breeding season. Black Phoebes and Song Sparrows may forage in and around the wet areas for insects. The seasonal marsh vegetation would provide nesting habitat for the Common Snipe and Northern Harrier.

Seasonal Wetlands

Vegetation. Several relatively small seasonal wetlands occur within the matrix of the non-native grassland in the valley, primarily towards the northwestern end of the property (near Watsonville Road). These seasonally wet areas occur in slight depressions where moisture from seasonal rainfall collects. These areas appear to pond as a result of the channelization of Hayes Creek in the area, the mounding along the fence line adjacent to Hayes Creek, and the annual regrading of the access road through the area. All these factors apparently interrupt the historic drainage of the site, and create man-made spring pools. The condition of these seasonal wetlands varies from fairly undisturbed to degraded; a dirt road passes through several of the wetlands.

The seasonal wetlands were dominated by Mediterranean barley in 1994. However, during the spring of 1992 and 1993, portions of these areas (approximately 0.2 to 0.4 acres) were dominated by several species typical of vernal pool habitats, including maroon-spotted downingia and hyssop loosestrife. Other common species, some of which were abundant in one or more of the pools, included toad rush, flowering quillwort, smooth lasthen, snow-white meadowfoam, bracted popcornflower and Mediterranean barley. This vernal pool-like flora appears to be very uncommon in Santa Clara County.

Wildlife. Several species of invertebrates only occur in alkaline freshwater vernal pools, seasonal wetlands, or other ponded areas including the longhorn fairy shrimp, vernal pool fairy shrimp, and California linderiella. Although common species of fairy shrimp are likely to be present on-site, the federally-listed species of fairy shrimp are unlikely to be found on the site, as discussed subsequently. The California tiger salamander may move into temporary ponded areas during and after rains to breed, but these areas pond too shallowly and dry too quickly for successful breeding.

Orchard/Cropland

Vegetation. A plum orchard and fallow agricultural field are located near the eastern border of the site. An understory of non-native grasses is present in the orchard. The fallow field consists primarily of wild oats, Italian ryegrass and common barley.

Wildlife. Birds typically found in this habitat and observed in the abandoned plum orchard on-site include Northern Mockingbird, Northern Oriole, Mourning Dove, and House Finch. Other species observed on-site or in the vicinity included Yellow-billed Magpie, American Crow, and California Quail. A large Monterey pine tree at the southeast corner of the orchard would provide a potential roost for Red-tailed Hawk or other raptor. Some wood piles in the orchard would also provide cover for western fence lizards and southern alligator lizards.

Residential/developed

Vegetation. Several residences, ranch buildings and associated structures are located in the eastern portion of the property. Landscape vegetation and numerous large non-native trees and large valley oaks are present in this area.

Wildlife. Residential and developed habitats may support a variety of wildlife, depending on the amount of shrubby vegetation, height and density of the tree canopy, and the presence of debris, such as wood piles, weedy lots, etc. There are several bird species typical of this type of habitat. A common invasive species is the European Starling, which may nest in the palm trees on-site. Starlings may also use dead snags for nesting or roosting. House Sparrows typically nest under eaves or in shrubs near human habitation. Other bird species commonly found near residences with gardens include the House Finch, Northern Mockingbird, and California Towhee.

Special Status Species

Special-status species are plants and animals that are legally protected under the state and/or federal Endangered Species Acts or other regulations, as well as other species that are considered rare enough by the scientific community and trustee agencies to warrant special consideration. Species with legal protection under the Endangered Species Acts often represent major constraints to development, particularly when they are highly sensitive to habitat disturbance and where proposed development would result in a "take" of these species.

Special-Status Plant Species

The special-status plant species that occur in the project vicinity in habitats similar to those found on the project site are described below. The legal status and likelihood of occurrence of these species on-site are given in Table 6. Species that occur in Santa Clara County, but do not occur in habitats or microhabitats present on the site were not included or discussed below.

Field surveys were conducted for special-status plants within the project area to be affected by development, and the hilly region situated to the north of the Valley floor (the "study area").

State or Federal Endangered or Threatened Species, or Proposed for State or Federal Status

Tiburon Indian Paintbrush *(Castilleja affinis ssp. neglecta)*. Federal listing status: Endangered; State listing status: Threatened; CNPS List: 1B. This perennial herb grows on open serpentine slopes and serpentine grasslands. This species, which has been reported from only six locations, was previously known only from north of San Francisco Bay. Recently, however, it was reported from a site in the Morgan Hill quadrangle, in the Metcalf Canyon vicinity. The blooming period ranges from April to June. Specific surveys for this species have not been conducted. The serpentine habitat in the northeastern portion site may provide appropriate habitat for this species. Tiburon paintbrush may, therefore, potentially be present within the study area, but is extremely unlikely to occur in the non-serpentine areas proposed for development.

Coyote Valley Ceanothus *(Ceanothus ferrisae)*. Federal listing status: Endangered; State listing status: None; CNPS List: 1B. This shrubby species occurs on serpentine soils in chaparral and valley and foothill grassland communities between elevations 400 and 1000 feet. It has been found in the western foothills of the Mount Hamilton Range near Anderson Reservoir. No individuals of any ceanothus species were observed during site surveys. Therefore, Coyote Valley ceanothus is presumed to be absent from the study area.

Santa Clara Valley Dudleya *(Dudleya setchellii)*. Federal listing status: Endangered; State listing status: None; CNPS List: 1B. This small, perennial, succulent plant grows primarily in serpentine rock crevices and in serpentine-derived soils in grassland communities. This species is narrowly restricted to the southern foothills of the Mount Hamilton Range and the eastern foothills of the Santa Cruz Mountains bordering the Santa Clara Valley. The typical blossoming period is from May to June. Approximately 100 to 220 Santa Clara Valley dudleya occur on the south-, east-, and west-facing slopes of the serpentine hills in the northeastern section of the property (see Figure 14).

Metcalf Canyon Jewelflower *(Streptanthus albidus ssp. albidus)*. Federal listing status: Endangered; State listing status: None; CNPS List 1B. This plant is found on road-cuts, on rocky outcrops of serpentine, and on steep slopes of relatively thin, serpentine-derived soils. Its range is limited to the Santa Clara Valley region and it generally occurs east of Coyote Creek. The blooming period of this species ranges from April to early June. Metcalf Canyon jewelflower was not found during special-status species surveys and is, therefore, presumed to be absent from the study area.

TABLE 6
SPECIAL-STATUS SPECIES

SPECIES: COMMON NAME	SPECIES: SCIENTIFIC NAME	STATUS*	POTENTIAL FOR OCCURRENCE ON SITE
PLANTS			
State or Federally Endangered or Threatened or Proposed Endangered or Threatened			
Tiburon Indian Paintbrush	*Castilleja affinus ssp. neglecta*	FE, ST, 1B	May be present on serpentine hills north of project footprint.
Coyote Ceanothus	*Ceanothus ferrisae*	FE, 1B	Not observed during rare plant surveys; presumed absent.
Santa Clara Valley Dudleya	*Dudleya setchellii*	FE, 1B	Present on serpentine hills north of project footprint.
Metcalf Canyon Jewelflower	*Streptanthus albidus ssp. albidus*	FE, 1B	Not observed during rare plant surveys; presumed absent.
State Protected, Federal Candidate Species, or CNPS List 4			
Showy Indian Clover	*Trifolium amoenum*	FC2*, 1B	Not observed during rare plant surveys; presumed absent.
Contra Costa Goldfields	*Lasthenia conjugens*	FC1, 1B	Not observed during rare plant surveys; presumed absent.
Most Beautiful Jewelflower	*Streptanthus albidus ssp. peramoenus*	FC1, 1B	Present on serpentine hills north of project footprint.
Santa Clara Red Ribbons	*Clarkia concinna ssp. automixa*	FC2, 1B	No appropriate habitat within project footprint; presumed absent.
Mount Hamilton Thistle	*Cirsium fontinale var. campylon*	FC2, 1B	Not observed during rare plant surveys; presumed absent.
Fragrant Fritillary	*Fritillaria liliacea*	FC2, 1B	May be present on serpentine hills north of project footprint.
Big Scale Balsamroot	*Balsamorhiza m. var. macrolepis*	1B	No appropriate habitat within project footprint; presumed absent.
Hall's Bush Mallow	*Malacothamnus hallii*	1B	Not observed during rare plant surveys; presumed absent.
Serpentine Linanthus	*Linanthus ambiguus*	CNPS 4	Present on serpentine hills north of project footprint.
ANIMALS			
State or Federally Endangered or Threatened Species, or Proposed Endangered or Threatened.			
Bay Checkerspot Butterfly	*Euphydryas editha bayensis*	FT	Not observed during special surveys; presumed absent.
Unsilvered Silverspot	*Speyeria Adiaste*	FT	Not observed during special surveys; presumed absent.
Vernal Pool Tadpole Shrimp	*Lepidurus packardi*	FE	No suitable habitat; outside known range; presumed absent
Longhorn Fairy Shrimp**	*Branchinecta longiantenna*	FE	Site is outside of known range; presumed absent.
Vernal Pool Fairy Shrimp**	*Branchinecta lynchi*	FT	Site is outside of known range; presumed absent.
American Peregrine Falcon	*Falco peregrinus anatum*	FE, SE, ST	Rare to occasional visitor.
Willow Flycatcher	*Empidonax traillii*	SE	Rare to occasional transient.
San Joaquin Kit Fox	*Vulpes macrotis mutica*	FE, ST	None found during 1988 surveys; site is outside current range.
California Tiger Salamander	*Ambystoma californiense*	FPE, S	Suitable habitat present; observed on site during surveys.
California Red-legged Frog	*Rana aurora draytoni*	FPE, SP, S	Suitable habitat on site; none observed during surveys; potentially present.
California Species of Special Concern, State Protected, or Federal Candidate Species			
Opler's Longhorn Moth	*Adela Oplerella*	C2	Not observed during special surveys; presumed absent.
Phalangids	*Microcina homi, M. Jungi*	C2	Not observed during special surveys; presumed absent.
California Linderiella**	*Linderiella occidentalis*	RL	Potential habitat on site; records exist from vicinity of site.
Western Pond Turtle	*Clemmys marmorata*	FC2, S	Suitable habitat present; observed on site.
Western Spadefoot	*Scaphiopus hammondii*	FC2, S	No known records from Santa Clara County; presumed absent.
California Horned Lizard	*Phrynosoma coronatum frontale*	S	Suitable habitat; observed on site.
White-tailed Kite	*Elanus caeruleus*	CP	Suitable breeding and foraging habitat on site.
Northern Harrier	*Circus cyaneus*	S	Transient and winter visitor.
Sharp-shinned Hawk	*Accipiter striatus*	S	Marginal breeding habitat on site; potential forager.
Cooper's Hawk	*Accipiter cooperii*	S	Suitable breeding and foraging habitat on site.

TABLE 6
SPECIAL-STATUS SPECIES

SPECIES			
COMMON NAME	**SCIENTIFIC NAME**	**STATUS***	**POTENTIAL FOR OCCURRENCE ON SITE**
Ferruginous Hawk	*Buteo Regalis*	FC2	Potential winter visitor
Golden Eagle	*Aquila chrysaetos*	CP, S	Forager on site; historical breeder.
Merlin	*Falco columbarius*	S	Potential winter visitor on site.
Prairie Falcon	*Falco mexicanus*	S	Transient and winter visitor.
Long-billed Curlew	*Numenius americanus*	FC2, S	Potential transient.
Burrowing Owl	*Speotyto cunicularia*	S	Suitable breeding habitat on site; historical records from site.
California Horned Lark	*Eremophila alpestris actia*	FC2	Suitable breeding habitat on site.
Loggerhead Shrike	*Lanius ludovicianus*	FC2	Suitable breeding habitat on site.
Yellow Warbler	*Dendroica petechia*	S	Potential migrant and transient; possible breeder on site.
Tricolored Blackbird	*Agelaius tricolor*	FC2,S	Suitable breeding habitat on site; potential breeder.
Townsend's Big-eared Bat	*Plecotus townsendii*	FC2, S	Potential forager; no suitable roosting habitat on site.
Pallid Bat	*Antrozous pallidus*	S	Potential forager; no suitable roosting habitat on site.
California Mastiff Bat	*Eumops perotis californicus*	FC2,S	Potential forager; no suitable roosting habitat on site.
Ringtail	*Bassariscus astutus*	CP	Suitable habitat on site; likely present.

* = Federal, state, and California Native Plant Society listing designations.
1B = California Native Plant Society's (CNPS) list 1B; plants rare, threatened, or endangered in California, and elsewhere.
CNPS 4 = CNPS list 4; plants of limited distribution; a watch list.
FE = Designated as an endangered species by the federal government under the authority of the federal Endangered Species Act.
FT = Designated as a threatened species by the federal government under the authority of the federal Endangered Species Act.
FPE = Currently proposed for endangered status by the federal government.
FC1 = Designated as a candidate species by the federal government. Occurrence on list 1 indicates that U. S. Fish and Wildlife Service has sufficient biological information to support a proposal to list the species as Endangered or Threatened.
FC2 = Designated as a candidate species by the federal government. Occurrence on list 2 indicates that U.S. Fish and Wildlife Service has potential information for upgrading listing to endangered or threatened, but conclusive data on the biological vulnerability and threat are not currently available to support proposed listing.
FC2*= Threat and/or distribution data are insufficient to support federal listing, but the organism is presumed extinct.
SE = Designated as an endangered species by the California Fish and Game Commission under the authority of the state Endangered Species Act.
ST = Designated as a threatened species by the California Fish and Game Commission under the authority of the state Endangered Species Act.
S = Species of special concern, includes species whose breeding populations in the state have declined severely or are otherwise so low that extirpation is a real possibility. There are no special legal statutes governing the protection of this group.
CP = Fully protected species in the state of California.
RL = listing determined to be unwarranted by the USFWS; no longer a candidate species.
**Other invertebrate species covered in separate report by the Center for Conservation Biology, Stanford University.

State Protected or Federal Candidate Species

Contra Costa Goldfields *(Lasthenia conjugens)*. Federal listing status: Candidate 1; State listing status: None; CNPS List: 1B. Contra Costa goldfields occurs on dry, sunny flats in valley grassland communities and along the drying borders of vernal pools up to 700 feet in elevation. This annual herb typically flowers from April to May. This species was known historically from several Bay Area counties, but is now known to exist only in Solano and Napa counties. The closest known historical occurrence occurred in the San Jose East quadrangle, several miles northwest site. No Contra Costa goldfields were found during site surveys. This species is, therefore, presumed to be absent from the study area.

Most Beautiful Jewelflower *(Streptanthus albidus ssp. peramoenus)*. Federal listing status: Candidate 1; State listing status: None; CNPS List: 1B. Previously known as uncommon jewelflower, this close relative of the Metcalf Canyon jewelflower is found in similar habitats in geographically-separated areas. This species has been found on serpentine in the Oakland Hills and in Santa Clara County west of Coyote Creek. The flowering period for the most beautiful jewelflower ranges from April to May. Approximately 10,000 individuals were observed on-site during 1992 surveys, on the south-, east-, and west-facing slopes of the serpentine hills in the northeastern portion of the site. The number of individuals of this annual species may be expected to show large year-to-year fluctuations. The Santa Clara Valley dudleya and most beautiful jewelflower occupy roughly the same portion of the site (see Figure 14).

Mount Hamilton Thistle *(Cirsium fontinale var. campylon)*. Federal listing status: Candidate 2; State listing status: None; CNPS list: 1B. This coarse thistle is a serpentine endemic that occurs most commonly in wet soils associated with springs, seeps, streams, and canyon bottoms. The blooming period ranges from April through October. Mount Hamilton thistle was not found during special-status surveys and is, therefore, presumed to be absent from the study area.

Fragrant Fritillary *(Fritillaria liliacea)*. Federal listing status: Category 2; State listing status: None; CNPS List: 1B. This bulbous plant is found in widely scattered locations in central California in coastal scrub and grassland habitats. All but one of the known populations of this species in Santa Clara County occurs on serpentine; however, some populations in Marin, Alameda, and Sonoma Counties occur on non-serpentine substrates, generally in moist locations. The general blooming period for this species ranges from February to April; however, populations south of San Francisco Bay finish blooming by mid- to late March. Previous surveys for this species were probably conducted too late to identify this species. Fragrant fritillary potentially occurs in the northeastern serpentine area of the site, which is not proposed for development, but is extremely unlikely to occur in the non-serpentine areas of the site which are proposed for development.

Special-status Animal Species

Table 6 lists the potential for occurrence of the special status wildlife species, their status, and their potential for occurrence on the site. Suitable habitat exists on-site to support resident populations of several species. Transients, such as the Sharp-shinned Hawk, Ferruginous Hawk, and Merlin may occasionally forage on-site. Expanded descriptions are provided below for only those species for which potentially suitable breeding habitat occurs on the project site, for which special surveys were conducted, or for which the resource agencies have expressed particular concern.

State or Federal Endangered or Threatened Species, or Proposed for State or Federal Status

Bay Checkerspot Butterfly *(Euphydrias edith bayensis)*. Federal listing status: Threatened; State listing status: none. This species occurs in native serpentine grassland communities of the San Francisco Bay Area. The Bay Checkerspot requires dense stands of its larval food plant, dwarf plantain for reproduction and survival, and uses owl's clover as secondary food source in its larval stage. Adult Bay Checkerspot Butterflies emerge from pupae and fly in March and April. Springtime surveys conducted over several years by the Stanford Center for Conservation Biology observed no Bay Checkerspots on the site, although the serpentine grasslands of the site were found to support large patches of the dwarf plantain and owl's clover. Due to the warm conditions on the south-facing slopes of the on-site serpentine grasslands, it is believed that in typical years the host plants would dry up and die before the butterfly would complete the larval stage. In addition, the site is approximately 5 miles south of the nearest existing colony of the butterfly. Thus, even if individual butterflies were able to migrate to the site, the species could only be supported at the site during brief periods of unusually favorable weather (i.e., years with late rains when host plant development may be delayed to coincide with larval development).

Opler's Longhorn Moth *(Adela Oplerella)*. Federal listing status: Candidate 2; State listing status: none. Like the Bay Checkerspot Butterfly, this species is restricted to remnant patches of native serpentine grasslands. This species is quite small having a wingspan of one centimeter, and also has its adult flight season in March and April. This species was first recorded on the site in 1986, and is found throughout the serpentine grasslands in the northeastern portion of the site.

Unsilvered Silverspot Butterfly *(Speyeria adiaste)*. Federal listing status: Threatened; State listing status: none. This insect is associated with forest-meadow areas of the Santa Cruz Mountains, with the nearest known population observed at San Bruno Canyon approximately 10 miles north of the project site. The oak woodland savannas and grasslands at the site are low in elevation and dry compared to other known localities of this species. While there are a number of creeks and seeps on the site that could conceivably support this butterfly, the lack of observations indicates that it is unlikely that a population of the unsilvered silverspot exists at the Hayes Valley site.

Phalangids *(Microcina homi, Microcina jungi)*. Federal listing status: Candidate 2; State listing status: none. These two species of spider-like arthropod are found on the undersides of rocks in serpentine grassland. While this species was not observed on the site, it maybe present near any springs or seeps in the serpentine grasslands of the site.

Longhorn Fairy Shrimp *(Branchinecta longiantenna)*. Federal listing status: Endangered (September 19, 1994); State listing status: none. The longhorn fairy shrimp is a California endemic occupying seasonally astatic pools and either grass-bottomed swales or clear sandstone depression pools. The longhorn fairy shrimp is known from four distinct populations along the eastern margin of the central coast range from Contra Costa County south to San Luis Obispo County and from the Altamont Pass area to the Carrizo Plain and Kesterson National Wildlife Refuge in the Central Valley. Based on a reconnaissance-level survey of site conditions and the known species distribution, the longhorn fairy shrimp is not expected to occur on-site.

Vernal Pool Fairy Shrimp *(Branchinecta lynchi)*. Federal listing status: Threatened (September 19, 1994); State listing status: none. The vernal pool fairy shrimp occurs in ephemeral freshwater pools in sandstone outcrops. This species has a wide distribution extending from Shasta County through most of the length of the Central Valley to Tulare County, and along the central coast range from northern Solano County to San Benito County. While the vernal pool fairy shrimp occurs widely in California, it is does not occur in high densities and has a sporadic distribution within vernal pool complexes. Seasonal wetlands occurring in the northwest corner of the site may provide suitable habitat for this species. However, based on the known species distribution and preliminary surveys, this species is not expected to occur on-site.

California Linderiella *(Linderiella occidentalis)*. Federal listing status: Delisted (September 19, 1994); State listing status: none. The USFWS in September 1994 determined that the uplisting to endangered or threatened of California Linderiella was no longer warranted due to its relative abundance and distribution. California linderiella occurs in ephemeral pools that are either grass-bottomed swales or sandstone depression pools. This species is relatively common and occurs from Tehama to Riverside Counties. Seasonal wetlands found in the northwest corner of the site may provide suitable habitat for this species. This species of shrimp is the most likely to occur on the property. However, extensive surveys were not conducted on the property to verify presence or absence.

Vernal Pool Tadpole Shrimp *(Lepidurus packardi)*. Federal listing status: Endangered (September 19, 1994); State listing status: none. Pools containing vernal pool tadpole shrimp have clear to highly turbid water and range in size from a few square meters to many acres. These pools may be highly turbid and mud-bottomed or grass-bottomed in old alluvial soils underlain by hardpan. Vernal pool tadpole shrimp are known from 18 populations in the Central Valley, ranging from east of Redding in Shasta County south through the Central Valley to the San Luis National Wildlife Refuge in Merced County, and from a single vernal pool complex in the San Francisco National Wildlife Refuge in the City of Fremont. The pools in the northwest corner of the property appear to be too shallow and short-lived to offer suitable habitat for the vernal pool tadpole shrimp.

San Joaquin Kit Fox. *(Vulpes macrotis mutica)*. Federal listing status: Endangered; State listing status: Threatened. At one time, the kit fox occurred extensively throughout California's Central Valley and parts of the Salinas and Santa Clara Valleys. Loss of habitat from urban, agricultural, and industrial development has severely reduced their former range. The San Joaquin kit fox typically occurs in annual grassland or mixed shrub/grassland habitats throughout low, rolling hills, and flatlands. They are generally most active in the late afternoon and evening. Their diet consists predominantly of kangaroo rats, rabbits, and hares in the southern part of their range and California ground squirrels in the northern part.

No kit foxes nor evidence of their presence (e.g., tracks, scats, etc.) were detected during evening spotlighting, scent/track station surveys, or line transects conducted in January 1988 by H. T. Harvey and Associates. The project site is now accepted by state and federal agencies as being well outside the present range of the kit fox. Therefore, kit foxes are presumed absent from the site.

California Tiger Salamander *(Ambystoma californiense)*. Federal listing status: Candidate 1, proposed for listing; State listing status: Species of Special Concern. The California tiger salamander is a large salamander with distinctive yellow or cream-colored spots on a black body. This species is found in moderate numbers in riparian and wet meadow habitats, but the adults are more commonly found in the burrows of pocket gophers or California ground squirrels in grasslands. Breeding and juvenile habitat requirements include a temporary (3 to 4 months) or permanent water source. Adults often emerge at night during the first moderate to heavy winter rains. They will migrate up to 0.75 miles to nearby vernal pools, or man-made ponds, where they lay their eggs. The adults remain between one and four months in the pool, feeding at night on invertebrates. The eggs are attached singly, or in clumps, to vegetation under water, or on the bottom of the pool if emergent vegetation is lacking. The eggs hatch approximately one week after they are deposited. The larvae prey upon invertebrates and other amphibian larvae for between three and six months, during which time they metamorphose into juveniles. Juveniles typically migrate in large numbers during a one- to two-week period, during which they search for available rodent burrows. Juveniles hibernate in these burrows until the following winter, if there is sufficient precipitation for emergence and reproduction.

Tiger salamanders take several years to reach maturity and do not necessarily breed every year, even if sufficient habitat is present. They are essentially restricted to the Central Valley and Coast Range of California from Butte County south to Santa Barbara County. They have disappeared from a significant portion of their range due to habitat loss from agriculture and urbanization and the introduction of non-native aquatic predators (i.e., fishes such as bluegill, largemouth bass, and mosquitofish, and bullfrogs).

Reconnaissance-level surveys for this species were conducted by H. T. Harvey and Associates in the late winter of 1989 and the spring of 1990. One adult California tiger salamander was found on-site in April of 1990. More intensive surveys, including dip-netting of the three stock ponds on-site, were conducted by H. T. Harvey and Associates in April, May, and June 1992. Approximately 75, 8, and 1 larvae were captured in pond 1 in April, May, and June, respectively, and 5 larvae were captured in pond 2 in May. In a subsequent field survey conducted by LSA Associates in 1995, tiger salamanders were found in ponds 1 and 2, as well as in two additional stock ponds in the northeastern corner of the site. The presence of larval tiger salamanders indicates that a resident population exists on-site. The numerous California ground squirrel, Botta's pocket gopher, and California vole burrows present in proximity to the ponds would also provide suitable refugia for tiger salamanders during their summer aestivation period.

California Red-legged Frog *(Rana aurora draytonii)*. Federal listing status: Candidate 1; State listing status: Species of Special Concern. The California red-legged frog is a medium-sized frog with reddish-colored legs. This species is generally restricted to riparian habitats in California and northern Baja. Red-legged frogs prefer deep, quiet pools (greater than 3 feet deep) in creeks, rivers, or lakes below 3,000 feet in elevation. Habitat requirements include fresh emergent or dense riparian vegetation, especially willows adjacent to shorelines. Red-legged frogs can survive in seasonal bodies of water that are dry for short periods if there is a permanent water body or dense vegetation stands nearby. The adults are normally active at night and breed in ponds in creeks or in marshes during the late winter or early spring after waters recede. Females attach eggs in a single cluster to a vegetation brace just under the surface of the water. The eggs hatch in just over a week and the resulting larvae feed on plant and animal material on the bottom of the pond. It takes at least 4 months for the larvae to metamorphose into juvenile frogs.

Juvenile frogs are predaceous, and are normally active both day and night, but gradually shift to a more nocturnal activity pattern. Adults normally reach sexual maturity in 2 to 3 years after metamorphosis. This species is active throughout the year, although they may estivate in vegetation thickets during flood events or cold weather. Red-legged frogs once ranged from the Coast Ranges of California from Point Reyes south to northern Baja and east through the Central Valley to the Sierra Nevada foothills. But they have disappeared from about 75 percent of their historic range due to habitat loss from agriculture and urbanization and the introduction of non-native aquatic predators (e.g., fishes and bullfrogs).

No eggs, larvae or adult red-legged frogs were detected during surveys conducted in April and May, 1992 by a qualified herpetologist. Therefore, the California red-legged frog is presumed absent from the site.

California Species of Special Concern, State Protected, or Federal Candidate Species

Western Pond Turtle *(Clemmys marmorata)*. Federal listing status: Candidate 2 (FC2); State listing status: Species of Special Concern. The western pond turtle is a medium-sized brown or olive-colored aquatic turtle, and is found west of the Sacramento-San Joaquin Delta, and south to northern Baja, except in desert areas. The pond turtle is normally found in and along riparian areas, although gravid females have been reported up to a mile away from water in search of an appropriate nest sites. The preferred habitat for these turtles includes ponds or slow-moving water with numerous basking sites (logs, rocks, etc.), food sources (plants, aquatic invertebrates, and carrion), and few predators (raccoons, introduced fishes, and bullfrogs). Juvenile and adult turtles are commonly seen basking in the sun at appropriate sites, although they are extremely wary animals and often dive into the water at any perception of danger.

Adults breed in the spring and early summer (March-July). Typical nests are excavated by females in hard-packed clay soil in open habitats (usually on southfacing slopes) within a couple of hundred yards from the water course; however, nests have been located up to 0.4 miles from water. The female will then lay between 1 to 15 eggs which are left to incubate for 3 to 4 months.

Young turtles will either leave the nest shortly after hatching or over-winter in the nest until the late winter rains. Young hatchlings are quite small and feed mainly on aquatic invertebrates in shallow, moss-covered waters. These turtles reach sexual maturity at about 8 years of age. They are also relatively long-lived and may reach 40 years in the wild. They have disappeared from a significant portion of their range due to habitat loss from agriculture, urbanization, water development projects, and the introduction of non-native aquatic predators (e.g., fishes and bullfrogs).

At least 5 western pond turtles were observed by H. T. Harvey and Associates in pond 1 during sampling for amphibian larvae in June 1992. During subsequent field surveys by LSA Associates in 1995, pond turtles were again observed in pond 1 but were not found in any other on-site ponds. The stock ponds and ephemeral drainages on-site provide suitable habitat for this species. The absence of bullfrogs on-site probably increases the chances of survival of pond turtles.

<u>White-tailed Kite</u> *(Elanus caeruleus)*. Federal listing status: None; State listing status: Protected. This species prefers habitats with low ground cover and variable tree growth. Kite nests are built near the tops of oaks, willows, or other dense broad-leafed deciduous tress in partially cleared or cultivated fields, grassy foothills, marsh, riparian, woodland, and savannah. Kites prey primarily on small rodents (especially the California vole), but also feed on birds, insects, reptiles, and amphibians. When prey is abundant, these birds may rear two broods in a single breeding season. Once considered endangered, the kite is now fairly common, although it is fully protected in California.

Suitable breeding habitat exists for this species on-site in the sycamore trees along the valley floor, as well as within the dense oak woodland habitat throughout the site. There also appears to be an adequate insect and small mammal prey base to support breeding kites. Although no White-tailed Kites were observed on-site during surveys, this species would be expected to occur.

<u>Northern Harrier</u> *(Circus cyaneus)*. Federal listing status: None; State listing status: Species of Special Concern. The Northern Harrier is commonly found in open grasslands, agricultural areas and marshes. Nests are built on the ground in areas where long grasses provide cover and protection. Harriers hunt for a variety of prey, including rodents, birds, frogs, reptiles, and insects by flying low and slow in a traversing manner utilizing both sight and sound to detect prey items.

The emergent vegetation partially surrounding ponds 1 and 2 on-site is not extensive enough to support nesting Northern Harriers. This species requires dense, tall emergent or weedy vegetation in which to build nests. Northern Harriers were observed foraging during the winter on-site.

<u>Sharp-shinned Hawk</u> *(Accipiter striatus)*. Federal listing status: None; State listing status: Species of Special Concern. The Sharp-shinned Hawk is commonly found in dense woodland or riparian habitats bordering open areas. Sharp-shinned Hawks typically pursue small birds in semi-open country, at the edges of open woodlands, in clearings, along hedgerows, shorelines, or along bird migration corridors. Nest sites are usually within 90 meters of a water source and located in dense stands of even-aged trees on north-facing slopes. Fledging of young hawks coincides with that of the songbirds in the area which allows the young of the year to practice foraging on inexperienced prey.
Sharp-shinned Hawks surely move through the site in spring and fall, during periods of migration. They may also spend a portion of the winter months foraging for small birds and other prey on the site. Although the site does not provide dense stands of conifers or other even-aged trees for nesting, the oak woodland habitat of the site may provide less optimal to marginal nesting habitat for Sharp-shinned Hawks. There are scattered breeding records for this species in the Bay Area. Sharp-shined Hawks were observed foraging on-site.

<u>Cooper's Hawk</u> *(Accipiter cooperii)*. Federal listing status: None; State listing status: Species of Special Concern. The Cooper's Hawk is a larger accipiter than the Sharp-shinned Hawk and thus this species can prey upon medium-sized birds (e.g., jays, doves, and quail) and occasionally takes small mammals and reptiles. The Cooper's Hawk prefers landscapes where wooded areas occur in patches and groves which facilitates the ambush hunting tactics employed by this species. Breeding pairs in California prefer nest sites within dense stands of live oak woodland or riparian areas, and prey heavily on young birds during the nesting season. The extensive and varied character of the oak woodland on-site offers abundant nesting opportunities for the Cooper's Hawk. The patchiness of the canopy enhances foraging opportunities for this species. The presence of a large number and

variety of oaks and other large trees render the site suitable for breeding Cooper's Hawks. Cooper's Hawks were frequently observed foraging on-site.

Golden Eagle *(Aquila chrysaetos).* Federal listing status: Protected by the Bald Eagle Protection Act and the Migratory Bird Treaty Act; State listing status: Species of Special Concern, Protected. The Golden Eagle is an uncommon permanent resident and migrant in California. Golden Eagles forage upon a variety of prey, but show a preference for rabbits and rodents. The home range of a breeding pair of eagles may include a number of alternate nests, usually located on cliffs, in large trees, or on high tension towers. Only one of these sites is used each year for breeding. Golden Eagles, their nests, and eggs are fully protected in the state of California by the California Department of Fish and Game. In addition, Golden Eagles and their nests are federally protected under the Bald Eagle Protection Act and the Migratory Bird Treaty Act.

Golden Eagles may have nested on-site in 1989. This eagle nest was discovered in July and August of 1989 after the breeding season, but the presence of numerous feathers, prey remains, ground covered with eagle excrement, etc., strongly suggested recent use. A pair of eagles was observed foraging on the site, and several day and night roosts were discovered during the summer of 1989. An inactive nest was also found during that survey period. A maximum of 7 Golden Eagles (5 adults, one sub-adult, and one first-year bird) were observed foraging on the site during late winter and early spring of 1990. One family group, which included a pair of adults and the first year eagle, were regarded as permanent residents, and remained on-site during the spring of 1990.

Intensive surveys for Golden Eagles were conducted on-site in late May and June 1992. All accessible potential Golden Eagle nest trees were searched for nests. Two pairs of adult Golden Eagles and one subadult were observed on-site during these surveys. Two pairs performed aerial displays, indicating a probable territorial boundary on the north slope of Lion's Peak. One adult also foraged consistently over the valley floor and along the southern boundary of the site. A nest with two nearly fledged young was discovered off-site on the south side of Lion's Peak in June 1992. A pair of Golden Eagles (probably the same pair) nested successfully and produced one fledged young in 1993. Although the nest was not active during a nest survey in April 1994, one adult displayed breeding behavior in the vicinity of the inactive nest, which indicates that the pair may be using an alternate nest in the same or adjacent drainage.

Burrowing Owl *(Speotyto cunicularia).* Federal listing status: Protected by Migratory Bird Treaty Act; State listing status: Species of Special Concern. The Migratory Bird Treaty Act prohibits the "taking of active nests, eggs, young, or adults" of Burrowing Owl. CDFG recommends that lead agencies consider disturbances of Burrowing Owl nest sites as adverse significant impacts. They also recommend mitigation measures to reduce the impacts to a level of insignificance. The Burrowing Owl is a small, terrestrial owl of open country. Burrowing Owls favor flat, open grassland or gentle slopes and sparse shrubland ecosystems. These owls prefer annual and perennial grasslands, typically with sparse or nonexistent tree or shrub canopies. In California, Burrowing Owls are found in close association with California ground squirrels. Owls use the abandoned burrows of ground squirrels for shelter and nesting.

Several Burrowing Owls were observed on-site during reconnaissance surveys conducted during January of 1988. One individual was observed during a site visit during 1988 (D. Hartesveldt, pers. comm.). However, no owls have been observed on-site during subsequent visits. There were two accounts of Burrowing Owls in the vicinity of Day Road, to the south of the site in 1993, but the accounts were unverified. The presence of numerous California ground squirrel burrows within the non-native grassland habitat throughout the valley as well as along some of the low-lying hills provides abundant suitable habitat for Burrowing Owls. Therefore, although Burrowing Owls have not been observed on the site since 1988, they could occur on-site in future years.

Ringtail *(Bassariscus astutus).* Federal listing status: None; State listing status: Fully Protected, CDFG Code 4700. Ringtails are a close relative of the raccoon. They inhabit cavities in rock outcrops, talus slopes, and hollows in trees, logs and snags. Ringtails are usually not found more than 0.8 km from permanent water. This secretive carnivore is nocturnal and feeds mainly on rodents and rabbits and less frequently on birds, reptiles, invertebrates, fruit, nuts, and some carrion. No ringtails were observed during any of the field surveys, but they are expected to occur within the valley oak woodland and riparian woodland habitats on-site.

American Badger *(Taxidea taxus)*. Federal listing status: None; State listing status: Species of Special Concern. The American badger is a nocturnal carnivore that occurs within most of California in the drier open regions of grasslands, shrublands, and wooded areas. Habitat requirements include loose, dry soils (which aid in digging), and an abundance of small avian or mammalian prey. The abundance of California ground squirrel burrows throughout the low-lying areas on-site, as well as the abundance of the non-native grasslands in the valley, provide suitable habitat for the badger. There is also adequate cover provided at the grassland edges by trees and shrubs. In addition, a large burrow of appropriate size for a badger was discovered on-site in May 1993. It is, therefore, likely that badgers occur on-site.

Wetlands and Watercourses

Wetlands are recognized as important features on a regional and national level due to their high inherent value to fish and wildlife, their function as storage areas for storm and flood waters, and their water recharge, filtration and purification functions. Although definitions vary to some degree, wetlands are generally considered to be areas that are periodically or permanently inundated by surface or groundwater, and support vegetation adapted to life in saturated soil. Technical standards for delineating wetlands have been developed by the U.S. Army Corps of Engineers (Corps) and the U.S. Fish and Wildlife Service (USFWS), which generally define wetlands by the application of three criteria: hydrology, soils and vegetation.

A wetland assessment was prepared by LSA Associates in May 1994 to provide an estimate on the extent of area subject to Corps' jurisdiction under Section 404 of the Clean Water Act. A copy of this wetland assessment is included in Appendix E.

Based on the assessment by LSA, the total area under Corps' jurisdiction on the property is 9.4 acres. This includes: 3.9 acres of watercourses, consisting of the numerous intermittent streams of the site; 1.3 acres of stock ponds located mainly on the valley floor; 0.2 acres of seeps, found mainly in the northern hillsides; and 4.0 acres of seasonal wetlands located in the western portion of the site.

It is important to note that the LSA assessment does not cover the 176-acre area added to the eastern portion of the site subsequent to their wetland survey. This area contains approximately 0.4 acres of watercourse, bringing the total watercourse area to approximately 4.3 acres, and the total wetlands of the site to approximately 9.8 acres. When the 4.0 acres of seasonal wetland and the 0.2 acres of seeps are removed from this total, the remaining 5.6 acres is equivalent to the acreage for Aquatic habitat in Table 5. (The calculations for this table by H.T. Harvey did not include seeps, which were included in the acreages for grassland habitats.)

Ordinances and Regulations That Address Biological Resources

State and Federal Protections for Species, Habitats and Wetlands: As discussed above, state and federal agencies have a lead role in the protection of biological resources under their permit authority set forth in various statutes and regulations. The U.S. Fish and Wildlife Service is responsible for implementation of the federal Endangered Species Act, and the Migratory Bird Treaty Act, while the U.S. Army Corps of Engineers has primary responsibility for the protection of wetlands under Section 404 of the Clean Water Act. At the state level, the California Department of Fish and Game is responsible for administration of the State Endangered Species Act, and for the protection of streams, waterbodies, and riparian corridors through Streambed Alteration Agreements under Section 1601-1606 of the California Fish and Game Code. (For a detailed discussion of the jurisdictional and regulatory context, see the Biological Resources Report by H. T. Harvey and Associates, contained in Appendix F of this EIR.)

County Zoning Ordinance: Article 14 (Hillsides) allows wood cutting as a matter of right in the Hillside zone provided the yield is not more than 10 percent of trees over 12 inches in diameter per year on any parcel or ownership. Additional wood cutting maybe undertaken in the hillside zone with a Special Permit, with specified limits subject to the submittal of a timber harvest plan.

Santa Clara County General Plan: The Resource Conservation Element of the County General Plan includes policies for the protection of natural streams and freshwater habitat through use of appropriate setbacks and buffer areas. Policy R-RC 37 specifies a protected buffer area of 150 feet from the top bank on both sides where the creek or stream is predominantly in its natural state, and a setback of 100 feet where both sides of the waterway has been altered. Policy R-RC 38 states that no building, structure or parking lots are allowed within the buffer area specified by Policy R-RC 37. This policy also states that "no despoiling or polluting actions shall be allowed, including grubbing, clearing, unrestricted grazing, tree cutting, grading, or debris or organic waste disposal..." within the buffer area. Policy R-RC 43 discourages large scale land clearing that will significantly degrade valuable habitat, and Policy R-RC 51 encourages the preservation of habitat linkages and migration corridors. Policy R-RC 44 encourages the protection of healthy, mature specimen trees. (See Section *II. Consistency with Plans, Policies and Regulations* for the full texts of applicable General Plan policies.)

The County has no tree preservation ordinance, but typically calls for replacement at an appropriate ratio for loss of native trees with a trunk diameter of 12 inches or greater as part of environmental review process.

Significance Criteria

With respect to biological resources, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environmental if it will:

(c) Substantially affect a rare or endangered species of animal or plant or the habitat of the species;
(d) Interfere substantially with the movement of any resident or migratory fish or wildlife species
(f) Substantially diminish habitat for fish, wildlife or plants."

Specific thresholds of significance are based on current state and federal regulatory standards or guidelines for the protection of biological resources, as discussed above.

Impacts and Mitigation

Impact 1. **The project would involve the removal of 246 acres of non-native grasslands, orchards, cropland and residential landscaping. (Less-than-Significant Impact)**

Non-Native Grasslands (non-serpentine substrate)

The proposed golf course and residential area would result in the removal of approximately 246 acres of grassland, and the proposed vineyard near Watsonville Road would result in the removal of an additional 100 acres of the total 874 acres of non-native grassland (non-serpentine substrate). Approximately 46 of the remaining 528 acres consist of relatively small grassland patches located between golf course fairways. The remaining 482 acres of on-site grassland would be maintained as permanent open space.

The loss of this habitat would reduce the overall carrying capacity of the site for a variety of animal species including the Red-tailed Hawk, Golden Eagle, White-crowned Sparrow, California Towhee, Western Meadowlark, California ground squirrel, California vole, western harvest mouse, red fox, and black-tailed deer. Thus some terrestrial vertebrates would be lost due to site development, or displaced to neighboring sites not currently developed. Non-native grassland is regionally abundant and the majority of the biotic resources associated with it would continue to be abundant following project completion. Non-native grassland is not a sensitive natural community according to the California Natural Diversity Data Base, and the loss of non-native grassland from the site would not significantly affect botanical, avian, or mammalian resources. The reduction in on-site foregoing habitat for Golden Eagles and other species likewise would not represent a significant impact, as discussed under Impact 8 below. Two special-status species known to occur on-site, the California tiger salamander and the western pond turtle, may utilize an unknown amount of the non-native grassland on-site. (See discussion under Impact 6 below.)

Orchard/Cropland

Project implementation would result in the conversion of all 164 acres of orchard/cropland habitat on-site to residential development, a lake and an equestrian center. Plant and wildlife species that occur within this habitat are relatively common species that are regionally abundant. Therefore, the loss of orchard/cropland from the site would represent a less-than-significant effect.

Residential/Developed

Project development would result in the conversion of approximately 9 acres of currently developed lands into open space, although the existing trees and vegetation would remain. The wildlife species that occur in the previously-developed area tend to relatively common species that are regionally abundant. No special-status plant or animal species are known to use these residential/developed areas. Therefore, the conversion of the Residential/Developed habitat would be a less-than-significant impact.

Mitigation 1. **No mitigation required.**

Approximately 482 acres of grasslands would be included in the area to remain as permanent open space.

Impact 2. **Development of the two partially wooded lots (Lots 24 and 25) in the residential cluster subdivision in the southeastern portion of the site may result in the limited removal of valley oak woodland. (Potential significant Impact)**

Approximately 21 acres (or 4 percent) of the 480 acres of valley oak woodland on-site are located within the 2 proposed residential parcels (Lots 24 and 25). The woodlands are located on the upper, hilly portions of these lots. The lower flatter areas are vegetated with non-native grassland. Although these are to be custom lots, the building envelopes for these lots have been sited within the lower grassland areas to minimize potential tree removal. Any removal of valley oak woodland would be considered a significant impact. The remaining 459 acres (96 percent of the total) of valley oak woodlands on-site would be included in the area to be preserved as permanent open space.

A portion of the proposed equestrian trail network would be located within the valley oak woodland area. These riding trails would consist of existing trails and jeep tracks that occur throughout the site. Some minor improvements may be made to these trails, such as trimming of trees and bushes, but no trees would be removed. Therefore, the new equestrian trails would not result in significant impact to the valley oak woodland.

Mitigation 2. **The removal of valley oak woodland within Lots 24 and 25 would be avoided to the extent feasible by placing the building envelopes in areas with relatively little tree cover. Any valley oak trees which cannot be avoided by future residential construction would be replaced at a ratio of 5:1.**

Detailed provisions for tree protection and replacement are set forth under Mitigation 4 below.

Impact 3. **The project would result in the loss of 1.7 acres of riparian vegetation or in the reduction of habitat quality in the riparian zone. (Potential Significant Impact)**

Approximately 14.8 acres of the total 18.6 acres of Valley Oak/Sycamore Riparian Woodland habitat of the site occur within the portion of the site to be developed, including 13.9 acres within the proposed golf course and 0.9 acres within the proposed Rural Residential parcel on the eastern boundary.

The value of the Valley Oak/Sycamore Riparian Woodland within these parcels would be lessened due both to direct and indirect impacts. Direct impacts include losses of riparian vegetation resulting from removal of vegetation and diversion of creek flows upstream from or filling channels directly adjacent to riparian vegetation. Approximately 1.7 acres of riparian vegetation would be removed, of which 0.4 acres would become "non-riparian" due either to diversion or filling of channels.

Indirect impacts include the conversion of adjoining natural habitats due to the proximity of the golf course and associated facilities (in some locations, proposed irrigated turf and development occur up to and sometimes beneath the canopies of riparian trees), and human disturbance of the riparian corridor. Potential human disturbance may include authorized or unauthorized crossing of the creek by golfers where no bridges exist, and trampling of creekside vegetation by players searching for balls. Several holes which span either the main creek or its tributaries could increase the potential for such disturbances to occur. These include Holes 6, 7, 8, 9 and 10.

The parking facilities adjacent to the creek near Holes 1, 10 and 18 would be set back at least 75 feet from the riparian habitat. In addition, the parking lots are designed so stormwater would not drain in the creek system but into nearby retention basins. Therefore, these parking lots are not expected to contribute to impacts to the riparian habitats.

The loss of riparian vegetation and the proximity of development and managed golf course would reduce the value of the Valley Oak/Sycamore Riparian Woodland to native wildlife without mitigation. Numbers and diversity of wildlife species occurring along the intermittent creeks of the site are likely to decline during and after project implementation. The loss of riparian habitat and the reduction of riparian habitat values would constitute a potentially significant environmental effect.

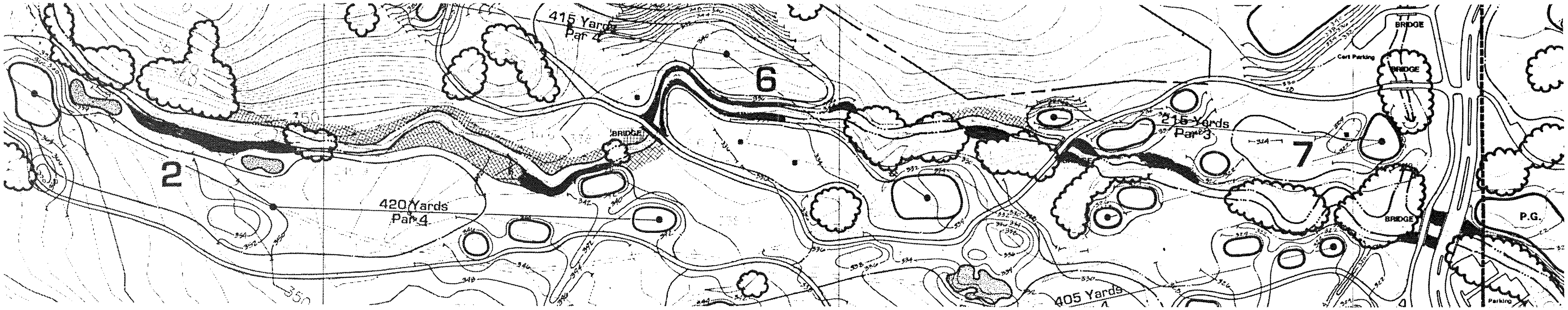
Additionally, any fill, grading and excavation within this habitat would be regulated by the CDFG and by the U.S Army Corps of Engineers, and permits from both of these agencies would be required prior to commencing activities which may affect this habitat.

Mitigation 3. **Impacts to riparian habitat would be avoided to the extent feasible. The unavoidable loss of riparian vegetation and the reduction of habitat value would be mitigated by the on-site replacement of lost habitat, and by measures to protect and enhance the remaining habitat.**

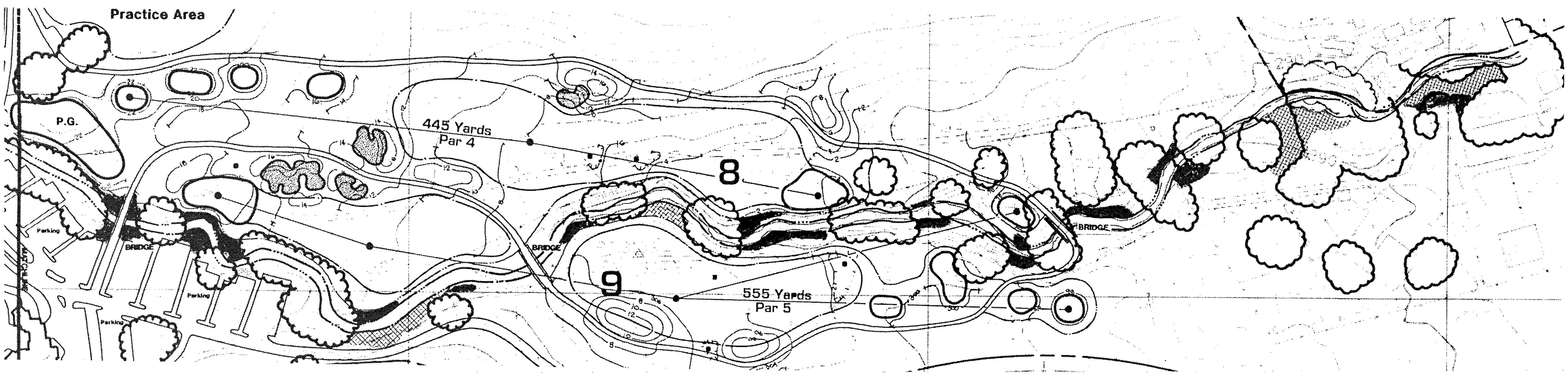
The following measures should be implemented as mitigation:

Removal of riparian habitat would be avoided to the extent feasible. Where avoidance of riparian habitat is not feasible (e.g., at bridge crossings), areas removed by the project would be replaced on-site with newly created Valley Oak/Sycamore Riparian Woodland. A Riparian Habitat Restoration and Enhancement Plan would be developed by a qualified biologist (see Figure 15 for a conceptual habitat restoration plan prepared by LSA Associates). The plan would contain the following components:

(a) Identification of appropriate restoration sites. The area identified for on-site restoration and enhancement is a 1.2-mile long on-site reach of West Branch Llagas Creek extending



WESTERN HALF



EASTERN HALF

Location of Tree and Shrub Planting Areas

Trees

Shrubs

SCALE: 1"= 200'

RIPARIAN HABITAT RESTORATION AND ENHANCEMENT CONCEPT

Source: LSA Associates

FIGURE 15

from the existing on-site pond in the west to the existing ranch complex in the east. This corridor contains approximately 2.5 acres of area to be revegetated as shown on the riparian restoration and enhancement concept plan. This represents sufficient area to accommodate the required tree and acreage replacement ratios discussed below.

(b) Replacement for lost trees. Replacement of lost riparian trees would occur at a 3:1 ratio for trees between 2-12" DBH and 5:1 ratio for trees greater than 12" DBH. These ratios should be necessary to compensate for the habitat values lost while restored riparian habitats are maturing (a process taking many years). The riparian corridor would be planted with container-grown plant stock ranging in size from deep pots (2" x 9" black plastic tubes), and 1 gallon containers to larger pots such as citrus pots (4 gallons) and tree pots (15 gallons). As noted in Section *I. Project Description*, the applicant has over 2,500 trees which have been grown from acorns and seeds collected from the site. These include 1,774 sycamores and 454 valley oaks, many of which would be planted within the riparian revegetation area. The mitigation site would be protected from disturbance during project grading and construction.

Planting would occur in late fall or early winter to take advantage of winter rains. All plantings would be spaced at variable distances to create a natural appearance, with sufficient space between them to allow the development of a full mature canopy. The plantings would be maintained and monitored for a period of 5 years, or longer if needed to ensure continued survival of 85 percent of the plantings without further maintenance.

(c) Replacement of lost acreage. Lost acreage would be replaced at a ratio of 1:1 to 2:1 depending on the value of the riparian habitat removed. A portion of the 1.7 acres of riparian habitat to be removed would also constitute wetlands under the jurisdiction of the U.S. Army Corps of Engineers and would be replaced by the wetland replacement mitigation identified under Mitigation 12 below. The 2.5 acres of riparian restoration area along the main creek channel would more than compensate for the remaining non-wetland riparian habitat to be removed as a result of the project.

(d) Apply for and comply with all appropriate permits. The project proponent would apply for and obtain a Streamed Alteration Agreement from CDFG and a Section 404 permit from the Corps of Engineers prior to issuance of a grading permit. The project proponent would comply with all conditions of each permit.

(e) Establish an undeveloped buffer on either side of the riparian area. The CDFG generally recommends riparian setbacks of 100 feet, and the Santa Clara County General Plan recommends setbacks of 150 feet (for structures and pavements) from the top of the bank line where a creek is predominantly in its natural state, and provides for reduced setbacks where creekside habit has been degraded. The County's interim Environmental/Design Guidelines for Golf Course indicates a setback of 75 to 150 feet for structures, paved roadways and parking areas. Since quality of the riparian habitat on-site has been degraded due to many years of livestock grazing, smaller buffers would adequately protect existing riparian functions and values. The riparian woodland consists primarily of large, relatively widely-spaced trees. Little or no woody understory vegetation is present, and almost no regeneration of trees has occurred. The relatively simple and open structure of the riparian habitat has resulted in a reduction of its value to wildlife. Habitat value and the preservation of existing vegetation conditions would, therefore, be maintained with reduced buffers. Within the proposed Lion's Gate project, the paved areas nearest to the creek channel would be clubhouse parking areas, which are proposed to be set back a minimum of 75 feet from the creek bank. In addition, all parking lot runoff would be piped to off-channel retention basins, and would not be allowed to enter the creek.

Along the main creek channel, a minimum buffer of 50 feet on either side of all riparian trees as measured from the edge of the canopy would be established, where feasible, as recommended by H.T. Harvey and Associates. (As discussed under Impact 5 below, the main internal access road would unavoidably encroach upon the driplines of several mature oak trees at the eastern bridge planned over the main creek channel.) In areas that do not support canopy for a distance of at least 100 feet, the buffer should measure 10 feet from the top of bank. (It is important to note that the 10-foot minimum setback applies only to turf and rough areas. These turfed areas adjacent to the riparian corridor are used by wildlife, and thus would not inhibit the wildlife movement along the creek.) On all tributaries to the main creek channel, a minimum buffer of 25 feet on either side of all riparian trees as measured from the edge of canopy should be established. In areas not supporting riparian trees, the buffer should measure 10 feet. Access roads and cart paths would not be constructed within this buffer except where necessary to cross the water courses.

(f) Discourage additional human intrusion into the riparian zone. Bridge crossings would only be provided at locations where creek crossing is necessary to travel from one hole to another or from one end of a hole to the other. Any other access into the riparian and buffer zone would be prohibited. Signs and information would be distributed to golfers regarding the value of the riparian habitat and the prohibitions of access into it. Periodically, golf balls and other man-made debris would be carefully removed from the riparian area by trained maintenance personnel. In addition, the removal of cattle from the site would help facilitate enhancement of the riparian habitat.

Impact 4. **Development of the site as proposed would involve removal of up to 18 trees. (Potential Significant Impact)**

The golf course and related facilities would require the removal of 18 trees, including 11 valley oaks, 6 willows and one sycamore. It is possible that several of the valley oaks may be saved or transplanted depending on the final golf course plans and the recommendations of a qualified arborist.

TABLE 7

TREE REMOVAL AND REPLACEMENT

Species	Trees to be Removed			Trees to be Planted	
	Size Class (inches)			Required Tree Replacement	Proposed Tree Planting
	12 - 24	24 - 36	36+		
Valley Oak (Quercus lobata)	--	2	9	55	454
Willow (Salix sp.)	4	2	--	30	30
Sycamore (Plantanus racemosa)	--	1	--	5	1,774
Black Walnut	--	--	--	--	216
Buckeye	--	--	--	--	128
Totals	4	5	9	90	2,602

*Valley oaks are required to be replaced at 5:1. Other native trees are required to be replaced 3:1, except riparian species which are to be replaced at 5:1. All trees to be removed consist of valley oaks or riparian species.

The two partially wooded residential lots proposed in the southeastern area of the site (Lots 24 and 25) may involve some minor removal of trees for building pads or driveways. However, building envelopes for these lots have been established in areas of the lots where there is little or no tree cover (see Figures 9a and 9b).

Mitigation 4(a). **Existing trees on the site would be preserved and protected to the greatest extent possible.**

Where incursion into tree canopy is unavoidable, trunk locations should be surveyed and mapped during the preparation of improvement plans, and attempts to preserve individual trees made where feasible through the use of retaining walls, short oversteepened slopes, and other methods.

Mitigation 4(b). **A tree replacement program would be prepared to provide for replacement of native trees removed by proposed development.**

The tree replacement program would be implemented as part of site revegetation and landscaping. Oaks would be replaced at a ratio of 5:1 (replacement:removed), with all other native trees replaced at a ratio of 3:1 (except riparian species, which would also be replaced at 5:1). The composition of required tree replacement plantings would be consistent with the percentage of each required tree species removed. Any trees and saplings salvaged within the limits of anticipated grading would qualify as replacement plantings if successfully transplanted.

As shown in Table 7, the estimated tree removal for the project would necessitate replacement planting with a total of 90 trees. As noted in Section *I. Project Description*, the applicant has over 2,500 native trees which have been grown from acorns and seeds collected from the site. These include 454 valley oaks, 1,774 sycamores, 216 black walnuts and 128 buckyeye, which would be planted throughout the project site.

Mitigation 4(c). **Detailed guidelines would be prepared by a certified arborist to minimize potential damage to trees to be preserved.**

These guidelines would cover both construction-related impacts and long-term affects due to changes in drainage or irrigation. The location of tree trunks to be retained would be identified in the field through flagging or other obvious marking method prior to any grading. Standards contained in the preservation guidelines would include the following:

- Grade changes within the tree dripline would be minimized, generally prohibiting any encroachment closer than one-third the distance from the dripline to the trunk. Restrictions on the limits of grading, adjustments to the final grade of cut and fill slopes, and use of retaining walls, if necessary, would all be considered to protect individual trees worthy of preservation.

- Temporary fencing would be required along the outermost edge of the dripline of each tree or group of trees to be retained in the vicinity of grading to avoid compaction of the root zone and mechanical damage to trunks and limbs.

- Paving within tree driplines would be minimized and porous materials such as gravel, loose boulders, cobbles, wood chips or bark mulch would be used where hardscape improvements are necessary for access in the vicinity of trees.

- Trenching would be prohibited within tree driplines, with any required utility line within the dripline installed by boring or drilling through the soil.

- Landscape irrigation within tree driplines would be minimized, prohibiting turf or any landscaping with high water requirements and limiting permanent irrigation improvements to bubbler, drip, or subterranean systems.

Impact 5. **The main access road would encroach upon the driplines of several mature oaks south of the proposed eastern bridge across West Branch Llagas Creek, potentially resulting in stress or death to those trees. (Potential Significant Impact)**

The main access road has been designed to avoid removal of any trees, but it would unavoidably encroach upon portions of the driplines of several (2 to 4) valley oaks south of the proposed eastern roadway bridge. It is possible that grading within the dripline of these trees may result in damage of the root structure and eventual death of the trees.

Mitigation 5. **Grading and paving within the driplines of the affected oaks would be subject to the recommendations of a qualified arborist to minimize stress and damage, with replacement required for any trees that do not survive.**

The affected trees would be monitored for a 5-year period. If these trees do not succumb to the grading activities, then no additional mitigation is necessary. However, if they should exhibit stress from these construction activities within this 5-year period, then these trees would be replaced using the replacement ratios outlined above.

Impact 6. **The proposed project may result in direct impacts to the California tiger salamander, a special-status species, and would result in the loss of breeding habitat for the tiger salamander. (Potential Significant Impact)**

The project may result in direct mortality to the tiger salamander during grading. After completion of the golf course, salamanders migrating to or from breeding ponds may be run over by golf carts or by cars and trucks traveling on the proposed maintenance access road from Watsonville Road to the maintenance facility, or on other paved roads on the project site. Adult salamanders or larvae in the irrigation storage lake could be lost during pumping or the drawdown of the water level in the lake.

The proposed project would result in loss of breeding habitat for the tiger salamander by filling pond 2 and incorporating this area into the golf course. Pond 1 would be left intact but its suitability as breeding habitat for the tiger salamander would be reduced. The construction of the irrigation storage reservoir approximately 400 feet from pond 1 where bullfrogs could become established increases the probability of the predators moving to pond 1 when water is present. The presence of bullfrogs would reduce the tiger salamander population over time.

The proposed project would result in the loss of upland habitat for the California tiger salamander. Approximately 100 acres of upland habitat would be permanently lost due to the golf course development. Areas of annual grassland would be left intact within the golf course and may provide suitable upland habitat as long as estivation sites (burrows, especially of ground squirrels) are not removed.

The proposed project would potentially reduce water quality, resulting in impacts to the California tiger salamander. Irrigation runoff from the golf course may contain levels of pesticides, fertilizers and herbicides which, if they enter pond 1, may be toxic to the tiger salamander and other aquatic species.

Mitigation 6. **The project would include measures to reduce direct mortality of the California tiger salamander, and measures to preserve existing habitat and create new habitat to replace the habitat lost due to the project.**

Direct Mortality

Measures would be taken to reduce direct mortality of terrestrial salamanders during construction and during migrations to and from breeding ponds after construction is completed.

Fencing would be erected to enclose areas to be graded in the vicinity of ponds 1 and 2 in the fall of the year prior to the beginning of grading. The fence would be designed so that salamanders estivating within the construction areas could move out of their burrows and leave the fenced area to reach breeding ponds, but could not return within the fenced areas. Adults and the year's metamorphosed juveniles would then be forced to choose burrow sites outside the construction areas.

To reduce road mortality, the proposed road to the maintenance facility (and secondary emergency access) from Watsonville Road would be built without curbs and gutters.

The golf course access road would be built with rolling curbs or would have no curbs, which will prevent salamanders from becoming trapped on the road if they should migrate onto the roadway.

The permanent open space areas of the project site would be fenced to prevent trespass by unauthorized off-road vehicles.

Habitat Preservation and Creation

The project would preserve 3 existing breeding ponds in the permanent open space areas, maintain one breeding pond within the golf course (pond 1), introduce the salamander to two existing stock ponds which are not currently salamander habitat, and create 3 additional breeding ponds in a permanent open space area. The length of West Branch Llagas Creek and other drainages on the site would be largely preserved which would provide corridors between aquatic sites.

The two existing ponds which are not currently used as a breeding habitat would be made into breeding ponds by removing tiger salamander larvae from pond 2, which is proposed to be filled, and transferring the larvae to the two existing stock ponds. The 3 new breeding ponds would be created by damming tributary drainages and introducing larvae into the new ponds. The two existing ponds and two of the new ponds are located along the northern toe of the southern series of hills. The third new pond would be created to the north of pond 1 by damming the tributary drainage (this pond is also intended as new habitat for the western pond turtle, as discussed under Mitigation 7 below). All of these existing and proposed ponds are located in the area to be preserved as permanent open space.

Pond 1 would be managed to continue its suitability as breeding habitat for the California tiger salamander. The hydrology of this pond would not be changed, and a minimum buffer of 50 feet of undisturbed grassland would remain around the pond (see LSA report in Appendix F).

All remaining and proposed breeding ponds are located adjacent to or are within suitable upland California tiger salamander habit. Grassland is the primary habitat type and ground squirrels are common in all of these areas. These upland areas would be arranged to maintain optimal conditions for the California tiger salamander. (For further description of the mitigation plan and accompanying maps see the LSA report contained in Appendix F of this EIR).

Potential water quality impacts from golf course runoff would be minimized by the golf course drainage plan, which would direct runoff away from natural drainages and ponds, and through implementation of the Environmental Management Plan, under which the use of golf course chemicals would be minimized.

Impact 7. **The proposed project may result in direct impacts to the western pond turtle, a special status species, and would result in the loss of potential upland habitat for the pond turtle. (Potential Significant Impact)**

Construction and grading activity for the golf course may result in direct mortality to pond turtles using upland areas, and in the loss of existing nesting sites during grading activities.

After completion of the golf course, direct mortality may occur to females attempting to move to nesting sites and/or hatchlings moving to aquatic sites if they move into the golf course after it is completed. Approximately 100 acres of potential upland nesting and overwintering habitat would be permanently lost due to golf course development.

Pond turtles may also be subject to increased collection pressures due to the increased number of people using the area. Human activity in close proximity to pond 1 may disturb normal pond turtle activities (e.g., basking and foraging).

Water quality may be reduced by irrigation runoff from the golf course. Affected areas may include pond 1 and reaches of the creek which are adjacent to or downstream of the golf course. The possibility of introduction of exotic predatory species such as bullfrog and fish into waterbodies on the project sites would also increase.

Mitigation 7. **The project would include measures to preserve existing pond turtle habitat, and to create new habitat on the project site.**

Pond 1, which is the only on-site location known to be inhabited by pond turtles, would be situated within the proposed golf course. This pond would be managed to continue its suitability as aquatic habitat for western pond turtles. The hydrology of this pond would not be changed. A minimum buffer of 50 feet would be retained around the perimeter of the pond, which would be an out-of-bounds area for the golf course.

Additional aquatic habitat for western pond turtles is proposed to be created in the permanent open space area north of the golf course. A 10,000-square-foot pond would be created by berming the eastern drainage channel that flows into pond 1. This new pond would be designed to dry by October in a year of average rainfall. Aerial basking sites would be provided as well as shallow areas with emergent vegetation for hatchlings and juvenile turtles. (For a detailed description of the mitigation plan and accompanying maps, see the LSA report contained in Appendix F of this EIR.)

Impact 8. **The special-status plant and invertebrate species of the native serpentine grasslands on the site would be subject to potential disturbance by grading for the adjacent golf course and residential subdivisions, and by the general intensification of human activity resulting from the project. (Potential Significant Impact)**

Two special-status plant species, the Santa Clara Dudleya and the most beautiful jewelflower, occur in the serpentine hills in the northeastern portion of the site. Two other special-status plant species potentially occur on the site, including Tiburon Indian paintbrush and fragrant fritillary. In addition, one special-status animal species, Opler's longhorn moth, is also found in the serpentine grassland habitat of the site.

Under the proposed development plan, the serpentine area of the site is not proposed for development and would be preserved as permanent open space. Thus the special-status plants and animals that occur or potentially occur here would not be subject to direct impact. However, potential indirect impacts to this area are likely to result from the placement of residential lots adjacent to this area on the south. The serpentine habitat is fragile, consisting of steep, sparsely vegetated hillsides with thin, rocky soils. Potential activities which may adversely affect the plants and their habitat include trampling by people, horses, domestic pets, bicycles, and motorcycles. These potential indirect effects of the project would constitute potentially significant impacts.

The only area where grading may occur near the serpentine habitat area is at Lots 7 and 8 of the residential cluster subdivision. The lot boundaries for these lots have been carefully delineated to avoid this serpentine area. However, unless properly fenced or flagged during construction, any future grading activity for the construction of custom homes on these lots could inadvertently cross over into the serpentine area resulting in potentially significant impacts to special-status species.

Mitigation 8. **The serpentine habitat area would be fenced, and signs would be posted to prevent encroachment of grading from the adjacent residential lots, and to prevent the incursion of human activities after the project is completed.**

Public access to the special-status species habitat would be restricted in perpetuity. Brochures would be prepared by the project proponent, or a designee, and would be provided to all homeowners as part of a public education program about the presence of special-status species and the value of such protected resources.

Prior to site grading, temporary fences would be constructed between the serpentine and the adjacent residential lots. The fences would stay in place for the duration of project construction.

Impact 9. **Project construction may adversely affect any future burrowing owl nests that may be established on the site prior to development. (Potential Significant Impact)**

Borrowing owls were observed on the site in February 1988, and suitable habitat exists in some areas of the non-native grassland habitat on-site. Although no burrowing owls were observed during recent site surveys, there were at least 50 active California ground squirrel burrows in the central and western portion of the Hayes Valley site, and the habitat appeared to be suitable for owls. In addition, burrowing owls were observed south of the site in 1993 and 1994 and may disperse onto the project site prior to or following the breeding season. There is a possibility that burrowing owls may establish an active nest in the vicinity of proposed improvements, which nest could be destroyed or abandoned as a result of construction activities. Disturbances or destruction of a nest in active use would be a violation of the Migratory Bird Treaty Act and provisions of the State Fish and Game Code.

Mitigation 9. **Preconstruction surveys would be conducted 30 days prior to site grading to ensure that no burrowing owls nests have been established, with implementation of appropriate mitigation if active nests are found.**

The preconstruction surveys must be conducted by a qualified ornithologist during the spring and early summer months when nesting activity occurs, not during the winter months. If no owls are located during these surveys, then no additional action would be warranted.

If nesting burrowing owls are discovered during the survey, no construction activities, including tree removal, which would result in disturbance to active nests would be allowed to proceed until the ornithologist determines the extent of construction-free zones around the active nests. Results of preconstruction surveys for active burrowing owl nests would be presented to the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Game (CDFG). If any active burrowing owl nests are found on the site, recommendations for avoiding impacts to these birds would be submitted to these agencies for review.

Any burrowing owls discovered using the site during the non-breeding season may be passively relocated by installing one-way doors in active burrows. These doors would remain in the burrows for up to four days to ensure the no owls remain underground. All active burrows would then be carefully excavated to ensure that no owls remain underground. All burrows in the construction area would be closed prior to the passive relocation to prevent owls from using them.

<u>Impact 10</u>. **The project may adversely affect any future nests of the Golden Eagle or other raptors that could be established on the site prior to development. (Potential Significant Impact)**

Golden Eagles are not currently nesting within the project boundaries and the closest known Golden Eagle nest is 0.25 miles from the project boundary on the south side of Lion's Peak. This nest is more than 0.5 miles from any project related development and is also not within the line of sight of any proposed development. Therefore, project buildout would not adversely affect the reproduction success of the Golden Eagle nest on the south side of Lion's Peak.

In the event that any new eagles nests (or other raptor nests) are established on the site prior to site development, construction disturbance during the breeding season could result in the incidental loss of fertile eggs or nesting raptors, or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss or reproductive effort is considered a "take" by the CDFG. Any loss of fertile eggs, nesting raptors, or any activities resulting in nest abandonment would constitute a significant impact.

Golden Eagles have been observed foraging on-site for California ground squirrels, which are relatively common in most areas of the valley floor. After completion of the project, the eagles are likely to shift their foraging efforts to adjacent grasslands where their primary prey, ground squirrels and black-tailed hares, are also abundant. Native grasslands, which support an abundance of ground squirrels and black-tailed hares are one of the most common habitats presently undeveloped in south Santa Clara County. Golden Eagles forage between 20 and 66 square miles depending upon the quality of habitat. Eagles in San Diego county in similar habitats to Hayes Valley average a foraging range of 36 square miles. The loss of 246 acres of grassland due to the golf course and residential development would represent approximately 27 percent of the grassland on site. The proposed vineyard on 100 acres near Watsonville Road would represent an additional 11 percent, resulting in a total grassland loss of 38 percent. Assuming that the home range for local Golden Eagles consists of approximately 36 square miles, with a somewhat smaller home range for other raptors, this loss would represent 1 to 2 percent of the total foraging area for the potentially affected raptors. Considering also that the other grasslands in the vicinity are not planned or proposed for conversion, the loss of a portion of the on-site grasslands would not constitute a significant impact on foraging habitat for Golden Eagles and other raptors.

Mitigation 10. **Preconstruction surveys would be conducted 30 days prior to site development to ensure that no active eagle or other raptor nests have been established on the site, with implementation of appropriate mitigation if active nests are found.**

Construction activities during the nesting season (February to July) would be preceded by preconstruction surveys for nesting eagles and other raptors by a qualified ornithologist. No construction activities, including tree removal, which would result in disturbance to active raptor nest, would proceed prior to these surveys. The ornithologist would determine the extent of construction-free zones around any active raptor nests located during surveys. If any active nest of the Golden Eagle or other raptors are found on the site, recommendations for avoiding impacts to these birds would be submitted to the USFWS and CDFG for review.

<u>Impact 11</u>. **The project would result in the reduction of habitat on the site for the ringtail, American badger, California horned lizard and several species of raptor, all of which are special-status species which occur on the site. (Less-than-Significant Impact)**

The ringtail occurs primarily within the valley oak woodland and riparian woodland habitats. Approximately 96 percent of this habitat would remain as permanent open space on-site. Therefore, the loss of a small amount of potential habitat is considered a less-than-significant impact.

A potential badger burrow was discovered on-site in May 1993. The project would eliminate some habitat potentially used by badgers. Considering the large amount of grassland/woodland habitat to be preserved as permanent open space on the site, and the abundance of these habitats regionally, impacts to badgers are expected to be less-than-significant.

The California horned lizard was observed on-site. The majority of the appropriate habitat for this species (valley oak woodland) would not be lost due to project development. Hence, project-related impacts to this lizard are considered a less-than-significant impact due to the abundance of suitable habitat to remain as open space on-site and regionally.

White-tailed Kite, Sharp-shinned Hawk, and Cooper's Hawk use the project site for foraging. The proposed project would eliminate some foraging habitat for these species. Due to the abundance of similar habitat regionally, impact to these species resulting from a small loss of foraging habitat is expected to be less-than-significant.

Mitigation 11. **No mitigation required.**

<u>Impact 12</u>. **The project would eliminate approximately 1.5 acres of existing wetlands on the site. (Potential Significant Impact)**

Potential impacts to wetlands include direct modifications to creek channels and seasonal wetlands to accommodate fairways, roadways and golf cart path crossings, and to modify the existing pond.

The development of the project would result in the loss of approximately 1.3 acres of wetland under the jurisdiction of the U.S. Army Corps of Engineers, and an additional 0.2 acres of emergent vegetation along existing ponds. The grading and filling of seasonal stream courses for golf fairways and roadway and golf cart crossings would remove approximately 0.7 acres of watercourses. The excavation planned for the northern and eastern edges of the main stock pond would remove approximately 0.3 acres of these wetlands plus 0.2 acres of surrounding emergent vegetation, although these areas would be converted to storage pond. Approximately 0.3 acres of the seasonal wetlands in the western portion of the property would be filled for construction of the maintenance access road to Watsonville Road.

Wetland habitats are important for many native plants and animals. The loss of any of these habitats is considered significant and would require authorization from the U.S. Army Corps of Engineers. The bed and banks of all seasonal drainages would be under the jurisdiction of the California Department of Fish and Game (CDFG), and any alterations would require a Streambed Alteration Agreement from CDFG.

The floristic composition of these seasonal wetlands within and directly adjacent to the proposed maintenance access road is rare in Santa Clara County. Seasonal wetlands are generally considered by the CDFG to be of high priority. Therefore, the loss of any of this habitat is considered to be significant. Additionally, these seasonal wetlands may be subject to the jurisdiction of the U.S. Army Corps of Engineers.

Based on the preliminary estimate of 1.5 acres of wetlands affected by the project, it appears that the project may qualify for a General or Nationwide Permit from the Corps.

Potential erosion and degradation of the wetland and riparian habitats may result from increased urban runoff volumes and degraded water quality associated with proposed development. Soils exposed during grading and construction would contribute to increases sediment loads in the creeks unless adequate erosion control measures are implemented. Increased urban pollutants, such as petroleum products from automobiles, and fertilizers, herbicides, and pesticides associated with the golf course may contribute to long-term degradation of water quality.

Mitigation 12(a). **A detailed wetland protection, replacement, and restoration plan would be prepared which meets with the approval of the County, the Corps of Engineers, and the Department of Fish and Game.**

The plan would clearly identify: the total wetlands and other jurisdictional areas affected by the project; the replacement of wetland habitat lost at an acceptable ratio; and provisions for re-establishment, enhancement, and/or replacement of wetland vegetation. The following details would be included in the plan:

- The location(s) of on-site mitigation areas would be identified. Mitigation for loss of existing wetlands would be provided at a minimum replacement ratio of 1:1, and would result in created or restored wetlands with a higher habitat value. Use of freshwater marsh vegetation around the perimeter of the new waterbodies as partial mitigation would only be considered where long-term management to prevent interference with golf play would not preclude its establishment.

- Replacement habitat would be in-kind (e.g., seasonal wetland would be replaced with seasonal wetland, etc.).

- The plan would specify performance criteria, maintenance and long-term management responsibilities, monitoring requirements, and contingency measures.

- The plan would define site preparation and revegetation procedures, an implementation schedule, and funding sources to ensure long-term management of the overall wetland mitigation plan.

A concept for on-site wetlands mitigation has been outlined by LSA Associates (see letter to Bert Verrips dated December 18, 1995, in Appendix F). According to this concept, approximately 0.75 acres of new wetland area would be provided in the new ponds to be created as mitigation for the California tiger salamander and the western pond turtle (see discussion under Impacts 6 and 7 above). An additional 0.36 acres of wetland would be created adjacent to pond #1, as proposed in the project site plan. This accounts for a total wetland creation of 1.11 acres. The remaining wetland mitigation acreage would be created by further expanding the wetland habitat at pond #2, and/or by the creation of an additional salamander breeding pond.

Mitigation 12(b). **Best Management Practices would be used to manage and maintain the golf course in order to minimize impacts of pesticides, fertilizers, and herbicides on the wetlands of the site.**

Appropriate guidelines would be established, including the following provisions:

- Require the use of slow-release nitrogen formulas for all fertilization operations.
- Restrict the application of fungicides, pesticides, herbicides, or fertilizers onto any landscaped areas to fair weather days to prevent precipitation from leaching chemicals into surface water resources.
- Require that chemicals be applied with equipment that has a low ground clearance and a coarse spray to reduce the potential of inadvertent release.
- Minimize the potential of downward percolation of chemicals by requiring that water applied to fairways during fertilization shall be in an amount equal to the day's evapotranspiration rate.
- Restrict "heavy management" of golf course landscaping to tees and greens.
- Require the use of turf species that are low-energy demanding for golf course and other areas with turf landscaping.

[Note: The proposed golf course management practices are described in detail in the Environmental Management Plan, which is contained in Appendix E of this EIR.]

Mitigation 12(c). **A detailed erosion and sedimentation control plan would be prepared and implemented during project grading and construction.**

The plan would contain detailed measures to control erosion of stockpiled earth and exposed soil, provide for revegetation of graded slopes before the first rainy season following construction, and specify procedures for monitoring of the plan's effectiveness.

[NOTE: Comprehensive erosion control measures would be implemented under the Storm Water Pollution Prevention Plan required for the project, as discussed in Section *III. F. Water Quality*.]

Impact 13. **The introduction on non-native species to the site may adversely affect the native vegetation of the site. (Potential Significant Impact)**

Several exotic species used in landscaping commonly escape cultivation and become naturalized in adjacent native habitats. Typical species include French broom, black locust, blue gum, acacia, and periwinkle. These and other exotics are capable of naturalizing in native habitats and reducing the diversity of native plants on the site. This would constitute a potentially significant adverse affect on the native vegetation of the site.

Mitigation 13. **The use of invasive species in project landscaping would be avoided.**

A qualified botanist or horticulturalist would prepare a list of all exotic plants known to readily naturalize in habitats similar to those found on the project site. Species such as black locust, blue gum, various brooms, periwinkle, and others known to be invasive and difficult to eradicate would be placed on this list and not be used in landscaping for the golf course or residential elements of the project.

Conclusion. **With implementation of the above mitigation measures, the project impacts on biological resources would be reduced to less-than-significant levels.**

H. ARCHAEOLOGY

The following discussion is based on the Cultural Resources Evaluation prepared for the project by Basin Research Associates in December 1995, and the subsurface investigation report by Basin Research dated March 1996. The archaeology reports are kept administratively confidential by the Santa Clara County Department of Planning and Development.

Environmental Setting

There are 4 prehistoric and historic sites which have been recorded within the Hayes Valley site. The following discussion summarizes the findings and conclusions for each of these sites, based on surface reconnaissance and subsurface auger testing conducted by Basin Research.

<u>CA-SCl-76:</u> This site is located in the vicinity of the present ranch complex and according to Basin Research ".... probably represents the largest aboriginal village in the southern Santa Clara Valley." Previous studies reported that numerous artifacts have been recovered from this site including many mortars and pestles, points and blades, tobacco pipes, in addition to a large midden (refuse dump) containing fire-cracked rock, burnt bone and shell fragments. The field surveys by Basin Research also yielded several chert flakes from the prehistoric period.

The previous studies also reported that several prehistoric burials were uncovered. Local residents have also reported seeing bone fragments along West Branch Llagas Creek in the vicinity, particularly after heavy storm events. However, a thorough field survey of SCl-76 and the adjacent downstream creek channel conducted by Basin Research found no evidence of human remains.

SCl-76 is also believed to be the site of a pueblo from the Hispanic Period, although no material from this period has been discovered (see Section *III. I. Historic Resources*).

Given the potential for the project to disturb cultural resources at SCl-76, a program of subsurface excavation was undertaken by Basin Research Associates in March 1996 to determine the presence or absence of archaeological material in the vicinity of the proposed improvements. A total of 15 backhoe test units were excavated in areas of SCl-76 likely to be subject to deep excavation during project construction (e.g., proposed lake areas, swim and tennis center, and main access road). No archaeological materials were brought to the surface at any of the 15 test sites. These negative findings resulted in the conclusion by Basin Research that no subsurface prehistoric or historic cultural deposits associated with the site are located within areas to be potentially subject to deep excavation during project construction.

<u>CA-SCl-77:</u> Located near a spring at the northern boundary of the project, this site is believed to be a temporary camp site, with previously reported concentrations of chert flakes and cores, and some fire cracked rock. This site was reportedly disturbed by previous home construction, plowing and discing. However, an intensive ground investigation by Basin Research did not reveal any evidence of cultural resources in the vicinity of this recorded site.

<u>CA-SCl-305/H:</u> Located in the western portion of the site, near the north project boundary, the prehistoric component of this site was previously described as a chert outcrop probably used for tool manufacturing. The historic component ("/H") of this site consisted of an American period dwelling which was destroyed by fire in the 1920s. The surface reconnaissance of this site by Basin Research identified several pieces of chert but none showed cultural modification. No trace of the historic-era house was found in the vicinity.

<u>CA-SCl-568:</u> Located in the west-central portion of the site, at the foot of the south-facing slopes, this site was previously described as consisting of a scatter of chert flakes, a few chert cores, a hammerstone and a several

possible sandstone, groundstone fragments. The site was reportedly highly disturbed by agricultural activity. The field survey by Basin Research did relocate this site, but found no prehistoric cultural material.

In summary, 3 of the previously recorded sites within the project area, CA-SCl-77, SCl-305/H and SCl-568, did not have any visible surface or subsurface indicators of prehistoric occupation. Only CA-SCl-76 yielded surface and subsurface indications of prehistoric activity and therefore it is likely that this is the only site within the project boundaries which has archaeological significance. Given that Native American skeletal remains have been reported at CA-SCl-76, this site should also be considered significant to the Native American community.

Ordinances and Regulations that Address Archaeological Resources

County Ordinance Code Section B6-18; B6-20: This ordinance sets forth procedures to be followed in the event that human skeletal remains or artifacts are encountered, or in the event of a discovery of a Native American burial site. In the event that human skeletal remains are encountered, the applicant is required by County Ordinance No. B6-18 to immediately notify the County Medical Examiner/Coroner (299-5137). Upon determination by the County Medical Examiner/Coroner that the remains are Native American, the Coroner shall contact the California Native American Heritage Commission, pursuant to subdivision (c) of section 7050.5 of the Health and Safety Code, and the County Coordinator of Indian Affairs. NO FURTHER DISTURBANCE OF SITE MAY BE MADE EXCEPT AS AUTHORIZED BY THE COUNTY MEDICAL EXAMINER/ CORONER. If artifacts are found on the site, a qualified archaeologist shall be contacted, along with full compliance with section B6-19 of the Santa Clara County Code.

Significance Criteria

With respect to archaeological resources, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(j) Disrupt or adversely affect a prehistoric or historic archaeological site of a property of historic or cultural significance to a community or ethnic or social group; or a paleontological site except as part of a scientific study." In addition, Appendix K of the CEQA Guidelines provides detailed recommendations for the mitigation of impacts to archaeological resources, and sets forth criteria for determining "important" archaeological resources.

Impacts and Mitigation

Impact 1. **The construction of the main project entrance road and the proposed lake may have an adverse impact on the archaeological site recorded as CA-SCl-76. (Potential Significant Impact)**

As discussed under Environmental Setting above, a thorough program of subsurface excavation conducted at SCl-76 uncovered no evidence of archaeological resources within the area proposed for construction of the lakes, the swim and tennis center, and the main access road. However, given the proximity of the roadway to the southern boundary of SCl-76, there is a slight possibility that archaeological resources could be encountered during excavation for the project.

Mitigation 1. **Grading and excavation in the vicinity of SCl-76 would be subject to intermittent or spot monitoring by a qualified archaeologist.**

A program of intermittent or spot monitoring is recommended for the construction of the main access road in the vicinity of SCl-76, for any area subject to subsurface disturbance greater than 12 inches below the ground surface. The project archaeologist would have the latitude to modify or terminate any portion of the monitoring program at any time if significant cultural materials are not exposed during grading and or subsurface construction.

If any potentially significant cultural materials are exposed during monitoring, all grading and excavation within 30 feet of the find would stop pending the recommendation of the on-site archaeologist as to appropriate action (see Mitigation 2a below). Significant artifacts or features would include, but are not limited to, aboriginal human remains, chipped stone, groundstone, shell and bone artifacts, concentrations of fire cracked rock, ash, charcoal, shell, and bone; and historic features such as privies or building foundations.

In the event that human skeletal remains are encountered, the County Medical Examiner/Coroner would be contacted immediately, and further steps taken in accordance with County Ordinance No. B6-18, as discussed under Ordinances and Regulations above (see Mitigation 2b below).

Impact 2. **In the other areas of the project site which are archaeologically sensitive, such as at the locations where prehistoric sites were the previously recorded but where no archaeological material was found in recent surveys, there is a potential that buried archaeological resources may be damaged or destroyed by grading or excavation for the project. (Potential Significant Impact)**

Of the 3 other previously recorded sites within the project boundaries, 2 are located in areas of potential impact. The first site, SCl-77, located near a spring at the northern site boundary, may be subject to disturbance from grading for the golf course in that area. The second site, SCl-305/H, located in the western portion of the site, at the northern site boundary, may be disturbed by construction of the maintenance access road through that area. The third site, SCl-568, is located in the western area of the site to be preserved as permanent open space, and is not subject to potential impact.

According to present plans, the grading for the project in the vicinity of SCl-77 and SCl-305/H would not be deep enough to have an impact on any buried cultural deposits.

Mitigation 2(a). **Should evidence of prehistoric cultural resources be discovered during construction, work in the immediate area of the find shall be stopped to allow adequate time for evaluation and mitigation, and a qualified professional archaeologist shall be called in to make an evaluation; the material shall be evaluated; and if significant, a mitigation program including collection and analysis of materials prior to the resumption of grading, preparation of a report, and curation of the materials at a recognized storage facility shall be developed and implemented under the direction of the Planning Office.**

Mitigation 2(b). **Any human remains that are discovered shall be removed, the remains shall be analyzed, a report shall be prepared, and if determined to be Native American, the remains shall be reburied under the direction of a designated Native American group.**

Conclusion. **With the implementation of the mitigation measures identified above, the potential impact upon archaeological resources would be reduced to less-than-significant levels.**

I. HISTORIC RESOURCES

The following discussion summarizes the Historical and Architectural Evaluation prepared for the project site by Archives and Architecture in May 1995. The full report is contained in as Appendix G of this EIR.

Environmental Setting

Over 19 buildings are included in the ranch complex located near the eastern end of the site. During the historic period, this site was originally settled by Carlos Castro in 1827 or 1828, and formed the nucleus of the hacienda for Rancho San Francisco de las Llagas granted to Castro in 1834. During this period, buildings included at least one, and probably two, adobe residences and a building known as the soap factory, of which no visible traces remain. Upon the purchase of the rancho by the Murphys in 1848, the hacienda buildings were abandoned, and the Murphys constructed their ranch complexes elsewhere in the vicinity. The site was again occupied in 1890 when the property was acquired by the Lion Company. All the buildings currently on the site appear to have been constructed after 1890 by either Lion or by the Hayes family, which acquired the ranch in 1918 and operated it until the early 1950s, when it was sold.

The main buildings in the existing ranch complex are briefly described below.

Yellow Residence: Located south of the creek, this residence is a one story, front gabled, rectangular structure that appears to date from the 1890s.

Residence: Located on the south side of the creek east of the yellow residence, this dwelling is a one-story bungalow with a low-pitched hipped roof and an integrated porch. This residence may have replaced a Victorian house built by Lion, which burned down in 1918.

Residence and Barn on Highland: This double-gabled residence is located east of the main ranch complex on the north side of Highland near the Turlock intersection. Associated with this residence is a raised redwood water tank and a barn.

Hillside Residence: Located on the north side of the creek on the lower slopes of the northern hills, this dwelling has a wrap-around porch and a shed roof supported by braced posts.

Guest House: Located next to the hillside house, this small dwelling has a side-gabled roof and a full porch.

Creamery: Associated with the Hayes-era dairy operation, this stucco building has a low-pitched gabled roof clad in corrugated metal sheeting.

Barns, Sheds, etc: There are 6 barns and a number of sheds and other structures associated with the ranch complex.

Evaluation for Historic Significance

All the buildings within the subject area were constructed after 1890 and were associated with ranching and farming activities. None of these buildings have been previously identified as potentially significant resources. As part of the study by Archives and Architecture, all the structures were evaluated for historical and architectural significance.

The County Historical Heritage Commission uses the National Register criteria to determine eligibility for listing in the historic inventory. Therefore, even though no federal actions are involved in this project, the standards for the National Register of Historic Places were used for this evaluation. To meet National Register standards, a property must: 1) be at least fifty years old; 2) meet at least one of the criteria listed below; 3) possess architectural integrity; and 4) be evaluated within the context of the area's local history. Criteria for eligibility include: a) association with events significant to broad patterns of history; b) association with significant personalities in our past; c) have distinctive architectural characteristics of type, period, or method of construction; or d) have yielded or are likely to yield important archaeological information on the history of the area. Each of the resources in the subject area were evaluated both for possible individual significance and as a contributing structure to a potential historic district.

For about 80 years, the property was utilized as a large ranching and farming operation that included fruit production, dairying, and cattle grazing. Most of the buildings in the complex exceed the age of 50 years. All of the buildings currently on the property appear to be relatively well-maintained and most retain architectural integrity. None of the buildings, however, represent distinctive architectural types, periods or methods of construction as per criterion C.

Criterion A addresses the association of the buildings with events significant to broad patterns of history. The land use of the Hayes Valley property was typical of land use patterns in the valley. No significant events were identified that associated this property with broad agricultural or land use patterns.

Criterion B addresses the association of the resources with significant historic personalities. The people and activities associated with the history of the site do not have sufficient significance to satisfy criterion B.

Criterion D addresses the potential for yielding important archaeological information on the history of the area. The potential for significant historical archaeological deposits associated with Castro occupation during the Hispanic Period is highly likely.

It was concluded by Archives and Architecture that the Hayes Valley building complex does not constitute a significant historic district, and that none of the structures are individually eligible for the National Register of Historical Places or for listing in the Santa Clara County Heritage Resources Inventory. There is a potential, however, for significant subsurface historical resources that may yield important archaeological information on the history of the area according to criterion D of the criteria for significance.

Ordinances and Regulations that Address Historic Resources

<u>County Ordinance Code Section C1-91</u>: Structures that are designated as a Heritage Resource by the County cannot be demolished unless the Board of Supervisors finds that there is no feasible alterative to demolition. (None of the structures on the project site are designated as Heritage Resources by the County.)

<u>Zoning Ordinance</u>: Under Article 31, districts given the "H" designation (Historical Conservation District) have special regulations for the preservation of historic sites, historic structures, buildings of architectural significance, or other natural and man-made heritage resources. Special regulations pertain to requirements for Architectural and Site Approval, development standards, demolition, and types of uses permitted within the historic district. (No part of the project site is within the Historical Conservation Zoning District.)

Significance Criteria

With respect to historic resources, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(j) Disrupt or adversely affect a prehistoric or historic archaeological site of a property of historic or cultural significance to a community or ethnic or social group, or a paleontological site except as part of a scientific study."

Impacts and Mitigation

<u>Impact 1</u>. **Demolition and earth moving activity at the existing ranch complex could have a potentially adverse affect on any buried remnants of the Hispanic Period adobe structures that once occupied this site. (Potential Significant Impact)**

The project would involve the demolition of all of the existing structures within the ranch complex with the exception of the residence, guest house and barn on the north side of the creek which occupy a site that is not part of the proposed project. Since none of these structures have historic or architectural importance, their demolition would not represent a significant impact.

Any subsurface remnants of the adobe structure may be subject to disturbance during grading and excavation for the main access road, underground utilities and the lake planned for this area. Such disturbance may represent a significant impact.

Mitigation 1. **Grading and excavation in the vicinity of the ranch complex would be subject to intermittent or spot monitoring by a qualified archaeologist, with appropriate mitigations implemented in the event that cultural materials are encountered.**

As discussed in Section *III. H. Archaeology*, subsurface excavation and testing undertaken at prehistoric site SCl-76 found no evidence of prehistoric or historic period archaeological material within the areas of proposed excavation for the project. Since the ranch complex and the former pueblo complex occupy the recorded archaeological site SCl-76, archaeological monitoring of grading and excavation would already be required as mitigation for prehistoric archaeological resources. With the additional concern for the Hispanic Period adobes, the monitoring archaeologist would also be looking for these historic resources.

<u>Conclusion</u>. **With the implementation of the above mitigation measure, the potential impacts to historic resources would be reduced to less-than-significant levels.**

J. VISUAL AND AESTHETICS

Environmental Setting

The Lion's Gate site is rural and natural in appearance under existing conditions. The on-site series of hills and the central valley they enclose compose the dominant visual features of the site. The series of hills that bound the valley on the south are covered with oak woodland on the north-facing slopes, while the hills on the north side of the valley are covered with annual grasses and a few scattered trees.

The existing ranch complex near the eastern end of the site is the most distinguishable man-made feature present. It consists of several residences and a number of barns, sheds and other structures. Numerous palm, evergreen and broadleaf trees are planted among the structures. The West Branch of Llagas Creek flows through the complex, with large oaks along the banks just west of the ranch area.

Visual Accessibility of the Site

The Lion's Gate site is strategically located at the visual interface between the south Santa Clara Valley to the east and the foothills to the west. The on-site ridges are therefore visually prominent and can be seen from vantage points several miles to the east. However, the floor of the valley in the central area of the site is not visible from off-site vantage points. It is enclosed on the north and south by the on-site hills, on the west by low topographic saddle, and on the east by elevated topography and trees.

The eastern and western ends of the Hayes Valley site are characterized by relatively level terrain located outside of the main interior valley, and both of these peripheral areas are highly visible from off-site vantage points. Motorists on Watsonville Road traveling along the western site boundary have long views available into the site across almost one mile of flat grasslands with the hillside areas visually prominent to the south. Motorists traveling along Coolidge Avenue, north of Highland Avenue have direct foreground views into the orchard area and the steep hillsides in the background. Along Turlock Avenue, south of Highland, motorists have direct foreground views of the field extending back one-half mile to the first low hills. The ranch complex is also visible from Turlock Avenue and Santa Teresa Boulevard.

There is an existing development of residential estates located on the ridge to the north of the site. One of the dwellings in this development has sweeping views over the interior valley of the Lion's Gate site.

Scenic Roadways

The segments of Watsonville Road and Coolidge Avenue/Turlock Avenue which pass along the western and eastern site frontages, respectively, are designated by the County as "County Scenic Roadways" per Article 43 of the County zoning ordinance. As such, both of these roadways are subject to special development review requirements within their scenic corridors, as discussed in the following section.

Ordinances and Regulations that Address Visual Quality

Santa Clara County Zoning Ordinance: The zoning ordinance regulates the visual environment by establishing development standards for building height and setback, and by the implementation of site development approval procedures. The zoning ordinance also contains specific standards and required use permit findings to regulate bright lights, signs and development along scenic roads (see below).

Architecture and Site Approval: All applications for use permits (except for certain uses within Agricultural districts) require ASA approval to ensure the quality of architectural and site design of proposed development projects. The ASA Guidelines include detailed standards for architecture, site design, grading, landscaping, parking, signs, lighting and energy efficiency. One goal of the ASA Guidelines in "HS" zones is to promote development that blends into the natural landscape through appropriate exterior colors and landscaping.

Design Review for Scenic Roads and Corridors: Article 43 of the County zoning ordinance contains provisions governing the construction of any building or structure within 100 feet of a designated County scenic road, in this case Watsonville Road, Coolidge Avenue and Turlock Avenue. The intent of Article 43 is to promote excellence of development, protect recreational and scenic features, and to maintain the open character of the designated scenic roads. The ordinance stipulates that any development proposed within 100 feet of a scenic road shall receive Design Review and thus be subject to the "Development Guidelines for Design Review." The intent of the Design Review Guidelines is to go beyond ASA approval to ensure that the placement and appearance of any structures and associated grading and landscaping be compatible with the character of the neighborhood, adjacent development and the natural environment.

Grading Ordinance: In addition to requirements for site grading, the County Grading Ordinance contains provisions to prevent potential visual impacts due to slope destabilization and scarring of hillsides, and requires revegetation of cleared areas (see Section *III. D. Geology and Soils*).

Significance Criteria

With respect to visual resources, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(b) Have a substantial, demonstrable negative aesthetic effect."

Impacts and Mitigation

Impact 1. **The project would result in visual changes to some areas of the site open to public view. (Potential Significant Impact)**

As discussed under "Environmental Setting" above, the most visually accessible areas of the site are located along Coolidge Avenue (Santa Teresa Boulevard) and Turlock Avenue at the eastern end of the site, and along Watsonville Road in the west. The interior valley area of the site is not visible from off-site vantage points except for the single home that overlooks the site from the northern ridge. The hillside areas nearest to the flanking roadways are also visible.

The residential subdivisions proposed for the eastern end of the site would be partially visible from adjacent land uses and roadways. In the Rural Residential subdivision proposed adjacent to Coolidge Avenue, north of Highland, the 6 proposed lots would be set back from the roadway at least 300 feet toward the adjacent hillside to the west. The setback area would remain as permanent open space, with a landscaped berm and a planted vineyard providing visual screening for these lots.

The residential cluster subdivision proposed for the field west of Turlock Avenue, would also be partially visible to passing motorists. However, this subdivision would be set back 200 to 1,400 feet from the roadway, and would be screened by landscaped berms planted with black walnut trees. Nevertheless, the rooflines of the nearest dwellings would be visible from Santa Teresa Boulevard Avenue, at least until the black walnuts have matured enough to provide more complete screening (see Figure 16). Since two of the proposed lots (Lots 24 and 25) extend into the adjacent hillside area, it is possible that future custom homes to be built on these lots may be visible from Turlock Avenue and Santa Teresa Boulevard.

The only other visual changes that would occur at the eastern end of the site would be the roadway improvements and entry features along the Highland Avenue entry way. However,

EXISTING VIEW INTO SITE FROM HIGHLAND / SANTA TERESA INTERSECTION

VIEW WITH PROJECT SUPERIMPOSED

PHOTO SIMULATION

Prepared by Elmore Bohan Design

FIGURE 16

any improvements would be subject to Architecture and Site Approval to ensure that signs, fences, lighting and other features would be compatible with their surroundings. Also, the existing mature landscaping trees around the ranch complex would be retained and incorporated into the project.

From Watsonville Road in the west, very little of the project, if anything, would be visible. All of the area within 3/4 mile of the roadway is proposed to be maintained as permanent open space. The golf course would be located to the east of the low saddle that crosses the western position of the valley, and thus would not be visible from Watsonville Road. It is possible that the maintenance facility proposed for the western end of the golf course may be partially visible from Watsonville Road, 3/4 mile to the west. The only evidence of the project alongside Watsonville Road would be the new maintenance access road to be constructed from Watsonville Road to the golf course maintenance facility. There would be no structural entry features such as signage here since no public access to the golf course would be permitted from this direction.

In the interior area of the valley, the golf course, clubhouse and overnight units would not be visible from off-site vantage points, except for the single dwelling that overlooks the valley from the adjacent ridge to the north.

Mitigation 1. **The project would be designed and landscaped in a manner to help it blend in with the natural and rural surroundings, and to reduce its visibility from off-site locations.**

The site planning measures proposed as part of the project, including buffer zones from all adjacent roadways, as well as the proposed landscaping and berming, would minimize the potential visual impacts of the project. The design of the residential areas reflects many of the guidelines of the San Martin Integrated Design Plan (see Section *II. Consistency with Plans, Policies and Regulations*).

All structural elements such as signs, fences, lighting or other entry features would be subject to Architecture and Site Approval to ensure their compatibility with the surroundings. In addition, any structures proposed within 100 feet of the adjacent scenic roads would be subject to the County's Design Guidelines.

Impact 2. **Lighting for the project entrance, the clubhouse, swim and tennis center, equestrian center, parking areas and internal roadways may produce light and glare at off-site locations. Reflective building materials may also produce glare. (Potentially Significant Impact)**

Although detailed plans are not yet available, any unnecessarily bright or unfocused lights at the project entrance could be annoying to nearby residences and unattractive to passing motorists.

Light emanating from the clubhouse complex would be barely visible from off-site locations, if at all, since these buildings would be located at least one mile from the nearest public roads shielded by intervening topography and vegetation. The clubhouse lighting would be partially visible from the existing dwelling overlooking the complex from the northern ridge. However, this existing dwelling would be almost one mile away, and would have its view of most of the clubhouse complex blocked by an intervening knoll.

The lighting for the swim and tennis center and the equestrian center may be visible from off-site roadways to the east, and the neighboring ranch complex to the south. However, most of this lighting would be shielded by 4-foot high landscaped berms to be created along the eastern and southern site frontages.

Mitigation 2. **Project lighting would be sited and designed to minimize off-site light and glare. The project structures would be composed of non-reflective building materials and non-glare windows.**

At the project entrance, the swim and tennis center, and the equestrian center, lighting would be directed and focused so as to avoid nearby roadway and adjacent properties. At the clubhouse complex and internal roadways, exterior lighting would consist of hooded, downward directed lights. This would reduce overall light emanating from the site.

To avoid glare, all building materials would be non-reflective, and non-glare glass would be used in windows.

As noted, all project lighting and building design would be subject to ASA review.

<u>Impact 3</u>. **Grading, vegetation removal and construction activity would result in temporary scarring. Storage of equipment and materials may be visible from off-site locations. (Potential Significant Impact)**

Within the area visible from Coolidge and Turlock Avenues in the east, the grading activities would consist of the creation of building pads and roadway subgrades, as well as excavation for the on-site lake, and fill for the roadside berms. Grading in the hillside areas would be minimal, and would consist of grading for driveways and building pads for the two lots in the main cluster subdivision that would extend into the adjacent hillside area to the west. However, as noted on Figures 9a and 9b, the building envelopes for these lots would be located at the bottom of the slopes, so hillside grading would be minimized. There would be no massive cuts or fills in the hillside area that would leave permanent or visually prominent scars on the landscape.

On the western side of the site, the only grading that would take place would be for the proposed access road to the golf course maintenance facility. No grading for the golf course or clubhouse complex would be visible from Watsonville Road. Grading for the golf course would only be visible from the existing dwelling overlooking the site from the north.

In all, the grading and construction activities which would be visible from adjacent roadways would represent a portion of the total project, 33 percent at most. Given that these activities would be temporary, and that the public's views of them would be fleeting, the overall visual impact would not be significant.

Mitigation 3. **Graded areas would be revegetated as soon as possible, and landscaped berms would be created along the project frontage prior to construction of the dwellings in the proposed residential subdivisions.**

In order to minimize the visual effects of construction in the main viewshed area from the east, the landscaped berms proposed along Coolidge and Turlock Avenues would be created prior to grading and construction of the residential cluster subdivisions. This would be accomplished by creating the proposed 20-acre lake first, and using the excavated material for the berms.

Mitigation measures required for other potentially significant construction impacts would also have mitigating visual effects. Examples include revegetation of exposed slopes for erosion control, and control and regular clearing of debris and trash to maintain water quality.

<u>Conclusion</u>. **With implementation of the above mitigation measures, the potential aesthetic and visual impacts resulting from the project would be reduced to less-than-significant levels.**

K. TRAFFIC AND CIRCULATION

The following discussion is excerpted from the traffic report prepared for the project by TJKM in November 1995. The full traffic report is contained in Appendix H of this EIR.

Environmental Setting

Roadway Network

Important roadways serving the project area are shown in Figure 17 and discussed below.

U.S. 101 (South Valley Freeway) provides regional access to the site and is the major north-south highway in the south Santa Clara County area. In the area the project site, U.S. 101 carries 65,000 to 77,000 vehicles daily with interchanges at Tennant Avenue, San Martin Avenue, and Masten Avenue.

Monterey Avenue (Business 101), a major four-lane arterial, generally parallels U.S. 101 and provides service through the City of Gilroy to the south and Morgan Hill to the north.

Santa Teresa Boulevard/Coolidge Avenue, a two-lane north-south arterial, fronts the east side of the site.

Watsonville Road is a two-lane northeast-southwest arterial that fronts the west side of the site. It runs from the Hecker Pass Highway (State Route 152) up through the project vicinity, and connects with Monterey Road in the City of Morgan Hill.

San Martin Avenue and Highland Avenue are two-lane east-west collectors connecting Monterey Road (Business 101) and Santa Teresa Boulevard/Coolidge Avenue.

Transit Service

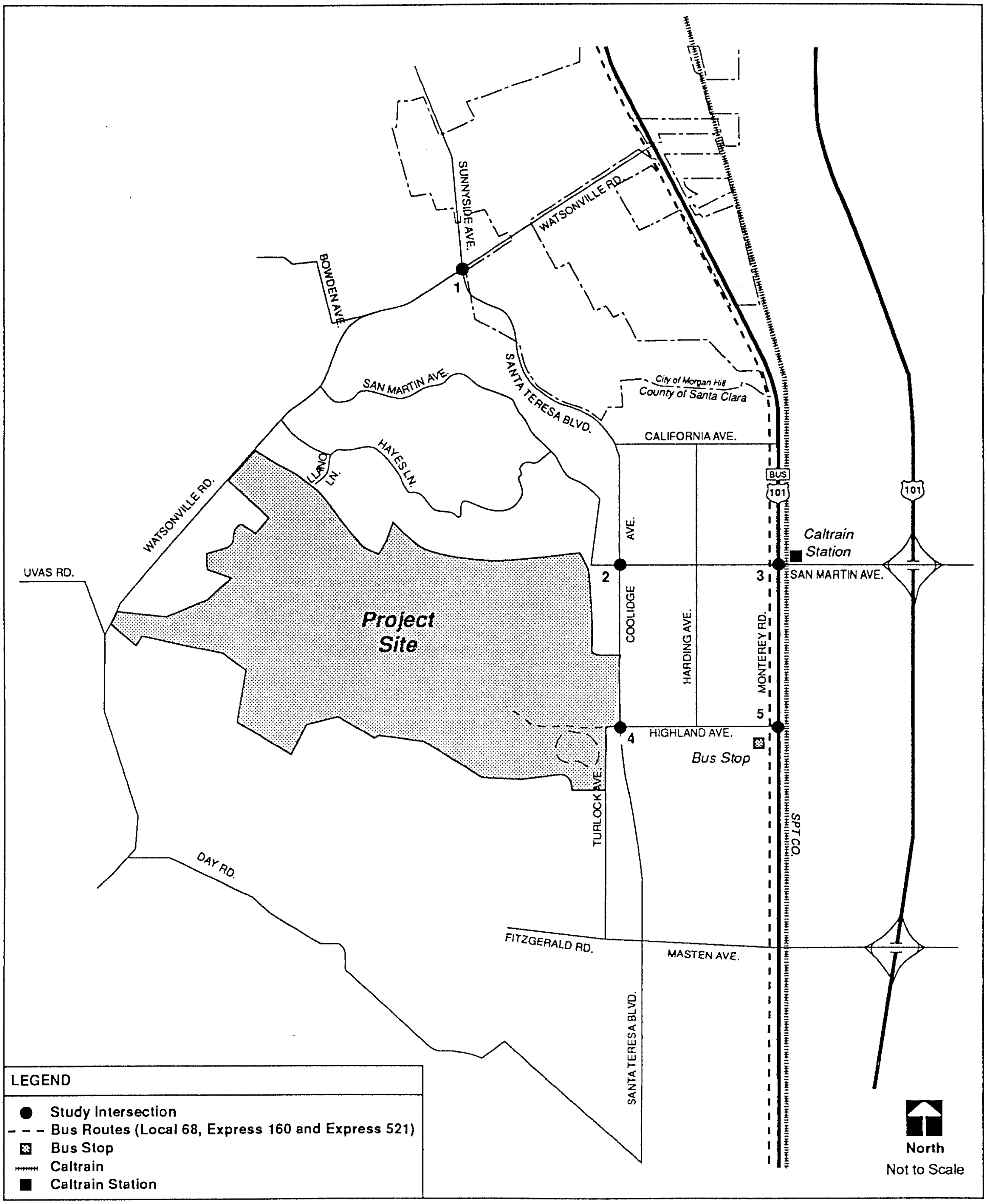
Figure 17 illustrates the existing transit routes in the vicinity of the proposed project. The transit center located closest to the proposed project site is the San Martin Caltrain Station on the northeast corner of Monterey Road and San Martin Avenue, approximately 1.5 miles northeast of the site. Caltrain service includes 4 northbound runs on the a.m. peak prior and four southbound runs in the p.m. peak period.

One local and two express bus routes along Monterey Road serve the Caltrain station and the surrounding area. The closest bus stops to the project site are at the intersection of the Monterey Road and Highland Drive. The local Route (68) runs between 4:30 a.m. and 11:45 p.m. with the frequencies of 15 minutes during the peak periods, 30 minutes during the midday, and 60 minutes in the late evening. The two express routes (160 and 521) combined offer 9 northbound and 9 southbound runs during the a.m. and p.m. peaks respectively.

Level of Service Analysis Methodology

Levels of service are qualitative descriptions of intersection operations and are reported using an A through F letter rating system to describe travel delay and congestion. Level of Service (LOS) A indicates free-flow conditions with little or no delay. LOS F indicates jammed conditions with excessive delays and long backups.

Two-way and four-way STOP-controlled intersections were evaluated using the methodology contained in the 1994 Highway Capacity Manual. This methodology also measures level of service in terms of vehicular delay.



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ROADWAY NETWORK

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142-026 - 4/94 - K2

FIGURE 17

Impact Criteria

The minimum acceptable intersection level of service during peak hours in the County of Santa Clara is LOS D (total average delay less than 40 seconds) while the minimum acceptable level of service on facilities monitored by the Santa Clara County CMA is LOS E (total average delay less than 60 seconds). Mitigation is required for any project traffic impact which causes an intersection to fall below these thresholds.

Existing Levels of Service

TJKM conducted a.m. and p.m. peak hour turning movement counts at the 5 existing study intersections during the week of April 11, 1994. All local school districts were in session during that week. Figure 18 illustrates the existing peak hour turning movements for the 5 existing study intersections.

The results of the intersection analysis are summarized in Table 8 for existing conditions. As the table indicates, all study intersections are currently operating at acceptable levels of service. The Monterey Road/San Martin Avenue intersection operates with the lowest level of service, LOS C (average delay of 17 seconds), during the p.m. peak hour. Detailed calculations are contained in Appendix H of this EIR.

TABLE 8

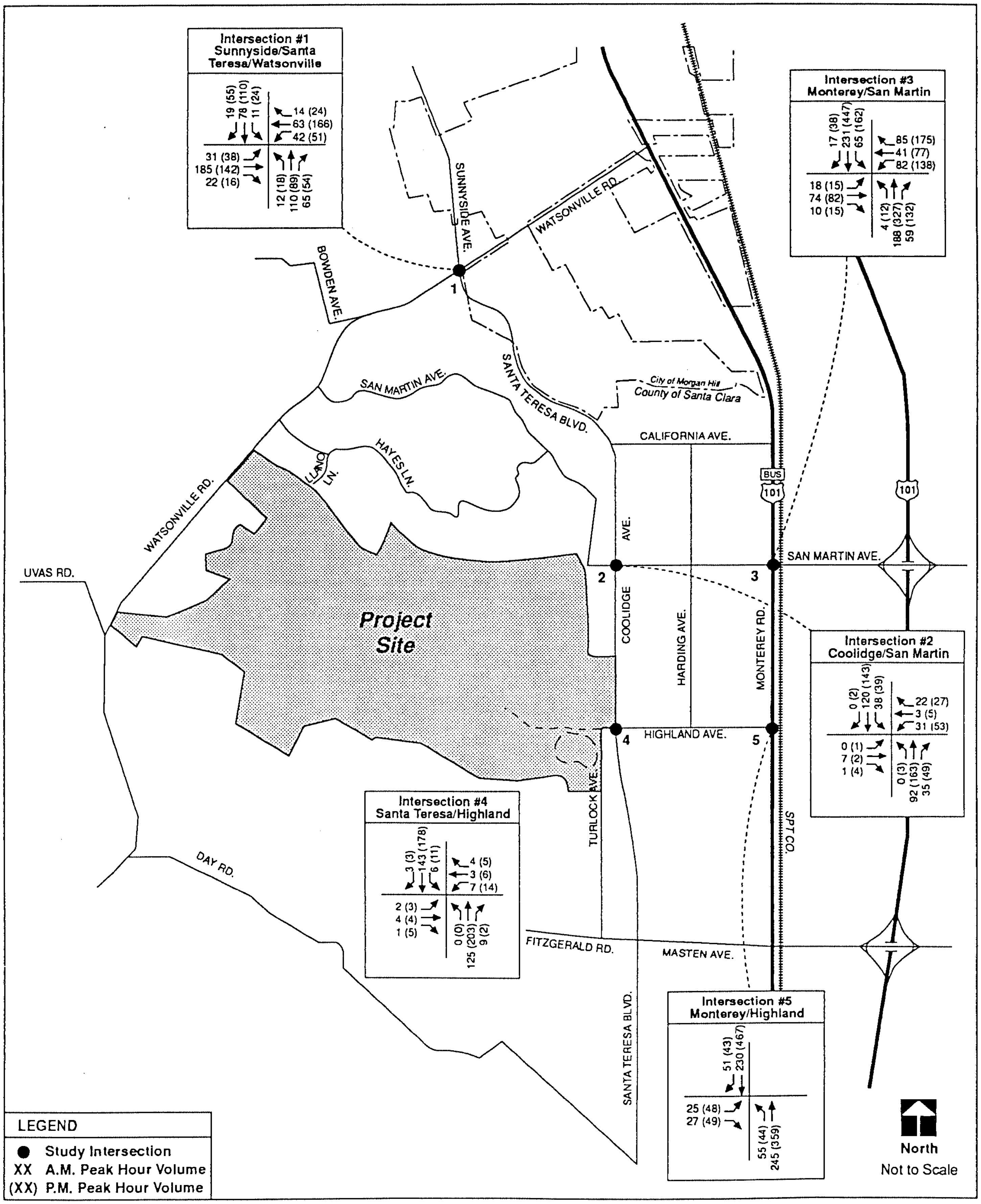
LEVELS OF SERVICE - EXISTING CONDITIONS

Intersection	Control	A.M. Peak Hour		P.M. Peak Hour	
		Delay*	LOS	Delay*	LOS
1. Santa Teresa Blvd/Sunnyside Avenue/Watsonville Road	4-way STOP	3.5	A	4.8	A
2. Coolidge/San Martin Avenue	2-way STOP	1.2 (3.9)	A A	1.5 (5.1)	A B
3. Monterey Road/San Martin Avenue	Signal	12	B-	17	C+
4. Santa Teresa/Highland Avenue	2-way STOP	0.4 (4.2)	A (A)	0.6 (4.9)	A (A)
5. Monterey Road/Highland Avenue	Signal	10	B+	5	A

*Average Vehicle Delay is measured in seconds per vehicle. For 2-way STOP controlled intersections, values for delayed movements alone are also given in parenthesis.

Background Traffic - Existing plus Approved Projects

The background scenario consists of existing traffic conditions plus development projects approved near the study area that will affect the study roadways. The list of approved projects was developed based on information provided by the Cities of Gilroy and Morgan Hill as well as the County of Santa Clara. (It should be noted that the City of Gilroy has indicated that no approved projects would affect the study area.) A table of these approved projects and a figure showing their locations are contained in Appendix G of this EIR.



Santa Clara County
Hayes Valley TIS

Existing Peak Hour Turning Movements

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142-026 - 4/94 - K2

FIGURE 18

The levels of service for the background scenario are summarized in Table 9 based on the turning movement volumes shown in Figure 19. As the table indicates, all study intersections are projected to operate at acceptable levels of service under background conditions. The lowest operating condition, LOS C (average delay of 22 seconds), is again found at the Monterey Road/San Martin Avenue intersection during the p.m. peak hour.

TABLE 9

LEVELS OF SERVICE - BACKGROUND CONDITIONS

Intersection	Existing				Existing plus Approved			
	A.M. Peak Hour		P.M. Peak Hour		A.M. Peak Hour		P.M. Peak Hour	
	Delay*	LOS	Delay*	LOS	Delay*	LOS	Delay*	LOS
1. Santa Teresa/Sunnyside/Watsonville	3.5	A	4.8	A	4.3	A	6.5	B
2. Coolidge/San Martin	1.2 (3.9)	A (A)	1.5 (5.1)	A (B)	1.2 (4.1)	A (A)	1.5 (5.4)	A (B)
3. Monterey/San Martin	12	B-	17	C+	14	B-	22	C-
4. Santa Teresa/Highland	1.2 (3.9)	A (A)	1.5 (5.1)	A (A)	1.5 (2.6)	A (A)	1.3 (3.2)	A (A)
5. Monterey/Highland Avenue	10	B+	5	A	10	B+	5	A

***Average Vehicular Delay** is measured in seconds per vehicle. For 2-way STOP-controlled intersections, values for delayed movements alone are also given in parentheses.

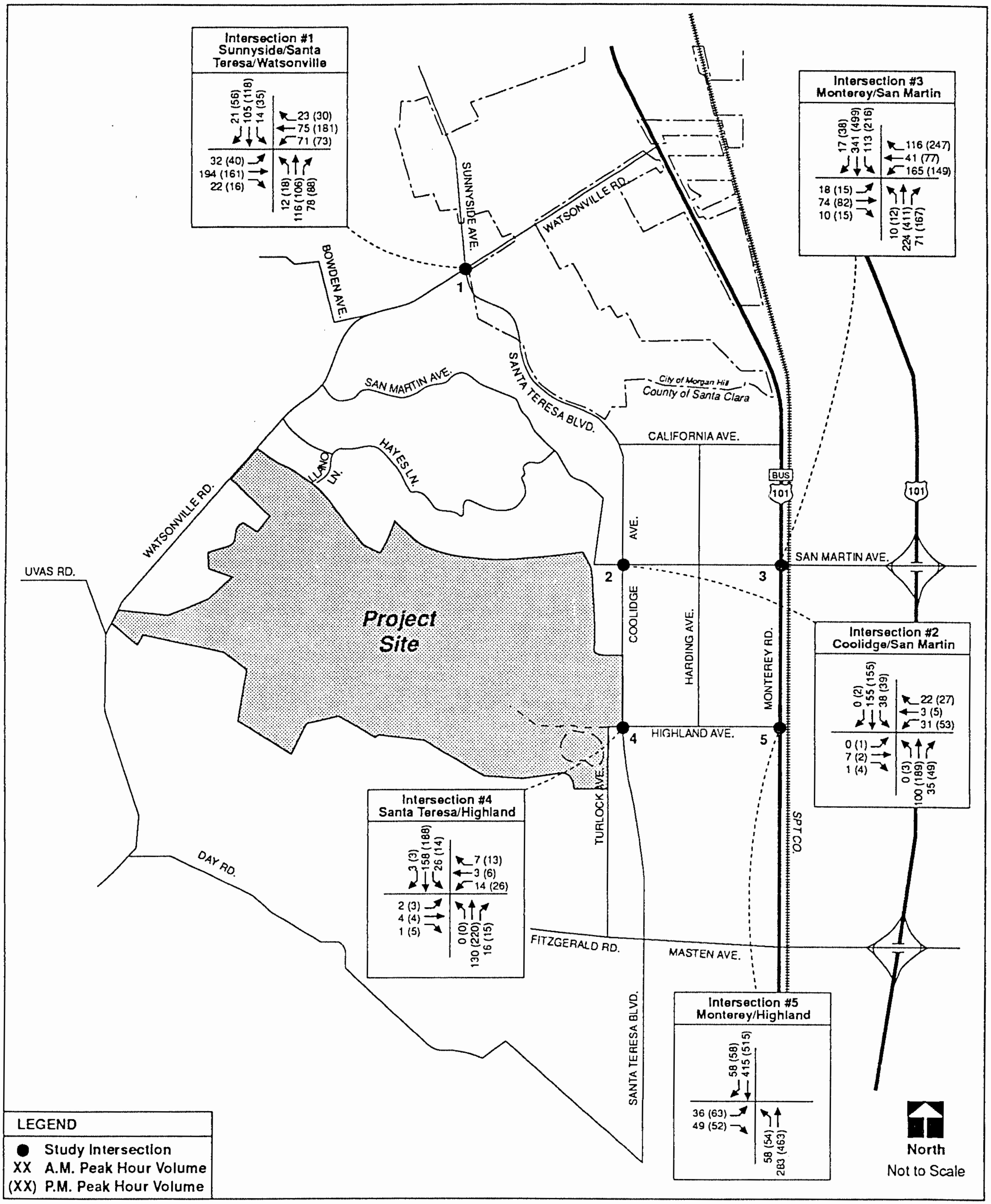
Ordinances and Regulations that Address Traffic

Parking Space Requirements: The County parking standards are intended to avoid or lessen congestion in the public streets by requiring adequate off-street parking consistent with the type of land use.

County Land Development Regulations: The County Subdivision Ordinance includes requirements for review and conditioning of projects for compliance with Official Plan Lines and off-street parking standards, as well as adequacy of street improvements and traffic circulation plans.

Official Plan Lines: This provides for the systematic execution of the Circulation Element of the General Plan by designating the precise location of rights-of-way, and limiting the location of buildings and other improvements with respect to planned rights-of-way. Official maps showing the rights-of-way have been adopted by the Board of Supervisors and are the basis for road dedication required for projects approved by the County.

Zoning Ordinance: The County zoning ordinance stipulates use permit findings requiring that safe access (including access for fire and emergency vehicles), and that adequate off-street parking and loading/unloading areas be provided, and that the proposed use shall not cause traffic congestion that adversely affects the surrounding area.



Santa Clara County
Hayes Valley TIS

Existing plus Approved Peak Hour Turning Movements

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142-026 - 4/95 - K2

FIGURE 19

Significance Criteria

With respect to traffic, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect if it will: "(1) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system."

In the County of Santa Clara, a level of service which is worse than LOS D (total average delay less than 40 seconds) is considered a significant adverse affect for traffic. For facilities monitored by the Santa Clara County Congestion Management Agency (CMA), the standard is LOS E (total average delay less than 60 seconds).

Impacts and Mitigation

Impact 1. **The project would result in increased traffic generation at the project site. (Less-than-Significant Impact)**

As discussed below, the additional traffic generated by the project would not result in significant degradation of service levels at the affected intersections.

Trip Generation and Assignment.

The trip generation assumptions for the residential and lodging portion are based on information contained in ITE's Trip Generation. The 5 homes to be removed were subtracted from the 41 new homes to yield a new increase of 36 homes on the site. An average occupancy rate of 78 percent was assumed for the 45 guest rooms. The golf course trip generation assumptions are based on previous studies performed by TJKM and on data specific to this project as described in Appendix H. The project is expected to generate 57 trips during the a.m. peak hour and 93 trips during the p.m. peak hour, as indicated in Table 10. These estimates take into account a slight decrease in traffic due to the displacement of 7 employees currently on the site.

TABLE 10

PROJECT TRIP GENERATION

Use	Size	A.M. Peak Hour					P.M. Peak Hour				
		Rate	In:Out	In	Out	Total	Rate	In:Out	In	Out	Total
Net New Single Family	36 du	0.74	26:74	7	19	26	1.01	64:36	23	13	36
Lodging	35 occ. rooms	0.33	60:40	7	5	12	0.48	37:63	6	11	17
Golf Course	18 holes	--	67:33	14	7	21	--	48:52	11	14	25
Restaurant*	4,000 sq. ft.	0.92	94:6	4	0	4	7.66	70:30	22	9	31
Displaced Employees	7 employees		100:0	(5)		(5)	--	0:100		(5)	(5)
NET TOTAL				**26**	**31**	**57**			**54**	**39**	**93**

*Restaurant trips were reduced by 35% to account for patrons staying in overnight lodging.

Project trip distribution assumptions were developed based on travel patterns, knowledge of the study area, and information contained in previous traffic studies. Figure 20 illustrates the trip distribution for the proposed project for both residential and golf course/lodging traffic.

Level of Service Analysis

Based on the project trip distribution, project trips were assigned to the local roadway network. Figure 21 illustrates the intersection turning movements for the project as added to the existing plus approved project traffic. Table 11 summarizes the results of the level of services analysis. Detailed calculations are contained in Appendix H.

As the table indicates, all study intersections are projected to continue to operate at acceptable levels of service under this scenario. The most congested intersection continues to be Monterey Road/San Martin Avenue (LOS C, delay of 23 seconds); however, this is well below the acceptable delay threshold as defined by the County standards.

TABLE 11

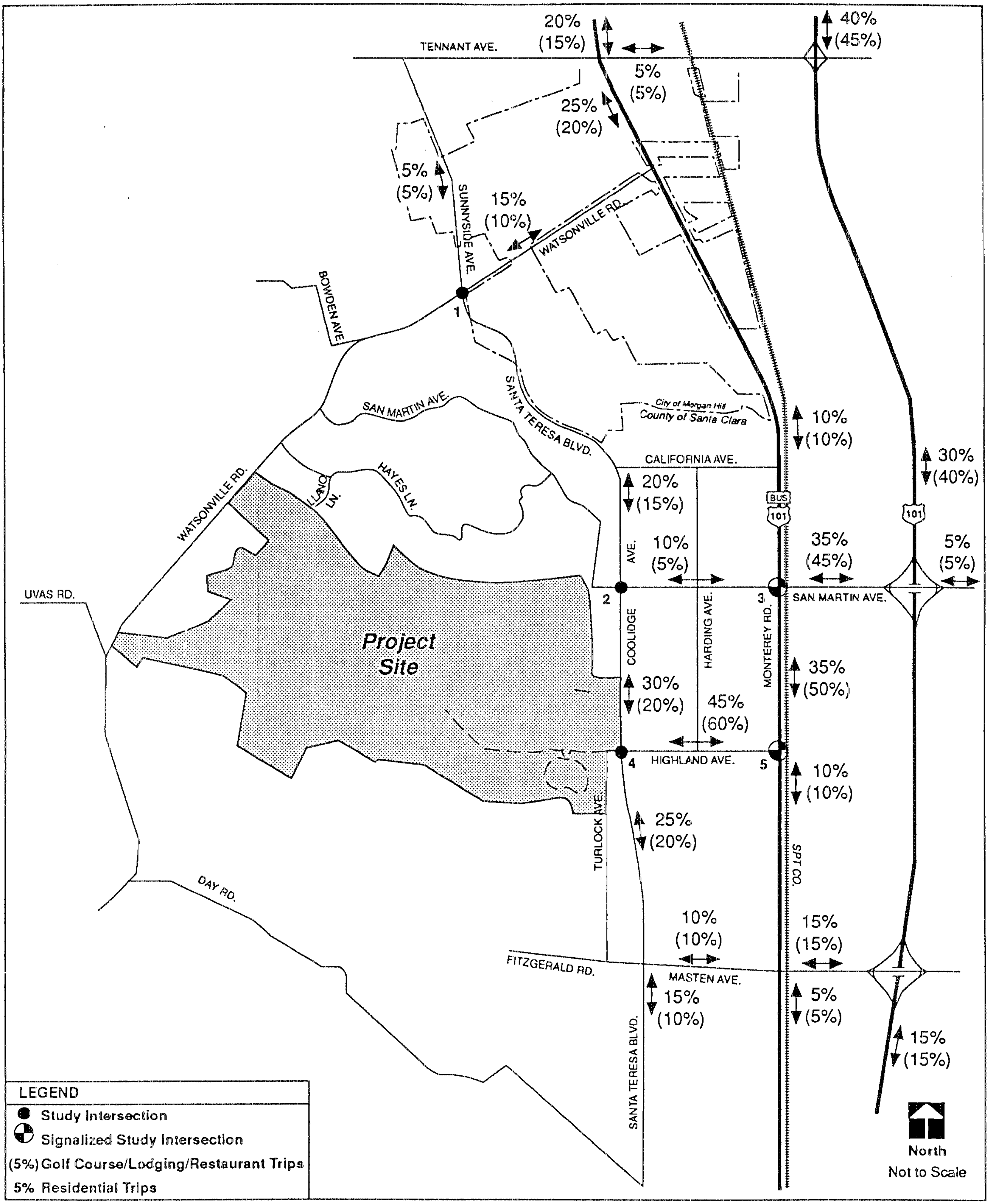
LEVELS OF SERVICE - EXISTING PLUS APPROVED PLUS PROJECT

Intersection	Existing				Existing plus Approved				Existing plus Approved plus Project			
	A.M Peak Hour		P.M. Peak Hour		A.M Peak Hour		P.M. Peak Hour		A.M Peak Hour		P.M. Peak Hour	
	Delay*	LOS	Delay*	LOS	Delay*	LOS	Delay*	LOS	Delay*	LOS	Delay*	LOS
1. Santa Teresa/ Sunnyside/Watsonville	3.5	A	4.8	A	4.3	A	6.5	B	4.5	A	6.8	B
2. Coolidge/ San Martin	1.2 (3.9)	A (A)	1.5 (5.1)	A (B)	1.2 (4.1)	A (A)	1.5 (5.4)	A (B)	1.2 (4.3)	A (A)	1.5 (5.6)	A (B)
3. Monterey/ San Martin	12	B-	17	C+	14	B-	21	C-	14	B-	23	C-
4. Santa Teresa/ Highland	0.4 (4.2)	A (A)	0.6 (4.9)	A (A)	1.5 (2.6)	A (A)	1.3 (3.2)	A (A)	1.4 (4.7)	A (A)	1.8 (6.2)	A (B)
5. Monterey/Highland	10	B+	5	A	10	B+	5	A	10	B+	6	B+

***Average Vehicular Delay** is measured in seconds per vehicle. For 2-way STOP-controlled intersections, values for delayed movements alone are also given in parentheses.

Mitigation 1. No mitigation measures required.

Since the project would not result in level of service impacts to the potentially affected intersections, no off-site mitigation measures are required. However, it is the recommendation of TJKM that a STOP sign be installed at the intersection of Highland and Turlock Avenues, on the Turlock Avenue approach, in order to improve safety at that intersection.



Santa Clara County
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Trip Distribution

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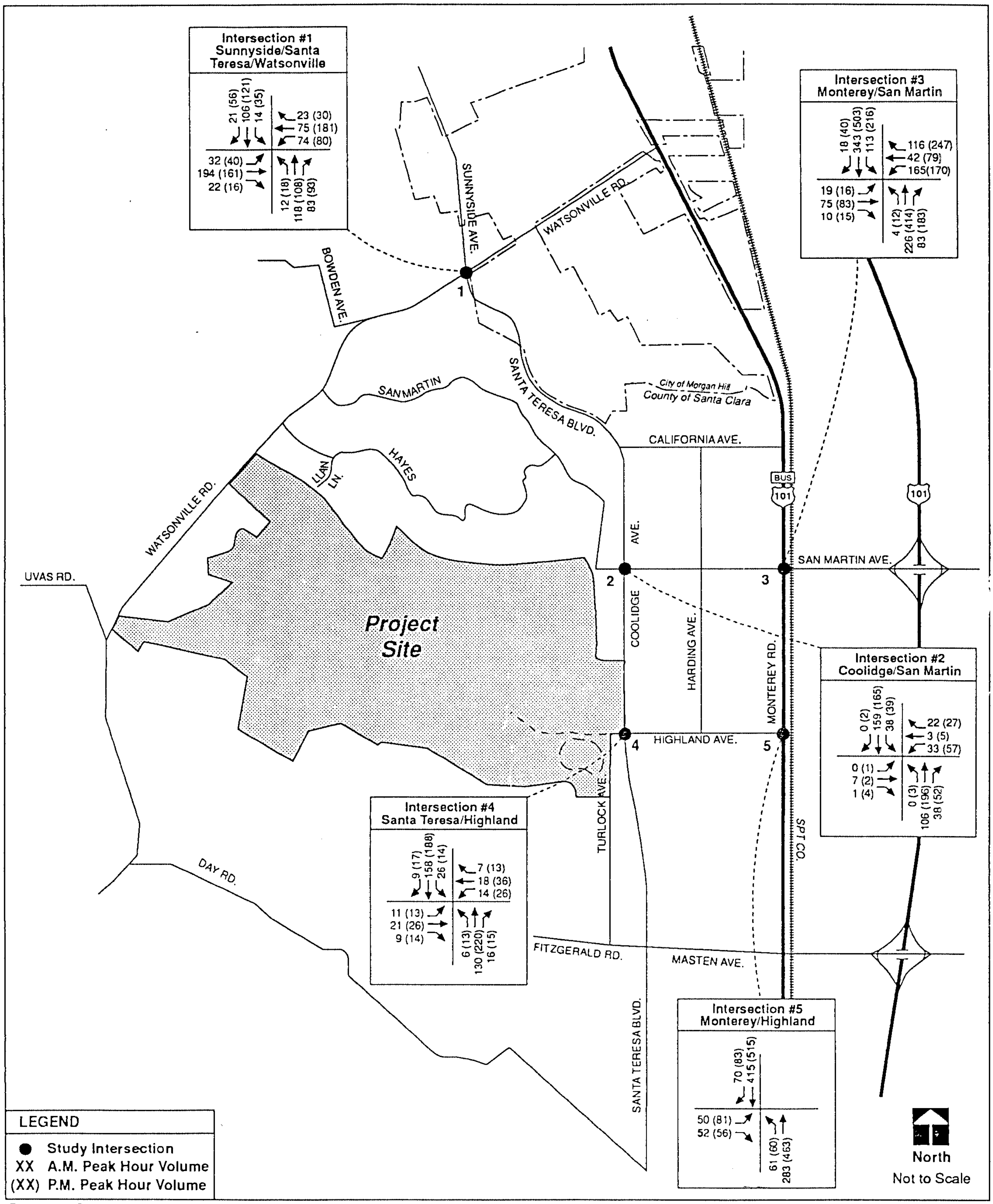
142-026 - 4/94 - K2

FIGURE 20



Santa Clara County
Hayes Valley TIS
Existing plus Approved plus Project Peak Hour Turning Movements

142-026 - 9/95 - K2

FIGURE 21

At the time of site development, the county would require the developer to dedicate and improve a minimum 30-foot half-street along the Watsonville Road and Highland Avenue frontages of the site, in conformance with existing Official Plan Lines (OPL). (To the west of Turlock Avenue, the extension of Highland Avenue would be a private roadway serving as the main entry road to the project.) Along Coolidge Avenue, a minimum 55-foot half-street would be required to be dedicated and improved.

Prior to project approval, a drainage plan would be submitted which demonstrates that runoff from the site would not have an impact on County maintained roads, and that surface runoff from the site would be carried to an acceptable outfall of adequate capacity.

The project applicant proposed to offer shuttle services to the Caltrain station on San Martin Avenue. This measure would potentially reduce the projects vehicular trip generation. However, since no project-related intersection impacts have been identified, the shuttle service would not change the findings of the traffic impact analysis.

Impact 2. **The project would increase the on-site parking required for the project site. (Less-than-Significant Impact)**

The on-site parking provisions proposed for the project were evaluated using the County of Santa Clara Parking Space Requirements. The analysis indicated that the 250 parking spaces proposed for the clubhouse/overnight/practice area of the project would more than satisfy County requirements. In addition, the parking spaces proposed for the equestrian center and the maintenance facility would also meet County parking requirements for such facilities.

Mitigation 2. **No mitigation required.**

Conclusion. **The project would not result in potential traffic or parking impacts; therefore, no mitigations are required.**

L. NOISE

The following discussion is based on the Environmental Noise Assessment prepared for the project by Illingworth & Rodkin, Inc., in November 1995. The full noise report is contained in Appendix I of this EIR.

Environmental Setting

To characterize the noise environment at the project site and on roadways serving the site, Illingworth & Rodkin conducted 3 noise measurements, at the locations shown in Figure 22. Measurement Site A, located on the eastern portion of the site near Highland Avenue, indicated an ambient noise level of 49 dBA L_{dn}. (Note: dBA indicates decibels measured on an "A-weighted" scale, which adjusts sound measurements to emphasize frequencies most sensitive to the human ear. L_{dn} stands for Day-Night Level and is the 24-hour average of noise levels, with a 10-dB penalty for noise occurring between 10:00 p.m. and 7:00 a.m. See Appendix I for a full explanation of terminology and concepts related to noise assessment.) Measurement Site B, located on Highland Avenue east of Coolidge Avenue (Santa Teresa) and west of Harding Avenue; indicated a background L_{dn} of 59 dBA. Measurement Site C, located on the west side of Santa Teresa Avenue, south of Highland Avenue, indicated a background L_{dn} of 66 dBA at 50 feet from the center of the roadway.

Ordinances and Regulations that Address Noise Impacts

Noise Ordinance: The County's Noise Ordinance establishes noise standards to control unnecessary, excessive and annoying noise and vibration. It sets maximum noise standards for both exterior and interior settings according to sensitivity of the land use. Limits are also established for specific types of noise and vibration generators (e.g., construction/demolition, loudspeakers, animals, etc).

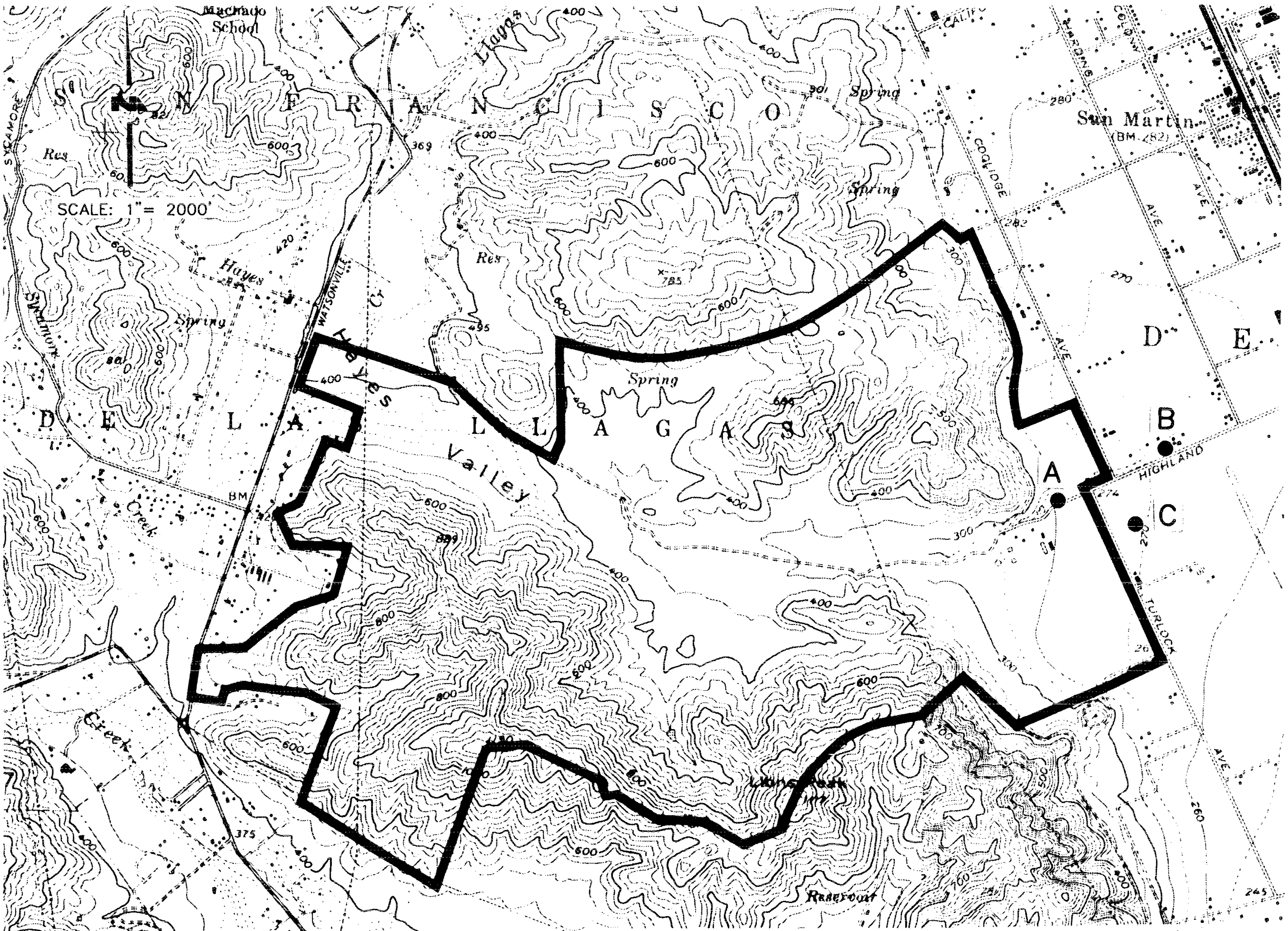
Santa Clara County General Plan: The General Plan noise policies are designed to protect existing land uses from unacceptable noise levels generated by sources such as new development, and require that mitigation be incorporated in new development projects proposed for sites already subject to high noise levels. The maximum allowable noise levels for various land uses are set forth in the Noise Compatibility Standards of the General Plan (see below).

Significance Criteria

With respect to noise, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(p) Increase substantially the ambient noise levels for adjoining areas."

Noise Compatibility Standards for specific land uses in proposed new development are set forth in the County General Plan. For residential uses, noise levels of up to 55 dBA L_{dn} are satisfactory, while levels ranging between 55 dB and 65 dB are rated as "cautionary," indicating a need for acoustical mitigation to achieve indoor noise levels of 45 dB or lower. For less sensitive commercial uses, such as the proposed clubhouse, golf course and overnight units, noise levels of up to 65 dB are acceptable, while noise levels ranging from 65 dB and 70 dB are classified as "cautionary."

The County's Noise Element does not contain quantitative criteria for establishing the amount of noise increase that would be considered a significant noise impact. Thus, for purposes of this assessment, if the average hourly sound level generated by the project does not exceed the existing background noise level (L_{90}) by 5 dBA or more, the impact is considered insignificant. If the noise generated by the project would result in an increase of greater than 5 dBA at an existing residence, the impact is considered significant.



NOISE MEASUREMENT LOCATIONS

Source: Illingworth & Rodkin

FIGURE 22

Impacts and Mitigation

<u>Impact 1</u>. **Traffic generated by the project would increase noise levels at existing residences. (Less-than-significant Impact)**

It was calculated by Illingworth & Rodkin that the noise resulting from project-generated traffic, in addition to traffic from approved projects in the vicinity, would result in noise level increases of less than 1 dBA on all roads except Highland Avenue.

On the segment of Highland Avenue west of Coolidge (Santa Teresa), traffic noise levels would increase by 8 dBA, almost entirely as a result of the project. Although this is a substantial increase, the resulting noise level would remain below the County's criterion level of 55 dBA. The road segment contains one existing dwelling, located on the project site, which would be demolished as part of the project.

On the adjacent segment of Highland Avenue to the east, between Coolidge Avenue and Harding Avenue, traffic noise levels would increase by 5 dBA, largely as a result of the project. This also would be a substantial increase, but would not constitute a significant noise impact since the County's criterion of 55 dBA would not be exceeded.

On the next segment of Highland Avenue to the east, between Harding Avenue and Monterey Road, traffic noise levels would increase by 2 dBA, which would not represent a significant increase.

Within the project site itself, the traffic on the new internal access road would generate additional noise. The existing ranch house at the east end of the project site would be potentially affected by traffic noise from the access road. Given the distance between the ranch house and the road, as well as the relatively low projected traffic volumes, it was calculated that the average noise level due to the traffic on the access road would be below 40 dBA outside of the existing ranch. This would represent an increase in the background noise, but the resulting noise level would remain below the County's criterion of 55 dBA for residential development.

Mitigation 1. **No mitigation required.**

<u>Impact 2</u>. **Portions of 2 lots proposed in the vicinity of Coolidge Avenue would be exposed to traffic noise levels in excess of 55 dBA L_{dn}, the County standard for residential uses. (Less-than-Significant Impact)**

The future traffic volume, including existing traffic, the traffic generated by all approved projects, the project-generated traffic, and expected growth in the area would generate an L_{dn} of 67 dBA a distance of 50 feet from the centerline of Coolidge Avenue. The 55 dBA noise contour would be located 315 feet from the centerline of the roadway. The two proposed lots closest to Coolidge Avenue (lots 4 and 6) would be set back approximately 290 feet from the centerline of the roadway. Any dwellings constructed within the proposed lots would be set back 30 feet from their lot boundaries as required by the applicable County zoning provisions. Thus the nearest proposed dwellings would be a minimum of approximately 320 feet from the centerline of the roadway. Assuming also that the outdoor use areas for these two lots would be at least 315 feet from the centerline of Coolidge Avenue, the County guidelines would be met and there would be no significant noise impact.

Mitigation 2. **No mitigation required.**

<u>Impact 3</u>. **Noise generated by golf course mowers would have a potentially adverse effect on nearest dwellings proposed on the project site. (Potentially Significant Impact)**

The mowing machines used at the golf course would be the loudest noise sources. These pieces of equipment typically generate noise levels no higher than 70 dBA at a distance of 50 feet.

The closest existing residence to the proposed golf course would be the existing ranch house near the eastern limits of the project site, which would be 900 feet from the golf course at its nearest point. At this location, the highest noise levels from mowers would be approximately 45 dBA. The average noise levels would be less.

The second closest residence would be the home to the north of the central area of site on the ridge, which would look down on the golf course, and which would be 1,600 feet from the golf course and its nearest point. For this home, the maximum noise levels generated by lawn mowers would be 41 dBA at the nearest point near the project property boundary. This noise level would be barely audible with the windows open.

The new lots in the proposed cluster subdivision would be 200 feet from the golf course at the nearest points, and the dwellings themselves would be at least 230 feet away (given the minimum required front setback distance of 30 feet). At the nearest dwelling, the maximum noise from mowers would be approximately 58 dBA. The maximum levels of mowing noise would exceed the County's 55 dBA threshold for the proposed new lots in the subdivision located north of Holes 8 and 9 at the eastern end of the golf course. According to the County's Noise Ordinance, however, the maximum mowing noise of 58 dBA would not constitute a noise impact if the residences were subject to these noise levels for less than 15 minutes in any hour. Since maximum noise levels would drop off to 55 dBA at a distance of approximately 330 feet, the noise threshold would be exceeded by the mowing of a band of turf 100 feet wide (or less, depending on the location of individual dwellings relative to the fairway). It is expected that the gang reel mowers would complete the mowing of that strip within 15 minutes with respect to any of the individual residences affected. It should be noted that the average noise level generated by mowers would be less than 5 dBA above the background level in the area of the proposed residences. In addition, fairway mowing would typically occur in the afternoon.

Mitigation 3. **The hours of mowing within 330 feet of any existing or proposed residences, would be restricted to weekdays between the hours of 8:00 a.m. and 5:00 p.m., with total noise generating activities in those areas restricted in accordance with the limits set forth in the County's Noise Ordinance.**

Beyond the requirements of the County's Noise Ordinance, the CC&Rs for the project should establish clear guidelines for operational golf course noise to minimize potential annoyance and inconvenience for all concerned.

<u>Impact 4</u>. **Activities at the clubhouse would increase noise levels in the interior of Hayes Valley. (Less-than-Significant Impact)**

Events at the clubhouse, such as weddings or banquets, would generate noise from music played at such events. There are two existing residences in the vicinity which would be within audible range of the clubhouse. One residence is located approximately 3,600 feet from the clubhouse on the northern ridge overlooking the valley. An on-site ridge located mid-way between the clubhouse and this residence would break the line of sight between these two structures and would provide noise shielding under normal atmospheric conditions. The second potentially affected residence is the existing on-site ranch house located approximately 2,400 feet east of the clubhouse, along West Branch Llagas Creek. The line of sight between the clubhouse and the ranch house would be unbroken by intervening terrain.

To evaluate potential noise impacts to these existing residences, worst-case meteorological conditions were assumed. The conditions of maximum sound propagation would be a temperature inversion with a light wind blowing toward the receiver. Under these conditions the sound levels would bend down from the atmosphere toward the receptor, thus negating shielding by intervening hills, buildings and other barriers. Under these conditions, it was calculated by Illingworth & Rodkin that the sound level of a loud rock band inside the clubhouse with the windows open would be about 35 to 40 dBA outside the on-site ranch house to the east, and about 35 dBA outside the ridgetop house to the north. Under the vast majority of meteorological conditions, sound levels would be 10 to 20 dBA lower, and essentially inaudible. Under conditions of good sound propagation, the sound of a very loud event at the clubhouse could be audible outdoors at these residences. However, it is also most likely under these conditions the windows in the clubhouse would be closed because it would have to be quite cold to create the type of inversion needed to result in the highest sound levels. Therefore, it is expected that sound from the clubhouse would be audible at the nearest residences, but only under rare circumstances.

The nearest residences proposed within the project itself would be located 1,200 feet to the northeast of the clubhouse. Under the worst-case meteorological conditions described above, the noise level at the nearest residence would be about 40 to 45 dBA, outside the residence. This noise level would still be well under the County's noise criteria of 55 dBA for residential land uses.

Mitigation 4. **No mitigation required.**

<u>**Impact 5**</u>. **Noise levels would be temporarily elevated during grading and construction. (Potential Significant Impact)**

Most of the existing noise receptors in the area are far from the main grading and construction area at the golf course. The major exception is the existing ranch house at the east end of the site. During construction, maximum noise levels generated by grading, paving, and other activities would be below 55 dBA at all receptors except the existing ranch. Average noise levels would be 5 to 10 decibels lower. If average levels do not exceed 55 dBA, there would be no interference with outdoor activity or indoor activity, although the construction may be occasionally audible. Noise levels at the existing ranch could reach as high as 80 dBA with average levels of up to 75 dBA. During most of the construction, however, noise levels would be significantly below 55 dBA.

The existing residence on the ridge to the north of the project site would be approximately 1,200 feet from the nearest grading activity for the golf course. At this distance, the sound of equipment would be noticeable but would not exceed 55 dBA.

At the eastern end of the project site, existing dwellings in the vicinity would be subject to short-term grading and construction noise impacts from construction of the perimeter berms, and to a lesser extent the proposed residential subdivisions which would be set back from the site boundary.

At the western end of the site, the construction of the maintenance access road to Watsonville Road would generate noise from grading and paving. The nearest existing dwelling would be 700 feet from this maintenance road at its nearest point, and would not be subject to construction noise impacts, although the noise would be audible.

Mitigation 5. **Short-term construction noise impacts would be reduced through compliance with the County's Noise Ordinance with respect to hours of operation and maximum noise levels at adjacent property lines.**

For example, the Noise Ordinance stipulates that construction noise generated between 7 am and 7 pm on weekdays and Saturdays should reach noise levels no greater than 75 dBA at an adjoining property line of a single-family or two-family dwelling.

These hours would be enforced by the grading inspector, and also the County Department of Environmental Health in the event of a violation of the County Noise Ordinance.

To minimize noise generation, construction equipment should be maintained in good operating condition and properly muffled.

To further reduce construction noise impacts, the berms proposed for the eastern project boundaries would be constructed during the early phases of grading in order to provide noise shielding from construction and grading in the interior of the project.

<u>Conclusion</u>. **Implementation of the above mitigation measures would reduce noise impacts resulting from the project to less-than-significant levels.**

M. AIR QUALITY

The following discussion is based on the Air Quality Study prepared for the project by MO'C Physics Applied in November 1995, as well as other sources. The MO'C air quality report is contained in Appendix J of this EIR.

Environmental Setting

Air Pollution Climatology

The amount of a given pollutant in the atmosphere is determined by the amount of pollutant released and the atmosphere's ability to transport and dilute the pollutant. The major determinants of transport and dilution are wind, atmospheric stability, terrain and, for photochemical pollutants, sunshine.

The combined effects of moderate ventilation, frequent inversions that restrict vertical dilution, and terrain that restricts horizontal dilution, give the Santa Clara Valley a relatively high atmospheric potential for pollution compared to other parts of the San Francisco Bay Air Basin.

The terrain features of Hayes Valley itself are of limited significance for air quality. Due to the sheltering effect of the adjacent hills that form the "walls" of Hayes Valley, there appears to be some potential for stagnant air flow or "calms" to sometimes develop in Hayes Valley even while adjacent areas of the Santa Clara Valley have some measurable air flow. However, such temporary stagnation of air flow would be of little consequence, given the proposed low density of development and the substantial width of the floor of the Hayes Valley.

Ambient Air Quality Standards

Both the U. S. Environmental Protection Agency and the California Air Resources Board have established ambient air quality standards for common pollutants. These ambient air quality standards represent safe levels of contaminants that avoid specific adverse health effects associated with each pollutant. Table 12 identifies the major "criteria" pollutants, along with their characteristics, health effects and typical sources.

The federal and California state ambient air quality standards for important pollutants are summarized in Table 13. In general, the California state standards tend to be more stringent, particularly for ozone and PM-10.

Ambient Air Quality

The Bay Area Air Quality Management District (BAAQMD) monitors air quality at several locations within the San Francisco Bay Air Basin. The monitoring sites closest to the project site are in Gilroy, 6 miles south site, and in downtown San Jose, 25 miles northwest of the project site. Table 14 summarizes exceedances of state and federal standards at these monitoring sites during the period 1991-1993. Table 14 shows that ozone and PM-10 exceed the state and federal standards in the project area. Violations of the carbon monoxide standards were recorded at the downtown San Jose site prior to 1992.

Both ozone and PM-10 are considered regional pollutants in that concentrations are not determined by proximity to individual sources, but show a relative uniformity over a region. Thus the data shown in Table 14 for ozone and PM-10 provide a good indication of levels of these pollutants at the project site.

Carbon monoxide is a local pollutant, i.e., high concentrations are normally only found very near sources. The major source of carbon monoxide is automobile traffic. Elevated concentrations, therefore, are usually only found near areas of high traffic volumes.

Air Quality Programs and Attainment Status and Regional Air Quality Plans

The federal Clean Air Act and the California Clean Air Act of 1988 require that the State Air Resources Board, based on air quality monitoring data, designate as "nonattainment areas" those portions of the state where the federal or state ambient air quality standards are not being met.

Until recently, concentrations of ozone and carbon monoxide have exceeded Federal standards in at least some parts of the San Francisco Bay area several times each year. However, the basin was recently declared to be in attainment of all the air quality standards which are ordained by the Federal Clean Air Act.

TABLE 12

MAJOR CRITERIA POLLUTANTS

Pollutant	Characteristics	Health Effects	Major Sources
Ozone	A highly reactive photochemical pollutant created by the action of sunshine on ozone precursors (primarily reactive hydrocarbons and oxides of nitrogen. Often called photochemical smog.	• Eye Irritation. • Respiratory function impairment.	The major sources ozone precursors are combustion sources such as factories and automobiles, and evaporation of solvents and fuels.
Carbon Monoxide	Carbon monoxide is an odorless, colorless gas that is highly toxic. It is formed by the incomplete combustion of fuels.	• Impairment of oxygen transport in the bloodstream. • Aggravation of cardiovascular disease. • Fatigue, headache, confusion, dizziness. • Can be fatal in the case of very high concentrations.	Automobile exhaust, combustion of fuels, combustion of wood in woodstoves and fireplaces.
Nitrogen Dioxide	Reddish-brown gas that discolors the air, formed during combustion.	• Increased risk of acute and chronic respiratory disease.	Automobile and diesel truck exhaust, industrial processes, fossil-fueled power plants.
Sulfur Dioxide	Sulfur dioxide is a colorless gas with a pungent, irritation odor.	• Aggravation of chronic obstruction lung disease. • Increased risk of acute and chronic respiratory disease.	Diesel vehicle exhaust, oil-powered power plants, industrial processes.
PM-10	Solid and liquid particles of dust, soot, aerosols and other matter which are small enough to remain suspended in the air for a long period of time.	• Aggravation of chronic disease and heart/lung disease symptoms.	Combustion, automobiles, field burning, factories and unpaved roads. Also a result of photochemical processes.

TABLE 13

FEDERAL AND STATE AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	Federal Primary Standard	State Standard
Ozone	1-Hour	0.12 PPM	0.09 PPM
Carbon Monoxide	8-Hour 1-Hour	9.0 PPM 35.0 PPM	9.0 PPM 20.0 PPM
Nitrogen Dioxide	Annual 1-Hour	0.05 PPM --	-- 0.25 PPM
Sulfur Dioxide	Annual 24-Hour 1-Hour	0.03 PPM 0.14 PPM --	-- 0.05 PPM 0.5 PPM
PM-10	Annual 24-Hour	50 $\mu g/m^3$ 150 $\mu g/m^3$	30 $\mu g/m^3$ 50 $\mu g/m^3$
Lead	30-Day Avg. Month Avg.	-- 1.5 $\mu g/m^3$	1.5 $\mu g/m^3$ --

PPM = Parts per Million
$\mu g/m^3$ = Micrograms per Cubic Meter

TABLE 14

SUMMARY OF AIR QUALITY DATA FOR SAN JOSE AND GILROY

Pollutant	Standard	Station	Days Exceeding Standard in: 1991	1992	1993	1994
Ozone	State 1-Hour	San Jose Gilroy	6 5	3 12	4 10	2 3
Carbon Monoxide	State/Federal 8-Hour	San Jose Gilroy	4 0	0 0	0 0	0 0
PM-10	Federal 24-Hour	San Jose	1	0	0	0
PM-10	State 24-Hour	San Jose	10	13	10	10

Under the California Clean Air Act, Santa Clara County is a nonattainment area for ozone and PM-10. The County is either classified as attainment or unclassified for other pollutants.

Sensitive Receptors

The BAAQMD defines sensitive receptors as facilities where sensitive population groups (children, the elderly, the acutely ill and the chronically ill) are likely to be located. These land uses include residences, school playgrounds, child care centers, retirement homes, convalescent homes, hospitals and medical clinics. Sensitive receptors in the vicinity include residences located along Coolidge, Turlock and Highland Avenues to the east site.

Ordinances and Regulations that Address Air Quality

In addition to the state and federal ambient air quality standards shown in Table 9, the following local provisions apply.

Grading Ordinance. The Grading Ordinance contains provisions for erosion and dust control (see Section *III. C. Geology and Soils*).

Zoning Ordinance. The Zoning Ordinance, Section 47-5(d) regarding use permit findings requires control of odor and dust.

BAAQMD Emissions Thresholds. The Bay Area Air Quality Management District defines substantial emissions as 80 pounds per day for all regional air quality pollutants except carbon monoxide. For carbon monoxide the threshold is 550 pounds per day (for stationary sources), although exceedance of this threshold only triggers the need for estimates of carbon monoxide "hot spot" concentrations.

Significance Criteria

With respect to air quality, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environmental if it will: "(x) Violate any ambient air quality standards, contribute substantially to an existing or projected air quality violation, or expose sensitive receptors to substantial pollutant concentrations." (The applicable air quality standards are set forth in Table 13.)

Impact and Mitigation

Impact 1. **Construction and grading for the project may generate dust and exhaust emissions that could adversely affect local and regional air quality. (Potential Significant Impact)**

During construction activities such as demolition, excavation and grading operations, vehicle traffic and wind blowing over exposed earth would generate exhaust emissions and fugitive particulate matter emissions that would affect local and regional air quality.

Construction activities are also a source of organic gas emissions. Solvents in adhesives, non-waterbase paints, thinners, some insulating materials and caulking materials would evaporate into the atmosphere and would participate in the photochemical reaction that creates urban ozone. Asphalt used in paving is also a source of organic gases for a short time after its application.

Construction dust could affect local air quality at various times during construction of the project. The dry climate of the area during the summer months creates a high potential for dust generation when underlying soils are exposed to the atmosphere. Construction vehicles traveling along unpaved roads within the project site would generate dust. Construction vehicles may also carry dirt onto paved roads outside the project site where it would eventually become airborne dust due to the action of passing vehicles.

The effects of project construction would include increased dustfall and locally elevated levels of PM-10 downwind of construction activity. Construction dust has the potential for creating a nuisance at nearby properties, particularly at the closest homes along Coolidge, Turlock and Highland Avenues. The generation of construction dust is considered to be a potentially significant localized and temporary impact of the proposed project.

Mitigation 1. **Effective measures would be implemented to reduce emissions of dust and vehicle exhaust emissions during grading and construction.**

The following specific mitigation measures should be implemented:

- Construction equipment should be selected considering emission factors and energy efficiency. All equipment should be properly tuned and maintained.

- Diesel-powered, low sulfur fuel, or electric equipment should be used, wherever possible and feasible, in lieu of gasoline-powered engines.

- Ridesharing and transit incentives for the construction crews should be supported and encouraged.

- The following dust control measures should be implemented:

  - Earthmoving or other dust-producing activities should be suspended during periods of high winds when dust control measures are unable to avoid visible dust plumes.

  - Provide equipment and staffing for watering of all portions of the site subject to vehicle or equipment travel or disturbance. A dust palliative or suppressant, suitable for use near bodies of water, should be added to the water before application. The frequency of application would vary according to the moisture level of the soils on the site, but should be frequent enough to avoid visible dust plumes.

  - Paved streets and roadways in the project vicinity should be swept daily of all mud and debris carried out from the site, since this material can be pulverized and later resuspended by vehicle traffic.

  - Roadways and driveways within the project site should be paved early in the construction phase, in order to reduce potential dust generation. These internal roadways should be swept or washed regularly.

  - Final grades should be treated with an appropriate dust suppressant, and covered with mulches or seeded as early as practical.

  - Construction contractors should cover stockpiles of debris, soil, sand or other materials that can be blown by the wind.

  - Travel speed on unpaved surfaces should be limited to 15 mph.

<u>Impact 2</u>. **Traffic generated by the project would increase carbon monoxide emissions at local roadways and intersections. (Less-than-Significant Impact)**

On the local scale, the pollutant of greatest interest is carbon monoxide. Concentrations of this pollutant are directly related to the levels of traffic and congestion along streets and at intersections. The most congested intersection in the project vicinity would be the intersection of Monterey Road and San Martin Avenue. It is estimated that worst-case concentrations of carbon monoxide in the vicinity of that intersection in the year 2000 would be 5.1 ppm. This estimate takes into account CO concentrations resulting from current traffic, as well as traffic associated with the Lion's Gate project and other approved projects in the vicinity. The worst-case CO concentration of 5.1 ppm would be far below the 8-hour standard of 9.0 ppm. Therefore, the project would not result in a significant air quality impact.

Mitigation 2. No mitigation required.

<u>Impact 3</u>. **Emissions from project-generated traffic would result in air pollutant emissions affecting the entire San Francisco Bay air basin. (Less-than-Significant Impact)**

The regional pollutants of concern include reactive organic gases, oxides of nitrogen (precursors of ozone), and PM-10. The BAAQMD significance threshold for each of these pollutants is 80 pounds per day.

The project would generate relatively small numbers of trips and would include few intermittent sources of pollutants such as space and water heaters, household paints, solvents, fireplaces and woodstoves, and the mowing of lawns and turfgrass. It is estimated that total emissions would be well below the 80 pounds per day threshold for each criteria pollutant. (For example, it would take emissions associated with a 380-unit residential project to generate 80 pounds of reactive organic gases per day.) Thus the project would not have a significant impact on regional air quality. However, the increment of pollutants resulting from the project would contribute to the cumulative degradation of regional air quality.

Mitigation 3. No mitigation required.

<u>Conclusion</u>. **With the implementation of the above mitigation measures for short-term construction emissions, the potential air quality impacts would be reduced to less-than-significant levels.**

[Note: The potential odor impacts associated with the equestrian facility are addressed in Section *III. N. Hazardous Materials, Public Health and Safety*.]

N. HAZARDOUS MATERIALS, PUBLIC HEALTH AND SAFETY

This discussion of hazardous materials is based on the following reports:

- Applied Geosciences Inc., Preliminary Site Assessment, 200 acres of Partially Developed Land, 785, 930 and 1005 Highland Avenue, San Martin, California, August 1995.

- Terratech, Inc., Pre-Purchase Site Assessment of Geologic Hazards, Ground Water Supply and Environmental/Toxic Contamination, Hayes Valley Property, Santa Clara County, January 20, 1988.

The report by Applied Geosciences is contained in Appendix K, and the report by Terratech is contained in Appendix B of this EIR.

Environmental Setting

The Terratech report of 1988 included a site reconnaissance of the entire Hayes Valley Property, as it was constituted at that time, as well as a general survey of the ranch complex. Subsequent to the 1988 survey, an additional 176 acres owned by IBM was added to the eastern end of the project. The 1995 assessment by Applied Geosciences included a site reconnaissance of the IBM lands, and also included a more detailed survey of the ranch complex.

The surveys conducted by both Terratech and Applied Geosciences were preliminary site assessments consisting of visual site inspections and reviews of existing inventories maintained by federal, state and local agencies. No sampling of soil or groundwater was conducted as part of these preliminary assessments.

The findings of these preliminary site assessments are summarized below.

Potential Sources of Hazardous Materials and Public Health and Safety

Underground Storage Tanks (USTs)

No USTs are currently evident on the property, according to Applied Geosciences. However, the 1988 Terratech report noted the presence of a 500-gallon UST, used for gasoline storage, which had just been excavated at the ranch complex on the north side of the access road. Apparently, no soil contamination was observed when the tank was removed. However, a representative from the County Environmental Health Department did not observe the removal and no soil samples were collected for laboratory testing.

A second historic UST was reportedly located within the ranch complex to the north of the old milk house. No soil staining was observed in the vicinity of the reported UST site.

According to records of the County Environmental Health Department, a third historic UST was removed in 1990 from the rear of the house located at 785 Highland Avenue (east of the main ranch complex on the 32-acre IBM orchard parcel). The tank was observed to be in good condition and the soil samples from the tank area contained petroleum by-products in non-hazardous concentrations.

The use of the 3 historic USTs on the site may have resulted in leaks or spills of gasoline or diesel fuel, which may still persist in the soil in hazardous concentrations.

A fourth historic UST was reported to have been located just off-site on the Ukestad property, the 20-acre out-parcel located to the north of the main ranch complex. According to Mr. Ukestad, this gasoline tank was removed in 1983, prior to the enactment of required tank removal permit procedures by the County. No soil sampling was conducted at that time, and there is a potential that spillage from refueling or leaks from the UST may have occurred. Considering that the UST site was approximately 20 feet north of the project boundary, there is a potential that petroleum by-products from the UST may be present subsurface at the northern site boundary.

Above Ground Storage Tanks (ASTs)

There is one existing 1,000-gallon diesel AST located near the barn to the rear of the main ranch house. There was no soil staining or other indications of spills or leaks in the vicinity of this tank.

Three portable 500-gallon ASTs, two gasoline and one diesel, were reported in the vicinity of the old milk house. No soil staining was observed in the vicinity of these tanks.

It was reported that a number of ASTs were historically located next to the pump and well house in the central area of the ranch complex. The contents of the historic ASTs is unknown. No staining was observed on the ground in this area.

At the eastern farm complex, north of Highland Avenue in the IBM orchard parcel, 3 propane ASTs were observed, but not in use, at the rear of the property.

The use of the historic and existing ASTs on the site may have resulted in leakage or spills of fuel, which may still persist in the soil in hazardous concentrations.

Other Storage Drums and Containers

In the central area of the ranch complex there are two barns used for equipment storage and repair which contain a number of hazardous materials. These include one 55-gallon drum of oil and smaller containers of diesel fuel, gasoline, motor oil, lubricant, spraying oils, and anti-freeze, as well as batteries and grease guns.

One of the barns contained a wooden rack that may have been for the storage of oil drums. Dark stains were observed on the surrounding concrete. Dark stains were also observed beneath a tractor in one of the storage barns. A nearby outdoor equipment storage area included a D7 Caterpillar tractor with an oil stain beneath it.

Based on these observations, there is a potential that these hazardous materials may have been spilled or leaked in sufficient quantities to persist in hazardous concentrations.

Transformers

Three pole-mounted power transformers were observed on one pole in the central area of the ranch complex. These transformers had a rusty color, and the center transformer had a dark stain on the bottom. These transformers may contain PCBs, a hazardous material.

Pesticides and Herbicides

There is some evidence of pesticide use on the property, including an old spray rig being stored in one of the barns, and a white powdered substance is present on the floor of a shed, which may have been a pesticide or herbicide. Three empty cans of "pour-on insecticide" were observed in another shed. The insecticide was reportedly poured on the backs of cattle in small quantities. In addition, the records of the Santa Clara County Agricultural Department indicate that a Monthly Pesticide Use Report for the Hayes Ranch was submitted in April 1995 for the application of herbicides on 15 acres of oats.

Although no containers of pesticides or herbicides were observed at the IBM parcel north of Highland Avenue, the plum orchard would have involved the application of these chemicals. Thus there is a moderate to high likelihood that pesticides and herbicides are present in the shallow subsurface soils of the site. However, it is expected that if these chemicals are present, their concentrations would be low.

Asbestos-Containing Building Materials

Based on the age of the residential structures present, it is expected that construction materials used for these residences are likely to contain asbestos, a hazardous material.

Asbestos Occurring in Serpentine Bedrock

A portion of hillside areas north of the ranch complex consist of serpentine bedrock, which contains small concentrations of chrysotile, a naturally-occurring form of asbestos (see Figure 11). If this serpentine area is disturbed by grading, it could result in the release of airborne particles of chrysotile, posing a potential health hazard if inhaled.

Groundwater Quality

The groundwater in the Llagas subbasin is well documented as having elevated levels of nitrate in the groundwater. This nitrate contamination is the result of a combination of cattle waste, fertilizer use, and septic tank/leach field system discharges. There are no wells on the Hayes Valley site to test for nitrates. It is an extrapolation that the problem exits beneath the property. The 1980 nitrate levels in the 3 closest wells were 30, 76 and 80 milligrams per liter (mg/l), while the drinking water standard is 45 mg/l.

Contamination Documented in the Vicinity

A review of publications, records and inventories by federal, state and local agencies revealed that there are no documented instances of hazardous materials releases within at least one-half mile of the Hayes Valley Site.

Ordinances and Regulations that Address Hazardous Materials and Public Health and Safety

Hazardous Materials Storage Permit Ordinance: This County ordinance is intended to provide for the safe use, handling and storage of hazardous materials in order to prevent injury, releases or potential contamination. The ordinance requires that a permit be obtained for the use of hazardous materials from the County Department of Environmental Health's Hazardous Materials Compliance Division before the issuance of a building permit. To obtain a permit, the applicant must submit appropriate plans, and provide evidence that the design and construction of the storage facility is suitable for the storage of hazardous materials.

In accordance with the ordinance, new facilities intended for the use, handling and storage of hazardous materials are to include the following: 1) a monitoring system, 2) primary and secondary containment, 3) overfill protection, 4) separation of materials, 5) a drainage system, 6) a security system, 7) emergency equipment and procedures, and 8) a Hazardous Materials Management Plan. The plan is to include the following: 1) general project/applicant information, e.g., names, phone numbers, hours, etc., 2) a general facility description, 3) a facility storage map, 4) a hazardous materials inventory statement, 5) separation of materials information, 6) a description of the monitoring system, 7) record keeping forms, and 8) emergency equipment information. A Hazardous Materials Management Plan is also required to be submitted for any proposed handling and storage of hazardous materials during construction.

Regulation of Horses by Zoning District: Article 47 of the Santa Clara County Zoning Ordinance sets forth standards and requirements for the keeping of horses. For the "HS" zone, the ordinance permits stables subject to securing a use permit. Findings required for the use permit are as follows: the use shall not constitute a nuisance; corrals must be set back from creeks to prevent water contamination, and from property lines and dwellings to protect the health, safety and welfare of residents and neighbors; and a satisfactory erosion control plan shall be provided. Stables are also subject to Architecture and Site Approval.

Significance Criteria

With respect to hazardous materials, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(v) Create a potential public hazard or involve the use, production or disposal of materials which pose a hazard to people or animal or plant populations in the area affected."

Impacts and Mitigation

Impact 1. **The historic and current agricultural activities on the Hayes Valley Ranch may have resulted in potential soil contamination due to spilled or leaked hydrocarbon products, pesticides and herbicides, PCBs from electrical transformers, and other potential sources of contamination. The existing residential structures may include materials that contain asbestos. (Potential Significant Impact)**

As discussed under Environmental Setting, the Preliminary Site Assessments for the Hayes Valley site included observations of potential contamination from various sources. However, the potential for contamination was not verified through soil sampling and testing.

Mitigation 1. **Prior to demolition of the existing ranch structures and site grading, the areas identified as having potential soil or asbestos contamination would be sampled and tested to determine whether contaminants are present in hazardous concentrations. Any soils which are found to be contaminated would be subject to remediation measures, as appropriate. If asbestos containing materials are found to be present, they would be removed in the manner specified by law.**

The locations of soil sampling would include, but would not be limited to, the area beneath the pole-mounted transformers, areas below the existing ASTs, the location of the historic AST and USTs, areas where soil staining has been observed, and any other areas known to have been the sites of hazardous materials storage. In the plum and walnut orchard, soil samples for pesticides and herbicides would be taken throughout the orchard area. Soil samples for pesticides and herbicides would also be taken in the field south of Highland Avenue, which has been used for cultivating oats in the past. In addition, the area along the northern site boundary to the south of the former UST site on the adjacent Ukestad property would be sampled and tested. All soil sampling for hazardous materials would be conducted prior to grading and demolition, under the supervision of the Department of Environmental Health Hazardous Materials Compliance Division.

To determine the presence of asbestos-containing building materials, samples of material would be taken from the residential structures and tested. Any structures containing asbestos materials would be subject to an Asbestos Removal Plan which would be prepared and implemented prior to general demolition of the ranch structures as required by the Bay Area Air Quality Management District (BAAQMD).

Impact 2. **Any unplanned construction or grading activity that encroaches upon the on-site serpentine hillsides could result in the release of airborne particles of chrysotile asbestos, potentially causing a public health hazard if inhaled. (Potential Significant Impact)**

There are no plans for development or grading to occur within any part of the serpentine hillside, and the project plans have been carefully prepared to avoid encroachment of this area with residential building lots. However, a portion of the hillside cluster residential subdivision would be constructed adjacent to the southern edge of the serpentine area. Unless this area is properly marked and fenced, there is a potential for grading activity to inadvertently encroach upon the serpentine area.

Mitigation 2. **To avoid disturbance to the serpentine bedrock area, the edge of this area would be fenced or roped-off to prevent encroachment by construction equipment.**

In addition, signs would be posted along this construction boundary warning of the potential hazard. Also, construction workers would be educated about the serpentine area and of the importance of preventing soil disturbance there.

<u>Impact 3</u>. **Improper use, handling and storage of hazardous materials used in the construction and operation of the golf course may result in potential soil or groundwater contamination. (Potential Significant Impact)**

The proposed project includes a maintenance facility, where equipment and vehicles would be maintained and cleaned, and where pesticides and fuel for the golf course operation would be stored. Unsafe storage and use, or unintended leaks or spills of these materials could result in soil and groundwater contamination, impacts to wildlife habitat, release of hazardous chemicals into the atmosphere, or damage to underground utilities. (See Section *III. F. Water Quality* for a discussion of potential impacts resulting from pesticide applications on the golf course.)

There may be chloride and other chemicals stored on-site which would be used to disinfect or treat the wastewater treatment plant effluent or the swimming pool water. In addition, diesel or gasoline would be used for the wastewater treatment plant emergency generators and pumps.

During construction, any temporary storage of fuels, lubricants and other toxic materials may result in spills or discharges which could contaminate soils, surface water and groundwater, and result in impacts to any nearby habitat.

No hazardous waste would be stored on the site. Waste oil, which is considered hazardous waste, would be generated at the site during routine vehicle maintenance. However, the waste oil would be picked up for off-site disposal or recycling, and would not be stored in significant quantities.

Mitigation 3. **The project would be required to obtain and implement the provisions of a Hazardous Materials Storage Permit for the proper use, handling and storage of pesticides, herbicides and other hazardous products during construction and operation of the golf course.**

As discussed previously in this section, the handling and storage of hazardous materials on the site would be carried out in compliance with the Hazardous Materials Management Plan to be prepared by the applicant.

Within the maintenance building there would be separate designated areas for handling and storage of pesticides and fertilizers. In addition, all golf course chemicals would be handled, applied and disposed of by technicians licensed by the State, thereby further reducing the risk of spills or improper usage.

The parking and washdown areas adjacent to the maintenance building would consist of a concrete pad surrounded by a continuous 6-inch concrete curb, and an 8-foot high chain link fence with a windscreen. The runoff from the washdown area would be conveyed to an advanced water filtering and recycling system which would capture grease and other hazardous materials washed off the equipment and vehicles.

Within the maintenance facility compound there would be a separate area for storage of fuels. The plan is to have a split 1,000-gallon vaulted storage tank which would contain both diesel and gasoline for vehicles and equipment. This would consist of a steel tank enclosed in secondary containment and encased in 6 inches of reinforced concrete. The fuel tank would be mounted on a concrete pad with earthquake restraints, and would be surrounded with a 6-inch high concrete berm to provide further containment.

The storage of chlorine and other chemicals for the wastewater treatment plant and the swimming pool, as well as fuel storage for emergency generators and pumps, would be subject to the storage and handling requirements of the County's Hazardous Materials Storage Permit Ordinance.

During the construction phase, any potential spills or discharges resulting from the temporary storage and handling of fuels and toxic materials would also be prevented through compliance with the County's Hazardous Materials Storage Permit Ordinance. (A Hazardous Materials Management Plan would also be required to be submitted for approval prior to any proposed handling and storage of hazardous materials during construction.) Storage of fuels and other toxic materials would occur well away from water courses and other sensitive habitats, and would be confined to designated storage areas with containment dikes, as would washdown and maintenance activities.

Given the stringent County requirements for storage and handling of hazardous materials, the probability of major spill occurring, even during and earthquake, is very slight. In the unlikely event of such spill, the Hazardous Materials Storage Plan required for the project would stipulate specific measures to be taken in the event of such an emergency.

<u>Impact 4</u>. **The equestrian facility could result in potential vector and odor impacts. (Potential Significant Impact)**

Vectors such as flies and rodents could become a problem if the stables are not properly managed. Offensive odors could develop from a large accumulation of manure or other poor husbandry practices.

Mitigation 4. **The equestrian facility would employ vector control measures, and would be operated in accordance with a manure management plan in conformance with State law, which would also be reviewed and approved by the County Department of Environmental Health.**

A manure management plan would be required under Title 23, Chapter 15 of the California Code of Regulations. The stable would be operated as cleanly as possible to reduce vectors and the potential for odor. Specific vector controls would include baiting for flies, manure management and rodent trapping. Hay would be stored in a barn and all feed grain would be stored in enclosed containers to reduce availability to rodents.

Manure management practices would consist of cleaning up manure daily and placing it in debris boxes which would be emptied daily or every other day and taken to a local landfill.

The equestrian facility would be subject to Article 47 of the County zoning ordinance which requires that stables not create a nuisance, and that they be set back from water courses and neighboring uses. The ordinance requires that erosion control plans be prepared for stables, and that they be subject to Architecture and Site Approval.

<u>Conclusion</u>. **Implementation of the above mitigation measures would reduce impacts associated with hazardous materials handling and storage, and potential health and safety impacts from vectors and odors, to less-than-significant levels.**

O. ELECTROMAGNETIC FIELDS (EMFs)

Environmental Setting

As described in Section *I. Project Description*, the Lion's Gate site is traversed by 2 high-voltage power transmission lines of 115 kV each. Since all electrical devices emit electromagnetic fields or EMFs, there is a potential that portions of the Lion's Gate project may be exposed to high levels of EMF, particularly where the transmission lines pass close by proposed residential lots in the east-central area of the site.

Background

In recent years there has been much controversy regarding the potential health effects resulting from long-term exposure to electromagnetic fields (EMFs). While EMFs occur naturally and are present in everything from visible light to radio waves to X-rays, attention has focused on whether exposure to extremely low frequency (ELF) EMFs is hazardous. Specifically, the question is whether or not long-term exposure to ELF EMFs associated with alternating current electricity (60Hz) causes health problems in humans. These ELF EMFs are present in appliances, televisions, video display terminals (VDTs), electric blankets, and household wiring, as well as electric transmission and distribution lines. The strength of an EMF is highly dependent upon the amount of current flow (amperage); the more power being consumed, the stronger the EMF. While the electric field component of the EMF is relatively easy to shield, the magnetic field component passes through most materials, including concrete and lead.

Most health-related research is centered on the potential hazards associated with the magnetic field component of EMFs. The unit of measurement of the magnetic field is the milliGauss (mG). The strength of a magnetic field diminishes sharply as one moves away from the source of the EMF. As an example, at a distance of 1.2 inches, the strength of the magnetic field from a hair dryer can range from 60 to 20,000 mG, while at 12 inches the strength drops from 1 to 70 mG.

The typical household background levels of EMFs range from 0.1 to 2.0 mG (Consumer Reports, 1994), with average residential levels at 0.9 mG (Merritt, 1994).

The earth's magnetic field, to which humans are constantly exposed, is about 500 mG.

Health Effects

There have been hundreds of studies on the subject of the health effects associated with long-term exposure to ELF EMFs. Recent studies have shown a potential link between chronic exposure to ELF EMFs and cancer. Some studies indicate that there may be health risks associated with long-term exposure to EMFs at strengths as low as 1 to 5 mG. According to American Planning Association report on EMFs, "current thinking holds that EMFs are cancer promoters rather than cancer initiators: they may not cause cancer or alter DNA directly, but rather accelerate the growth of tumors" (Slessin et al, 1991). However, it is critical to note that the EMF - cancer link has not yet been proven and that further studies are underway. In 1992, EPA's Science Advisory Board concluded that "currently available information is insufficient to conclude that... electric and magnetic fields are carcinogenic."

In April 1995, the American Physical Society released the findings of its exhaustive study on the issue, stating in effect that it could find no evidence that electromagnetic fields from power lines cause cancer (Broad, 1995).

There is no federal government standard on exposure levels for electromagnetic fields.

Implications for Development near Powerlines

Despite the absence of a conclusive scientific link between EMFs and cancer, and the unlikelihood that a national standard will be forthcoming, there remains a strong public concern with exposure to EMFs from powerlines. In response to this concern, various agencies have adopted the policy of "prudent avoidance" as the best way to address the problem. In most instances this results in some attempt to establish a standard for exposure. For example, Florida and New York have standards which limit exposure to EMFs to 150-250 mG at the edge of power line rights-of-way (ROW), but these standards have been criticized because they are not health based, but rather seek to maintain the status quo until further studies are completed. The California State Board of Education requires that new schools be sited 100 feet from the ROW of 100-110 kilovolt (kV) power lines, 150 feet from the ROW of 220-230 kV lines, and 250 feet from the ROW of 345 kV lines. Irvine, California has an ordinance which forbids the siting of schools or residences where they will receive exposure to EMFs from power lines of 4 or more mG, which has resulted in setbacks ranging from approximately 60 to 100 yards. Elsewhere, standards as low as 1 mG have been proposed (Slessin et al, 1991).

When considering the potential effects of power lines, it is important to note that the strength of EMFs is greatly dependent upon the design of the line (i.e., configuration and spacing of the wires, tower design, electrical phasing and circuitry, above ground, below ground, etc.), voltage, and current flow.

EMFs on the Lion's Gate Site

There are two 115 kV power transmission lines that traverse the site from north to south. The EMFs emanating from these power lines fluctuate depending on the current load passing through them at any given time. In June 1995, PG&E technicians recorded EMF strengths at the easterly 115 KV transmission line traversing the Lion's Gate site. Recorded in the late morning on a weekday, the field strength measured directly under the power lines was 2.5 mG. At a distance of 60 feet from the tower centerline, the field strength had dropped to 2.0 mG, and at about 130 feet from the centerline, the levels had dropped to about 1.0 mG. At the time of the measurements, the power line was carrying about 200 amps, which is not a peak load. (See Appendix K for the PG&E report on the field measurements.)

Previous measurements by PG&E at another 115 kV power line in San Jose in 1994 indicated EMF levels of 46.0 mG under the power line under normal current flow conditions for that line. The EMF level dropped to 2.0 mG at a distance of 175 feet from under the power line (City of San Jose, 1994). Under conditions of peak current flow, typical readings would be 91.5 mG under a 115 kV power line, which would drop off to 1.9 mG at a distance of 200 feet from under the power line (APA, 1991). For purposes of the impact analysis below, the worst-case condition is represented by this latter scenario.

Ordinances and Regulations that Address Electromagnetic Fields

There are no regulations or standards at the local, state or federal levels that address electromagnetic fields with respect to land use. However, many other local jurisdictions have adopted a policy of "prudence avoidance" in dealing with EMFs.

Significance Criteria

With respect to potential public hazards, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(v) Create a potential public hazard or involve use, production or disposal of materials which pose a hazard to people or animal or plant populations in the area affected."

In the absence of any standards for acceptable exposure levels, or commonly accepted setback distances, a reasonable goal for prudent avoidance would be to avoid exposure to EMFs which are higher than about 1.0 to 2.0 mG, which represents the range of typical household background levels from electrical appliances.

Impacts and Mitigations

Impact 1. **The siting of residential lots in the vicinity of existing high-voltage power lines may potentially expose future residents to increased levels of electromagnetic fields. (Less-than-Significant Impact)**

The western portion of the proposed cluster subdivision would be near the easterly 215 kV transmission line traversing the Lion's Gate site. Although the measured EMF strength at this powerline is relatively low, dropping to 1.0 mG at 130 feet from the powerline, worst-case levels for a 115 KV line would be significantly higher. Assuming peak loads with EMF strengths of 91 mG under the power line, the EMF levels at the edge of the PG&E easement or approximately 50 feet from the powerline would be about 30 mG. Compared with typical household background levels of 1.0 to 2.0 mG, exposure to 30 mG would not constitute prudent avoidance. At 300 feet from the powerline, the EMF strength under these worst-case conditions would drop to 1.0 mG, which is equivalent to the average household background level. At 200 feet, worst-case EMF levels would be about 1.9 to 2.0 mG, which is at the upper end of the range for typical household levels.

The project site plan (Figure 9b) shows that most of the proposed facilities and residential lots would be at least 300 feet from the power lines. In the clubhouse and overnight complex, the nearest overnight unit would be 700 feet from the powerline. The nearest residential lot fronting on the main access road northeast of the golf course would be 300 feet from the power line. The powerline would pass directly through Lot 24, the 18-acre lot southeast of the golf course, but the building envelope on that lot would be set back approximately 165 feet from the powerline, where worst-case EMF levels would be about 3.0 mG. The powerline would pass within 100 feet of Lot 25, but the building envelope on that lot would be set back approximately 250 feet from the power line. Since the worst-case EMF exposure at these distances would be within or very close to the range for a typical household, the project as proposed would not be subject to significant impacts from electromagnetic fields.

Mitigation 1. **No mitigation required.**

Conclusion. **The proposed project would not be subject to significant impacts due to exposure to electromagnetic fields.**

P. WATER SUPPLY

Environmental Setting

Existing Water Systems

West San Martin Water Works

The existing on-site ranch complex at the west end of Highland Avenue receives domestic water service from the West San Martin Water Works via a 2-inch pipe from its storage facilities on Hayes Lane to the north of the project site. The Water Company currently provides water to 180 residential customers and the San Martin County Water District.

The majority of the Lion's Gate site (and all of the proposed golf course and residential improvements) lie within the service area of the West San Martin Water Works. The water company currently has 3 operating wells in central San Martin with a total output of 1,000 gallons per minute. The average current water usage in the water company service area is approximately 184 acre-feet per year or 164,000 gallons per day. The water company's storage facilities consist of three 50,000-gallon tanks located on Hayes Lane, approximately 1/2 to one mile north of the proposed Lion's Gate project. In the near future, the water company plans to construct a new tank on Hayes Lane to provide an additional 300,000 gallons of storage capacity to improve existing low pressure problems in the system, to enhance fire protection capability and to provide for projected future growth. (See the letter from the West San Martin Water Works, which is included in Appendix M.)

Twin Valley Inc.

The extreme western portion of the project site lies within the service area of the Twin Valley Inc. This water company provides service to 60 residential/agricultural customers in the vicinity of Watsonville Road and Sycamore Avenue from two 120-foot deep wells located on the west side of Watsonville Road, southwest of the project site. There are 3 other wells within 1/4 mile of Twin Valley's wells. These wells are used for agricultural use only and have not experienced problems as far as pumping their required water. Due to elevated nitrate levels, Twin Valley's existing wells would not comply with the 1996 drinking water standards of the federal Safe Drinking Water Act and will be discontinued as a source of domestic supply. The water company plans to drill a 300-foot deep well as a new source of domestic supply for its existing customers, and would then pipe the (non-potable) water from the existing wells to the Lion's Gate project for irrigation supply.

On-site Groundwater

There are 4 agricultural wells on the site which were previously used for irrigation supply, but are no longer in use. In a groundwater study prepared by Geoconsultants, Inc., it was preliminarily concluded that the alluvial basin of the Hayes Valley has a storage capacity of approximately 2,150 acre-feet of groundwater. The safe yield of groundwater resources in the basin is estimated to be approximately 280,000 gallons per day (gpd). (For more detail, see the Geonconsultants report, contained in Appendix M.)

Ordinances and Regulations that Address Water Supply

There are no County ordinances that address water supply.

The applicable General Plan policies R-RC 8 and 9 require that development in rural unincorporated areas demonstrate adequate quantity and quality of water supply as a pre-condition of development approval. (See Section *II. Consistency with Plans, Policies and Regulations*.)

Significance Criteria

With respect to water supply, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will: "(n) Encourage activities, which result in the use of large amounts of fuel, water, or energy," "(o) Use fuel, water or energy in a wasteful manner," or "(h) Substantially degrade or deplete groundwater resources."

Impacts and Mitigation

Impact 1. **The proposed project would increase the demand for water at the site. (Potential Significant Impact)**

The project will require large quantities of water for golf course irrigation, and lesser amounts for residences, clubhouse and overnight units, swim and tennis center, equestrian center, as well as landscaping and maintenance activities, as described below and summarized in Table 15.

Residences: The residential water consumption was based on the factor of 800 gallons per day (gpd) per dwelling, which would result in a total demand of 32,800 gpd for the 41 proposed lots.

Golf Course Irrigation: The total annual irrigation demand for the golf course is estimated to be 122 million gallons (374 acre-feet), which represents an average daily demand of 334,000 gallons. During the summer months, the average daily water requirement for irrigation is estimated to be approximately 677,000 gallons per day.

Clubhouse: The clubhouse restrooms are estimated to be used by a maximum 200 people daily at 5 gpd, for a total water use of 1,000 gpd. Assuming 10 percent of golfers take showers, at 25 gpd, the total water demand for this purpose would be 2,000 gpd. The restaurant would serve a maximum of 200 meals a day at 10 gallons per meal, for a total of 2,000 gpd. Additionally, the 30 employees would generate a total of 450 gpd, based on 15 gpd per employee. Thus the maximum total water use for the clubhouse would be 5,450 gpd.

Overnight Lodging: The 45 overnight units would use a maximum of 150 gpd per unit for a total of 6,750 gpd for the complex.

Swim and Tennis Center: Based on 50 visitors/employees per day and a unit flow of 10 gpd per person, this facility would use a maximum of 500 gpd.

Equestrian Center: The equestrian center water demand for horse upkeep at 25 gpd per stall, for up to 30 stalls, would be 750 gpd. The estimated 25 visitors and employees of the center would use an additional 250 gpd, based on 10 gpd per person. In addition, the caretaker's residence would use 150 gpd. Thus the total daily water use for the equestrian center would be 1,150 gpd.

Maintenance Facility: It is estimated that the maintenance facility would use 225 gpd for domestic use, based on 15 employees at 15 gpd per employee. The washdown water estimates are provided below.

TABLE 15

ESTIMATED DAILY WATER DEMAND

Project Facilities	Average Daily Demand[1] (gpd)	Peak Daily Demand[2] (gpd)
<u>Domestic Water Use</u>		
• Residential (41 dwellings)	32,800	65,600
• Clubhouse	5,450	10,900
• Overnight Units	6,750	13,500
• Swim and Tennis Center	500	1,000
• Equestrian Center	1,150	2,300
• Maintenance Facility	225	450
• Landscape/Washdown	10,000	20,000
Total Domestic Water Use	56,875	113,750
<u>Non-Potable Water Use</u>		
• Golf Course Irrigation	334,000[3]	677,000[4]
Total Project Water Use	390,875	790,750

<u>Notes</u>:

1. Assumes all units are fully occupied and all facilities are in maximum use.
2. A peaking factor of 2.0 is applied to domestic water use.
3. Derived from total annual water use divided by 365 days.
4. Average daily irrigation needs during the summer months (Source: Audubon Conservation Services).

Landscaping and Washing: Water would be required for landscaping at the clubhouse and overnight complex, and the swim and tennis center. Water would also be needed for washing golf carts and maintenance equipment and vehicles. The total water required for these uses is estimated to be 10,000 gpd. This does not include landscaping irrigation for the 41 private residences, which is included in the estimates provided above for the residences.

Mitigation 1a. **Increased water supplies to meet project demand for domestic water would be provided by the West San Martin Water Works, without adversely affecting existing or future users.**

The Lion's Gate project lies within the service area of the West San Martin Water Works. As discussed in the Water Supply Report prepared by Geoconsultants in February 1996, there is sufficient capacity in the aquifer to produce a safe yield of 645,000 gallons per day. After subtracting the 164,000 gpd of current average use, this leaves 481,000 gpd available for increased usage. The combined domestic and irrigation water demand (see below) for the Lion's Gate project (97,000 gpd) would represent 20 percent of this remaining available supply, and 15 percent of the safe yield of the aquifer.

In the near future, the water company plans to construct a new 300,000 gallon water tank at an existing tank site on Hayes Lane, approximately 3/4 mile north of the proposed clubhouse. This tank is being constructed to improve existing low pressure problems in the system, to enhance fire protection capability, and to provide for projected future growth. With the completion of this tank, the water company would have sufficient capacity to meet the estimated water demands and fire flow requirements for the Lion's Gate project.

The clubhouse area and residential subdivisions would be served by 10-inch and 8-inch water mains. The first water main would extend from Highland Avenue westward into the project along the main project access road. The 8-inch main would extend from the new water tank on Hayes Lane southeastward around the site to join the 10-inch main at the project entrance.

During times of drought, the project would be subject to the same cutbacks and penalties for overuse as other water customers. The program for reduced golf course irrigation under drought conditions is described below.

Mitigation 1b. **Water supplies for golf course irrigation would be provided by a combination of sources, including on-site pumping of groundwater, non-potable water from Twin Valley, Inc., and backup supplies from West San Martin Water Works. This water would be supplied in a manner that would not exceed the safe yield of any of these sources.**

The primary source of golf course irrigation water would be on-site groundwater. As discussed in the Preliminary Groundwater Availability report prepared by Geoconsultants in April 1995 (see Appendix M), the on-site alluvial basin has an estimated safe yield of 280,000 gallons per day based on average daily use. Actual pumping rates may exceed the daily average depending on the time of year, provided that the annual safe yield is not exceeded. A new groundwater well (or wells) would be used to pump the groundwater. As discussed in the Water Supply report by Geoconsultants (Appendix M), the pumping of on-site groundwater would not result in impacts to wells immediately down-gradient to the east, provided that the new on-site irrigation well is located a prudent distance from the eastern property line. (Note: The on-site ranch house that is not a part of the project receives its water from the West San Martin Water Works.) The precise location of the on-site irrigation well would be determined prior to project development, based on primary locational criterion of resulting in no down-gradient impacts.)

To determine an appropriate location for the new well(s), pump tests would be conducted to gain an understanding of aquifer characteristics, especially the transmissivity of the groundwater. It is expected that an existing on-site well would be used for the pump test, with another on-site well used as an observation well for any drawdown effects. Based on the data generated by the pump tests, the radius of influence of the proposed groundwater pumping for the project would be determined. The objective would be to locate the new wells where the cross-section of the aquifer would produce the required volume of irrigation water while resulting in minimal if any drawdown at nearby wells.

Back-up supplies of non-potable water would be provided by Twin Valley, Inc. As discussed under "Environmental Setting" above, Twin Valley Inc. serves 60 residential/agricultural customers in the Watsonville Road/Sycamore Avenue area southwest site. Due to high nitrate conditions in the two existing wells, the company is discontinuing use of those wells for domestic supply in 1996. The company has agreed to dedicate these wells to providing non-potable irrigation water supply for the Lion's Gate project. As discussed in the Water Supply Analysis prepared by Geoconsultants in February 1996 (see Appendix M), the groundwater basin utilized by Twin Valley, Inc. has a remaining safe yield of 14,000 gallons per day. This water would be conveyed to the site via a new 6-inch diameter PVC water line which would be extended from the existing water company pipe in Watsonville Road, and would follow the proposed maintenance access road eastward to the irrigation storage reservoir.

TABLE 16

PROJECTED WATER SUPPLY

Water Sources	Water Yield (gpd) (average)
• West San Martin Water Works	150,000[1]
• On-site Groundwater	280,000[2]
• Twin Valley, Inc.	14,000[1]
Total Average Daily Water Supply	444,000[3]
Total Average Daily Water Demand	391,000
Surplus Water Supply	53,000

Notes

1. These figures are based on the average daily use over the course of a year.
2. Preliminary estimate based on average annual safe yield. Actual pumping rates may exceed the daily average depending on the time of year, provided that the annual safe yield is not exceeded. (Source: Geoconsultants, Inc.)
3. This does not take into account spray irrigation of treated wastewater, which would provide a daily average irrigation supply of approximately 23,000 gallons.

The total non-potable irrigation supply available from on-site groundwater pumping combined with backup supplies from Twin Valley, Inc. would be 294,000 gallons based on average daily flows. This would be augmented by domestic water from the West San Martin Water Works, which would readily be able to provide the additional 40,000 gallons of irrigation supply needed to meet the total daily average irrigation demand of 334,000 gallons (i.e., total average daily supply available from West San Martin Water Works is 150,000 gallons, minus 57,000 gallons for domestic use, minus 40,000 gallons for irrigation backup, equals 53,000 gallons surplus).

In order to avoid cross connections of the potable water supply with the non-potable irrigation water supply piping, the irrigation piping would be color coded or otherwise clearly marked.

In the event of a prolonged drought, water usage at the golf course would be cut back in phases. As a drought develops and/or water supplies diminish, irrigation applications would first be reduced in less critical areas such as fairways. As conditions worsen, irrigation of fairways would be further reduced or turned off altogether, depending on the severity of the drought. During this time, irrigation would also be reduced on higher priority areas such as tees and fairway landing areas, to a level which still maintains plant life, but at a severely stressed level. The greens would be the last to have reduced irrigation because they include the most critical turfgrass, and because they make up only about 4 percent of the total irrigated acreage.

Conclusion. **Implementation of the above mitigation measures would reduce the potential water supply impacts of the project to less-than-significant levels.**

Q. WASTEWATER TREATMENT AND DISPOSAL

The following discussion is largely based on the Wastewater Feasibility Study prepared by Questa Engineering in December 1995. The full report is contained in Appendix N of this EIR.

Environmental Setting

No public sanitary sewer system exists on the project site or in adjacent areas. The nearest public sanitary sewer system is located in the City of Morgan Hill, approximately one mile north of the project site.

The existing wastewater facilities for the on-site residences located on Highland Avenue consist of individual septic systems, which appear to be functioning normally.

Ordinances and Regulations that Address Wastewater

Sewage Disposal Ordinance: This ordinance establishes standards for the approval, installation and operation of individual, on-site sewage disposal systems (septic tank and leachfields) consistent with the appropriate California Regional Water Quality Control Board standards and basin plans. These standards are adopted so as to preclude the creation of health hazards and nuisance conditions and to protect surface and groundwater quality. Systems generating more than 2,500 gallons per day of effluent must be reviewed by the appropriate Regional Water Quality Control Board. Percolation tests are required to determine the suitability of a site for leachfields and to determine the amount of leachfields required. The systems are required to be set back a minimum distance from wells, creeks, reservoirs, springs, etc. The County Department of Environmental Health implements this Ordinance and issues the required septic tank permits.

County Ordinance Code - Chapter II, Article 3, Private Sewage Disposal in Lexington Basin: This ordinance sets additional requirements for the establishment of sewage disposal systems in the Lexington Basin. All lands within the basin have been mapped according to septic suitability, with varying design criteria, including minimum lot sizes, stipulated for each zone. In areas with poor septic suitability ratings, the ordinance requires installation of a second drainfield in the event of failure of the first leachfield. The ordinance requires 10 feet of separation between the leachlines and underlying groundwater table or bedrock.

County Zoning Ordinance: Section 47-(d) stipulates use permit findings that waste and sanitation facilities shall satisfy applicable County, state and federal requirements and that the use shall not adversely affect water quality.

Significance Criteria

With respect to wastewater, Appendix G of the CEQA Guidelines states that a project will normally have a significant effect on the environment if it will:

> "(f) Substantially degrade water quality;
> (g) Contaminate a public water supply; or
> (h) Substantially degrade or deplete groundwater resources.
> (s) Extend a sewer trunk line with capacity to serve new development."

Impacts and Mitigation

<u>Impact 1</u>. **The proposed project would increase the demand for wastewater treatment and disposal facilities at the site. (Potential Significant Impact)**

The proposed residences, golf course clubhouse, overnight units, swim and tennis center, and equestrian center would significantly increase the wastewater disposal requirements for the property. Although use of the golf facilities would vary seasonally and between weekdays and weekends, wastewater facilities should be designed on the basis of maximum expected daily flows, i.e., assuming 100-percent facility use. In order to calculate overall flows, the maximum wastewater treatment requirements were estimated for each project component, as described below.

<u>Single-Family Residential Units</u>: The project includes 41 custom residential lots. For central wastewater facilities, average flows from single-family residential units are typically estimated to be in the range of about 200 to 250 gallons per day (gpd) per connection. The actual flows will vary depending upon the size, occupancy and character of the residences, and the degree to which water conserving plumbing devices and practices are incorporated in the homes. The recent laws in California requiring low-flow plumbing devices (e.g., 1.6-gallon flush toilets) in new construction have had a measurable effect on wastewater flows; typical flows from new residential areas tend to average less than 200 gpd/house. (A similar project in Monterey County has experienced average daily flows of 150 to 175 gallons per dwelling over a six year period of operation.) To be conservative in planning wastewater facilities for the proposed project, an average daily unit flow estimate of 250 gpd/residence was assumed; this would adequately account for wastewater from a 4 to 5 bedroom (or more) residence on each parcel. On this basis, the total estimated flow contribution from the proposed 41 single-family residences would be 10,250 gpd (average dry weather flow).

<u>Clubhouse</u>: The clubhouse would generate wastewater from the restaurant, the employees and golfers. The flow estimates for each are as follows:

<u>Restaurant</u>: Based on a unit flow of 10 gallons per meal, the total daily flow for a maximum 200 meals would be 2,000 gpd.

<u>Golfers</u>: At a unit flow for restrooms of 5 gpd, 200 golfers would generate a total of 1,000 gpd. Assuming 10 percent of golfers would take showers, at 25 gpd, this would result in an additional 2,000 gpd for showers.

<u>Employees</u>: Up to 30 employees would work in and around the clubhouse on any given day. Based on a unit flow of 15 gpd per employee, the maximum flow would be 450 gpd.

<u>Overnight Lodging</u>: The maximum flows for the 45 overnight units were estimated on the basis of 150 gpd/unit, yielding total flows of 6,750 gpd.

<u>Swim and Tennis Center</u>: These facilities would be available for use by residents, corporate members and their guests. The facilities would include restrooms, showers and, perhaps, a small kitchen. Use of these facilities would be greatest in the summer and on weekends, and smallest in the winter and during the week. Accordingly, daily wastewater flows would fluctuate greatly. For planning purposes, the maximum daily flow is estimated to be 500 gpd, based on 50 visitors/employees per day and a unit flow of 10 gpd/person. In addition, backwash water from the swimming pool filter and occasional draining of the spa at the proposed recreation center would go to the wastewater system and add small volumes to the overall flow (i.e., not more than a few hundred gallons per week; and it would be greater in the warm summer months than in the winter). The spa would likely be drained once or twice

per year, contributing about 1,000 to 1,500 gallons of flow to the system at each draining. These flows constitute minor miscellaneous additions that are accounted for by the 1,000 gpd "contingency" contained in the preliminary wastewater flow projections (see Table 17).

Equestrian Center: This facility would have restrooms for employees and visitors. The wastewater flows from the equestrian facility are estimated to be approximately 400 gpd, based on 25 visitors/employees per day at a unit flow of 10 gpd/person, and 150 gpd for the caretaker's residence.

The total estimated wastewater flows are summarized in Table 17. Based on the above generation rates, the total wastewater flow for the Lion's Gate project is estimated to be approximately 23,000 gpd. This includes a contingency of approximately 5 percent to account for uncertainties about the specific details of project facilities that would not be determined until the design stage. Final wastewater facility design would also need to anticipate and provide for peak flow conditions which, on a daily basis, may be in order of 25 to 30 percent higher than the average daily flow. For the proposed project this translates to a peak system flow estimate of about 30,000 gpd.

TABLE 17

ESTIMATED WASTEWATER FLOWS*

Residences	41 houses	250 gpd	10,250
Golf Course Clubhouse			
• Restaurant	200 meals	10 gal/meal	2,000
• Golfers			
• Restroom	200	5 gpd	1,000
• Showers	20	25 gpd	500
• Employees	30	15 gpd	450
Overnight Units	45 rooms	150 gpd	6,750
Practice Range	50 golfers	3 gpd	150
Equestrian Center	25 visitors	10 gpd	250
Subtotal			22,000
Contingency			1,000
Total Project			**23,000**

*This does not include the wastewater flows for the golf course maintenance building (approximately 300 gpd) which would be served by an individual septic system.

Mitigation 1. Increased wastewater from the project would be treated and disposed of with new facilities to be constructed in conjunction with the project.

The proposed method of wastewater treatment and disposal for Lion's Gate project involves a central collection, treatment and disposal system for the golf course facilities (except the maintenance facility) and all of the residential development. The various elements of this system are described below and shown in Figure 23.

Septic Tanks: Each residential lot, the clubhouse/overnight complex and the equestrian center would be provided with septic tanks where primary effluent treatment (i.e., sedimentation) would occur. The effluent from the tank would then be piped to centralized treatment and disposal facilities (described below) instead of individual leachfields.

Collection System: The collection system would consist of a network of small diameter plastic pipes. The flow from the septic tanks to the collection system would be generally by gravity, although some pumping units would be required where septic tanks are at lower elevations.

Transmission Line/Pump Stations: The collection system would consist of 2 to 4 inch diameter PVC pipe which would convey all septic tank effluent to a central treatment plant, to be located north of the practice range. The collection system would have two major branches: one branch to serve the residential units, equestrian facility and the swim and tennis center; and a second branch to serve the golf course clubhouse and overnight lodging units. Both branches would require a central pump station, located approximately as shown in Figure 23.

Treatment Facility: As noted above, primary sedimentation is to be provided by the individual on-lot septic tanks. The remaining treatment would be provided by a central treatment plant, to be located adjacent to the practice range. The treatment plant would occupy an area of about 3,000 to 4,000 square feet. The plant would consist of a fully-enclosed proprietary "package" system that would produce secondary level effluent quality. The plant would include the following elements: (a) below ground, built-in-place concrete vaults for sedimentation and clarification; (b) oxidation process for secondary treatment; and (c) liquid chlorination system for disinfection.

Storage Facilities: The wastewater facilities would include short-term emergency storage and long-term wet weather storage, as described below.

Short-term Emergency Storage: Short-term emergency storage for one day of peak flow would be provided by underground tanks located alongside the treatment plant, and would have a capacity of 30,000 gallons. Each of the pump stations in the collection system would also have emergency storage capacity, roughly equal to one day of sewage flow from the respective service area, bringing the total emergency storage in the system to about two days of flow. The sewer pump stations would include alarm systems with auto-dialers and standby generator(s) for emergency power. This would ensure continuous pump station operation during power outages or mechanical breakdown of an individual pump. Emergency power would be provided by a dedicated unit at each pump station.

Long-term Wet Weather Storage: Long-term (90-day) storage of treated wastewater during the wet season would be provided by a storage pond to be located in the "saddle" area immediately upslope and to the northwest of the practice range. The storage pond would be roughly 16-feet deep (at capacity), with an additional two feet of freeboard and an overall maximum water surface area of about 30,000 square feet. The storage volume of the pond at capacity would be approximately 8 acre-feet. The pond would be lined with a clay, plastic or gunite liner to prevent leakage.

Disposal Facilities: Treated wastewater would be disposed of entirely by spray irrigation of restricted-access turf grass and open space portions of the project. The areas planned for irrigation include the golf course practice range and chipping area, plus about 3 to 4 acres of open-space grassland knolls on the west side of the storage pond (see Figure 23). The overall land area required for irrigation is estimated to be about 12 acres. This is based on the assumption of an 8-month irrigation season (roughly March through November). The calculations are based solely on the evapotranspiration requirements for irrigated pasture; they assume negligible loss of water to percolation. The total volume of reclaimed water to be disposed of during the irrigation season includes the daily wastewater flow during the irrigation season, plus all wastewater and rainfall collected in the storage reservoir during the winter months. The total volume is estimated to be about 28.2 acre-feet in a wet rainfall year.

Facility Operation and Maintenance: The proposed community wastewater system would be owned and operated by the Community Services District (CSD) established for the project. Since the system would generate more than 2,500 gallons of effluent per day, it would be under the jurisdiction of the Central Coast Regional Water Quality Control Board; as such, the system would require a waste discharge permit from the Regional Board. The CSD would be the responsibility party (i.e., "discharger") named in the Waste Discharge Requirements (i.e., permit) issued by the Regional Board for the facility. Actual day-to-day operations could be performed by employees of the CSD or by contractors. However, the CSD would have ultimate responsibility for compliance with the Waste Discharge Requirements and the submittal of monitoring reports to the Regional Board.

With respect to day-to-day operations, Title 22 of the California Administrative Code contains specific requirements for monitoring, record keeping and treatment plant maintenance to assure public health protection. A certified wastewater treatment plant operator would be required for the treatment plant. Additionally, the Santa Clara County Sewage Disposal Ordinance requires that community wastewater systems be monitored by the designer for one year, and that the operator execute a maintenance contract with a sanitary engineering firm for the first 5 years of system operation.

Maintenance Facility

The maintenance facility would not be connected to the centralized wastewater system, but would have its own septic tank and leachfield system. Based on a generation rate of 15 gpd for 15 employees, maximum flows would be 225 gpd. Preliminary soils and groundwater studies indicate that there is adequate depth to groundwater, and that the soils in the vicinity have acceptable percolation rates for the planned leachfield.

Alternative Wastewater Treatment Configurations

Several alternative methods of wastewater treatment and disposal were studied for the Lion's Gate project, as described below.

Individual Residential Septic Systems: The main alternative to the proposed wastewater system would include: a) the use of individual septic systems for each residential lot (and the equestrian center, and the swim and tennis center); and b) a separate package treatment plant, storage pond and spray irrigation system solely for the golf course clubhouse and lodging units. This alternative is feasible as studies to date have verified adequate soil depth/groundwater conditions to support individual septic systems at the residential building sites. The layout of the residential sites has been planned to match the septic system options and limitations. A package treatment plant system for the golf course facilities is also feasible. It would be about one-half the size and capacity of the proposed wastewater system to serve the entire development. The advantages of the proposed wastewater plan over this option of utilizing residential septic systems are as follows:

- All wastewater treatment and disposal would come under the maintenance and management authority of a public district and certified wastewater personnel;

- A greater percentage of the wastewater would be made available for reclamation and reuse for irrigation of a portion of the golf course (the practice areas), reducing the demand on other irrigation water sources; and,

- The overall nitrate loading from the project would be reduced, since the secondary treatment followed by irrigation removes a substantially greater amount of nitrate than do individual septic tank-leachfield systems. The use of package treatment plants with spray irrigation is identified as a nitrate control management objective in the Santa Clara Valley Water District's draft plan for the Llagas Groundwater Basin.

The one advantage of the individual residential septic system option would be the elimination of the effluent collection system (and its associated pump stations and piping) in favor of a simple, on-site gravity flow system at each house.

Conventional Gravity Sewers: Conventional gravity sewers, as opposed to effluent-only sewers, were considered as a system design option. Conventional sewers would eliminate the need for a septic tank at each house/building, but the construction costs and excavation requirement for larger diameter gravity sewers, manholes and lift stations spread over the development area would offset the savings. The on-site treatment plant could be designed to accommodate either effluent or raw sewage from a conventional sewer system. If conventional sewers were to be used, an additional screening and sludge handling process would be included at the treatment plant. Ultimately, disposal of the sludge would be by hauling to an approved landfill site. An advantage of the system design proposed for the project is the ability to build-in surplus storage or emergency disposal capacity at the stations or individual building sites with the use of subsurface leachfield trenches. This is possible because of the inclusion of septic tanks for primary treatment at each house/building. Septic tank effluent can be disposed in appropriately sited leaching trenches, but raw sewage cannot.

Municipal Sewerage: The possibility of extending sewer service from the City of Morgan Hill to the project site was considered in connection with prior development plans for the project site. The project site is not within the sewer service area for the Morgan Hill/Gilroy Wastewater Treatment Plant and would require annexation and several miles of sewer pipeline construction. Due to the relatively small wastewater flows from the Lion's Gate project, and the substantial distance to the Morgan Hill/Gilroy system, sewer connection to the system would not be a practical alternative.

Impact 2. **The proposed wastewater disposal facilities may result in degradation of surface and groundwater quality. (Potential Significant Impact)**

Under proper operation, the proposed disposal of wastewater to land should not result in any noticeable impacts on surface water quality in local drainages or the West Branch of Llagas Creek. This is because the system would be subject to the Regional Board's standard requirement that there be no runoff of wastewater from any spray disposal area into streams or drainages; and the spray disposal operations are planned to be confined to the irrigation season only. To further minimize the risks of reclaimed water runoff into streams, the proposed spray areas are to be set back 100 feet or more from local drainages. (Note: Treated effluent would be applied to the spray irrigation area at rates matching the evapotranspiration rate of the practice range turfgrass. Also spray irrigation would not occur during the winter months when the turfed areas are likely to be saturated. Thus, there is no potential for treated effluent to leach or run off into on-site drainages.)

A critical water quality concern in the Llagas Groundwater Basin area, where the Lion's Gate project is located, is the concentration of nitrate in groundwater. The Llagas Groundwater Basin has documented high levels of nitrate attributable to agricultural wastes and fertilizer, wastewater disposal and other land use activities. Sources of nitrate loading from the Lion's Gate project would include golf course fertilizers and on-site wastewater disposal. The nitrate analysis for golf course fertilizers prepared by Audubon Conservation Services (see Appendix E), estimated an annual nitrogen loading ranging from 262 lbs to 1,965 lbs of nitrogen, with a resultant nitrate-nitrogen concentration ranging from 0.6 mg/l to 4.5 mg/l reaching the groundwater. The mass nitrate-nitrogen loading from wastewater disposal is estimated conservatively to be about 263 lbs per year. The combined total nitrogen loading for golf course fertilizers and wastewater disposal is estimated to be 525 to 2,228 lbs per year, which equates to projected groundwater concentration of 1.2 mg/l to 5.1 mg/l. (The equivalent concentration as NO3 would be from 5 to 23 mg/l.) These nitrate loading calculations are a prediction of long-term cumulative nitrate levels resulting from the project, based on average annual conditions.

The nitrate loading analysis is based on very conservative (i.e., worst case) assumptions for the nitrogen content of treatment plant effluent (25 mg/l), nitrogen removal rate in the storage pond (40%), and uptake by the soils and vegetation (75%). Higher nitrogen removal rates are attainable with plant design (e.g., Sequencing Batch Reactor or SBR) or through an operating mode specifically selected to optimize nitrogen removal. A good example of the latter is the Las Palmas Ranch Wastewater Reclamation plant in Monterey County, which has a waste discharge limit of 10 mg/l nitrate-nitrogen set by the Central Coast Regional Water Quality Control Board. The total nitrogen concentration in effluent from the treatment plant ranges from 18 to 24 mg/l (as compared with our estimate of 25 mg/l); but, the final discharge from the storage pond is typically in the range of 3 to 4 mg/l, due to denitrification in the pond. Uptake by turf grass and soils in the irrigation area further reduces the concentration of nitrate-nitrogen reaching groundwater (probably to 1 to 2 mg/l, or less). Based on the demonstrated performance of the Las Palmas Ranch facility, reduction of nitrate concentrations to very low levels, e.g., a few mg/l, is feasible; however, a "zero nitrate discharge" is not an achievable or realistic standard.

The existing groundwater nitrate concentrations in the vicinity of the project site (at San Martin), as reported in the SCVWD Llagas Groundwater Basin Nitrate Study (November 1995), are indicated to be in the range of about 7 to 43 mg/l (as NO3). Historic sampling of a water well on the project site is also reported to fall within this range. The Lion's Gate project site is currently used for cattle grazing; and nitrogen associated with cow manure and urine represents the main current source of nitrate loading to groundwater and surface water runoff. Generally, in pasture and rangeland situations the majority of nitrogen in animal wastes is readily assimilated into the soil and vegetation. However, where soils are damp, where animals congregate and where they have direct access to streams and other drainages, a portion of the nitrogen will be carried by runoff or percolate into the groundwater. These are likely the current routes of nitrogen input to the Llagas Groundwater Basin from the project site.

Under the proposed project, the cattle grazing is planned to be entirely eliminated in favor of the golf course and residential development. From a nitrogen loading standpoint, the turf fertilizer and reclaimed wastewater would essentially replace animal wastes as the principal source of nitrate on the project site. Because of the slow rate of groundwater movement, it is likely to take several years for any changes in water quality to be noticeable. Moreover, as indicated by the water-chemical mass balance analysis in the wastewater feasibility study, the nitrate loading (in terms of resultant concentration) from the project is estimated to be roughly comparable to existing background groundwater conditions (i.e., 5 to 23 mg/l under project conditions, versus 7 to 43 mg/l under existing conditions). Thus, any long-term change in groundwater nitrate concentration is likely to be very slight and difficult to discern.

There is a slight possibility of leakage or spill of wastewater during a major earthquake. However, since the package wastewater treatment plant facilities would consist largely of below ground tankage, the potential consequence of failure or release of wastewater during an earthquake would likely be insignificant. However, this is a valid issue which would be covered in the "Contingency Plan," which is a standard element of the Waste Discharge Requirements that would be adopted for the wastewater facilities by the Regional Water Board.

Mitigation 2. **Groundwater wells would monitor groundwater quality up-gradient and down-gradient of the proposed spray irrigation area, with corrective action taken as necessary.**

Groundwater at the project site would be monitored as a precautionary measure in connection with the wastewater disposal systems and the golf course maintenance activities. All of the existing water wells on the property and the new proposed irrigation well would be periodically monitored for nitrate. Additionally, a dedicated monitoring well immediately down gradient (east) of the wastewater spray field areas (practice range and chipping areas) would be added to distinguish possible localized effects from the wastewater systems. The Regional Board may also require that additional monitoring wells be installed. This would provide a basis for detecting any changes over time and for making adjustments in fertilizer application rates or wastewater operations. In the unlikely event that evidence of contamination is found, corrective action could include incorporating additional treatment processes to further reduce nitrate levels prior to disposal. (The specific measures to be taken would be stipulated in the "Contingency Plan" for the treatment operation, which is a standard element of the Waste Discharge Requirements contained in the "permit" from the Regional Board.) In addition, surface water upstream and downstream of the spray irrigation area would also be monitored for water quality.

Impact 3. **The use of reclaimed wastewater for golf course irrigation would expose humans to possible physical contact with the treated wastewater, resulting in a potential public health hazard. (Potential Significant Impact)**

The areas planned for spray disposal of treated effluent include the golf course practice and chipping area and the grassy hillside knolls adjacent to the proposed wastewater storage pond.

Mitigation 3. **The wastewater would be treated to levels deemed acceptable for disposal on golf courses, and the areas affected would be posted to notify golfers and employees where irrigation by treated wastewater is occurring.**

State wastewater reclamation criteria recognize golf course irrigation as a suitable use for treated wastewater, and contain standards to protect against unacceptable risks to public health. The areas to be irrigated with treated wastewater would have restricted access and activities, and limited opportunity for human contact with the treated wastewater. The areas of the golf course proposed for irrigation are the practice range, which would be accessible primarily to maintenance staff, and the chipping area, which would have more general accessibility to the golfers. Both areas should be posted with appropriate signs indicating the irrigation with reclaimed water; and irrigation of these areas would need to be limited to times when people are not present, i.e., evenings. The other areas planned for irrigation are grassland knolls that are well removed from general public access. These sites would be part of the permanent open space area and would be accessible to an occasional hiker or horseback rider. Evening spray disposal in those areas is also recommended.

With diligent compliance with waste discharge requirements, the risks to public health would be minimal. However, if desired, the wastewater system could be upgraded and operated to meet the treatment standards for unrestricted landscape irrigation, as defined in Title 22 of the California Administrative Code.

Impact 4. **There is a potential for overflow of the storage reservoir, resulting in a public health hazard. (Potential Significant Impact)**

There is the possibility of an overflow from a wastewater storage reservoir during high rainfall years, if the reservoir capacity is exceeded.

Mitigation 4. **The wastewater storage reservoir would have sufficient capacity to accommodate high rainfall years.**

To minimize or eliminate the possibility of overflow, the reservoir would be sized to include: (a) surplus storage capacity to account for extreme wet weather effects; and (b) two-feet of freeboard in the pond above the projected maximum water depth. The calculated winter storage requirement is based on 90 days with no irrigation. An additional contingency available for a wet winter would be selective spray disposal during the rainy season. In particular, the grassland knolls near the reservoir site would provide suitable winter spray disposal capacity for emergency use without posing a threat of runoff to streams or ponding of treated wastewater in public use areas. In the future, should the wastewater flows exceed the system design, the capacity of the wastewater storage pond could be expanded. Additionally, a reserve leachfield area could be constructed near the treatment plant or pump stations for emergency use.

Impact 5. **The wastewater treatment and disposal system could generate odors. (Potential Significant Impact)**

Odors could be generated within the immediate vicinity of the two main pump stations and at the treatment plant. At the effluent storage pond, odors could be created by algae which could grow in the nutrient laden water.

Mitigation 5. **Odor control would be achieved by mechanisms incorporated into the design of the pump stations and the treatment plant, and by measures to be undertaken at the effluent storage pond.**

Odor control at the pump stations would be achieved by venting through subsurface soil "scrubber" trenches, or above-ground activated carbon canister-type filters. If properly maintained, these measures can be expected to reduce pump station odors to a level of insignificance.

To eliminate odors at the treatment plant, the plant would be designed to capture and eliminate methane and hydrogen sulfide odors with a vacuum system, and with soil filtration.

Control measures for algae include: (a) aeration of the wastewater pond; (b) addition of chemicals such as non-toxic dyes; and (c) promotion of duck weed to block light penetration.

With proper maintenance attention, these measures can be effective in reducing algae problems to less-than-significant levels.

<u>Impact 6</u>. **The existing pond and the proposed open water areas of the project, such as the wastewater storage pond and the residential lake, have the potential to be sites for breeding of mosquitoes, which could create a nuisance and a potential public health problem. (Potential Significant Impact)**

Mitigation 6. **Mosquito breeding would be controlled by several methods, as appropriate for each type of water body. These methods would include the circulation of water to prevent stagnant conditions, the introduction of mosquito fish, and the application of larvacides. The specific mosquito mitigation measures would be formulated in consultation with the Department of Environmental Health Vector Control District.**

At the wastewater storage pond, the water would be circulated through the pond, with a portion removed each day for irrigation. The turnover and movement of water would interfere with the mosquito breeding cycle during the warm months. The potential mosquito problem would also be minimized by the remote location of the storage pond which is well away from any residences or golf activity areas. At the existing pond in the central area of the site, and at the proposed lakes for the residential area, the introduction of mosquito fish and the circulation of water would not be appropriate measures for mosquito abatement. Since both of these water bodies would have outlets to West Branch Llagas Creek, the introduction of mosquito fish would risk the escape of the fish resulting in potential disruption of native species. For these ponds, mosquito abatement may require the use of one or more of the following three larvacides: lightweight oil, BTI and methoprene, which can be applied by air or with ground equipment. The oil, which contains surfactants, forms a very thin film on the water surface and essentially suffocates both the larval and pupal stages of the mosquito. The oil tends to dissipate within three or four days, depending on weather conditions. BTI *(Bacillus thuringlensis israelensis)* is a naturally occurring bacterial pathogen of mosquitos. It is most effective against the larval stages and is approved for use in sensitive habitats by the U.S. Fish and Wildlife Service. Methoprene is an insect growth regulator which prevents the mosquito from developing from the pupal to the adult stage. Extensive research has demonstrated that methoprene has very little impact on non-target organisms, and the U.S. Fish and Wildlife Service has approved its use in sensitive habitats, such as the habitat of the endangered Santa Cruz long-toed salamander.

Prior to design and construction of the new ponds, the Department of Environmental Health Vector Control District would be consulted to ensure a design that will inhibit the development of mosquito breeding.

<u>Conclusion</u>. **With the installation of the proposed wastewater facilities in accordance with applicable standards, and with the implementation of the mitigation measures set forth above, the potential wastewater and related impacts resulting from the project would be reduced to less-than-significant levels.**

R. FIRE PROTECTION

Environmental Setting

Fire Protection Services

Fire protection for the Lion's Gate site is provided by the South Santa Clara County Fire District (SSCCFD). The District is operated by the California Department of Forestry and Fire Protection (CDF) under contract to the County. There are 3 stations in the South County area that would respond to a call at the project site, as follows: CDF Santa Clara Headquarters Station at Monterey Road and Watsonville Road in Morgan Hill; South County Fire Station #2 on NoNameUno Avenue south of Masten Avenue, north of Gilroy; and County Fire Station #3 on Hecker Pass Highway, east of Watsonville Road. The latter two stations are owned by the County and operated by CDF. All 3 stations have two persons on duty around the clock, 365 days a year. Firefighting equipment includes pumpers, engines and tankers at each station. The District has mutual aid agreements with the Cities of Morgan Hill and Gilroy.

Fire Hazard

CDF rates the degree of fire hazard for rural areas on a 3-level scale, identifying the severity of hazard as Moderate, High, or Extreme for a given area. To determine fire hazard rating, the following 3 criteria are applied: 1) slope gradient - steeper slopes have a fire spreading effect making them more hazardous than flat terrain; 2) vegetative cover - the density of vegetation determines the amount of fuel available, and hence the corresponding fire hazard; and 3) critical fire weather - the less humid and dryer an area is, the higher the probability of a major fire.

Based on the above criteria, the Lion's Gate site has been mapped by CDF as lying within two fire hazard zones, including the Moderate and Extreme zones, and with other portions of the site not rated due to substantial modification by agriculture. The area of the site rated as having Extreme Fire Hazard includes all of the wooded upland area south of West Branch Llagas Creek. The grass-covered northern hillside areas of the site are within the Moderate Hazard zone. The areas of the valley floor along the creek channel, and the eastern areas of the site lie within the unclassified area.

Ordinances and Regulations that Address Fire Hazard

Uniform Fire Code: Prescribes regulations for protecting life and property from fire hazard, including minimum fire flows and water pressure.

Uniform Building Code: Requires fire retardant roofing materials in high fire hazard areas.

Santa Clara County Fire Prevention Code: Requires a variety of fire suppression measures including: on-site water storage tanks dedicated for fire fighting purposes, and kept separate from domestic water supply; roadway access requirements which specify minimum widths and turning radii, and maximum slopes; placement and spacing of fire hydrants; fire sprinkler use; fire break requirements which specify clearing and management of brush and trimming of trees for prescribed distances around structures. Proposed project plans are reviewed by the County Fire Marshal for compliance with fire protection requirements, and for prescribing conditions of project approval relating to fire hazard.

Significance Criteria

The CEQA Guidelines do not contain significance criteria which specifically address fire hazard and protection. However, Appendix G of the Guidelines states that a project will normally have a significant effect on the environment if it will: "(v) Create a potential public health hazard," and "(z) Interferes emergency response plans or emergency evacuation plans."

The County does not have performance standards relating to response times for fire emergency services. Given the remoteness of some unincorporated County locations, where response times may be one-half hour to an hour-and-a-half, it is not feasible to depend on fire services for fire suppression in these areas.

Impacts and Mitigation

Impact 1. **Portions of the project site are located in areas rated as Extreme and Moderate Fire Hazard areas, and thus may be subject to loss of life and property in the event of a wildland fire. (Potential Significant Impact)**

Fire Hazard: Most of the proposed structures would be located on the valley floor which lies within the unclassified area. This includes the clubhouse complex and all but one of the proposed residential lots (Lot 24), which is located in the southeastern upland area of the site, which is in the Extreme Fire Hazard Zone. In addition, portions of the southern cluster subdivision would be located adjacent to this wooded hillside area. The southern portions of the golf course would also be located in the Extreme Fire Hazard zone, and the northern portions of the golf course would lie in the Moderate Fire Hazard zone.

In those areas of the site proposed for the golf course, the potential for wildfires would be substantially reduced by the introduction of irrigated turf. The golf course would also function as a fire break, affording protection to clubhouse facilities, which would be surrounded by fairways.

Water Supply: The water supply system proposed to serve the project would be adequate to meet the fire protection needs. The water system improvements planned by the West San Martin Water Works would include adequate storage and flows for fire suppression, and would be subject to the approval of the County Fire Marshal. In addition, the irrigation storage reservoir for the golf course and the lake proposed for the residential area would provide a backup source of water.

Access: Most of the proposed development would occur at the eastern end of the site where emergency access is readily available via Highland Avenue. Secondary access to Watsonville Road to the west would be provided by the maintenance access road to the maintenance facility. Emergency access from the residential area to the west would be provided across the golf course along specially designated golf cart paths, which would be designed and built to carry heavy vehicles.

Response Time: The Lion's Gate site is centrally located relative to the 3 fire stations in the area. The residential areas would be located approximately 3 miles from both the CDF Headquarters station in Morgan Hill and South County Fire Station No. 2 at Masten Avenue, and would be approximately 7.5 miles from South County Fire Station No. 3 in Gilroy. Given the proximity of the fire stations, response times would be very favorable for any wildland or structure fires at the site.

The CDF/South Santa Clara County Fire District has indicated that the proposed project could be accommodated without the significant impact to fire protection services.

Mitigation 1. **The project would be required to implement the County Fire Marshal's conditions for fire protection, including minimum roadway standards, adequate water storage and pressure for**

fire fighting, installation of hydrants and automatic sprinklers, vegetation clearance and building specifications.

Project roadways would built to County standards with adequate widths, radius curves and clearances for fire trucks. Roadway bridges should be structurally adequate for heavy fire fighting equipment.

The proposed water supply system would have sufficient water pressure for fire suppression. The system would include a minimum of 180,000 gallons of water for fire fighting purposes (to provide a fire flow of 1,500 gpm for 2 hours) in addition to domestic water supply. This fire storage would be provided by a new 300,000 gallon tank planned to be constructed by the West San Martin Water Works. Hydrants would be located in accordance with the Fire Marshal's specifications.

All on-site structures would be constructed in conformance with the Uniform Fire Code and Uniform Building Code, including installation of automatic sprinkler and alarm systems, and fire-resistant building and roofing materials.

As prescribed in the County Fire Code, all brush would be cleared and managed around all structures, and overhanging tree branches would be trimmed back from structures.

Landscaping around the clubhouse, residences, and other structures would consist largely of native fire-resistance plant species.

Conclusion. **Implementation of the above mitigation measures would reduce the fire hazard on the project site to less-than-significant levels.**

S. POLICE AND SECURITY

Environmental Setting

Police protection for the Lion's Gate area is provided by the Santa Clara County Sheriff's Department from its South County Substation located on Highland Avenue, approximately one mile east of the project site. The substation has 14 regular officers, with 3 officers on duty at any given time. The Sheriff's Department has mutual aid agreements with the cities of Morgan Hill and Gilroy, as well as the CHP.

Ordinances and Regulations that Address Police Services

There are no applicable County ordinances or regulations which address the impact of new development on police services.

Significance Criteria

The CEQA Guidelines do not contain significance criteria which specifically address police protection services.

Impacts and Mitigation

Impact 1. **The proposed project may result in increased demand for police services at the site. (Less-than-Significant Impact)**

The project would generate additional calls for police service in the area. However, the golf course and residential subdivisions would not be expected to generate many calls. Other golf courses in the area generate occasional calls regarding clubhouse burglary or for disturbing the peace. No additional Sheriff's Department personnel or equipment would need to be added as a result of this project.

Mitigation. **No mitigation required.**

Overall security would be enhanced by installing perimeter fencing, providing locked gates at the golf course entrance, and installing burglar alarms at the clubhouse complex.

Conclusion. **The project would not result in a significant impact upon police services.**

T. SCHOOLS

Environmental Setting

The Lion's Gate site lies largely within the bounaaries of the Morgan Hill Unified School District. (The southern portions of the site, which are not proposed for development, lie within the Gilroy Unified School District.) The nearest schools to the project site are: San Martin/Gwinn Elementary Schools (K-6) in San Martin, Britton Middle School (7-9) in central Morgan Hill, and Live Oak High School (10-12) in eastern Morgan Hill.

According to the District's facility planner, all of these schools are currently impacted. The District has plans to build a new middle school south of Morgan Hill near Monterey Road and California Avenue by the year 2000. The District also plans to construct a new high school on Tilton Avenue in northern Morgan Hill, with the first phase planned for completion by the year 2000.

Ordinances and Regulations that Address Schools

There are no County ordinances or regulations that address impacts to schools. However, Policy C-GD 54 of the 1995 County General Plan states that proposals for new residential development in locations where school overcrowding exists or would result from planned levels of growth should be reviewed and conditioned to adequately mitigate adverse impacts. Also, under state law, builders of residential projects are required to pay a fee of $1.72 per square foot of residential floor area for school purposes.

Significance Criteria

There are no criteria in the CEQA Guidelines that address schools.

Impacts and Mitigation

Impact 1. **The proposed residential subdivisions would generate 32 school-aged children within the Morgan Hill Unified School District, where the schools are already impacted.**

Based on the School District's overall generation factor of .79 students per new single-family dwelling, the 41 dwellings proposed for the Lion's Gate project would generate a total of 32 school-aged children. Of this total, 18 would attend elementary school, 7 would attend middle school, and 7 would attend high school. As noted on the environmental setting discussion, all of the schools serving the Lion's Gate project are currently impacted. However, a new middle school and the first phase of a new high school are planned to be completed by the year 2000.

Mitigation 1. **The project's impacts to schools would be mitigated by the state-mandated school impact fee charge to the builder, and by a property tax increment for schools to be paid by the future homeowners under the Mello-Roos district that includes the Lion's Gate site.**

Under state law, all new residential development is subject to a one-time fee of $1.72 per square foot of floor area, payable by the builder prior to issuance of the building permits.

In addition, since the Lion's Gate site is already included in a Community Facilities District under the Mello-Roos Act, future homeowners would be subject to a property tax surcharge for schools. The additional property tax would be $418 plus $.06 per square foot per year for 30 years. Alternatively a new homeowner could elect to make a one-time payment of approximately $4,510, which represents the net present value of the tax increment. This election would only be available to the first purchasers of homes in the Lion's Gate project.

<u>Conclusion</u>. **With the implementation of the above mitigation measures, the project's potential impacts to schools would be reduced to less-than-significant levels.**

U. UTILITIES

Environmental Setting

Electricity: PG&E maintains 12-kilovolt overhead electrical powerlines which run along the site frontages on Coolidge/Highland/Turlock Avenues on the east, and Watsonville Road on the west. In addition, the site is traversed by two 115 kV transmission lines; however, these lines are not available for local service.

Natural Gas: There are existing PG&E gas distribution mains along portions of Highland Avenue to the east, and Watsonville Road to the west.

Telephone: The majority of the Lion's Gate site, including the proposed development area, lies within the Pacific Bell service area. Existing telephone service is provided to the ranch complex from Highland Avenue. The western end of the site along Watsonville Road is within the service area of GTE California.

Ordinances and Regulations that Address Utilities

There are no applicable County ordinances that address utilities impacts.

Significance Criteria

There are no criteria in the CEQA Guidelines that address utilities.

Impacts and Mitigation

Impact 1. **The project would increase demand for electric power, natural gas and telephone service at the site. (Less-than-Significant Impact)**

Electricity: According to PG&E, the existing electric power lines in the project vicinity have sufficient capacity to serve the proposed project. New services would be tied directly to the existing electric power lines or new lines would be added, depending on the location. There may be a need to change transformers serving the site.

Natural Gas: PG&E would provide natural gas to the site from the existing distribution main in Highland Avenue.

Telephone: The telephone lines to the site would require upgrading by PacBell to service the project.

Mitigation 1. **No mitigation required.**

Conclusion. **The project impacts on utilities would be less-than-significant.**

V. SOLID WASTE

Environmental Setting

Solid waste generated in the South County is picked up by private haulers and taken to the San Martin Transfer Station, which also serves as a collection point for recyclable materials. From here, solid waste is hauled to the Pacheco Pass landfill located east of Gilroy. This landfill site is expected to be full by 2010, at which time local solid waste would likely to be conveyed to the Kirby Canyon landfill located north of Morgan Hill.

Ordinances and Regulations that Address Solid Waste

Integrated Waste Management Act of 1989 (AB 939): This state law shifted the focus of solid waste management from development of landfill capacity to development of alternatives to landfill disposal such as source reduction, recycling, composting and conversion to energy. The Act requires each locality to meet a 25% waste stream reduction goal by 1995 and a 50% reduction by the year 2000.

In accordance with AB 939, the County prepared a draft Unincorporated Area Source Reduction and Recycling Element and a draft Unincorporated Area Household Hazardous Waste Element in March 1994. The draft Source Reduction and Recycling Element outlines approaches to reducing solid waste at its source and for promoting recycling, composing, and public education and information programs. The Draft Household Hazardous Waste Element evaluates alternatives for managing household hazardous waste.

Significance Criteria

The CEQA Guidelines do not contain specific criteria for solid waste.

Impacts and Mitigation

Impact 1. **The project would increase the generation of solid waste at the site, thereby reducing overall disposal capacity at local landfill sites. (Less-than-Significant Impact)**

The 41 proposed residential units would generate a maximum of approximately 49.2 tons of solid waste annually, based on the County-wide average of 1.2 tons/year per household (this figure assumes little or no recycling).

The golf course, clubhouse and overnight units would also generate solid waste. Some composting may occur under the golf course operation, but the majority of grass clippings would be left on the golf course and would not be collected.

The equestrian center would generate horse manure which would be collected on a daily basis and disposed of at a local landfill (one which is permitted to accept manure). Alternatively, on-site composting of manure may be considered instead of off-site disposal.

The project would result in an incremental increase in cumulative solid waste generation and thus would slightly increase the rate at which local landfill facilities would reach capacity.

Mitigation 1. **Provisions for recycling, composting and "grass cycling" would be incorporated into the project operation to reduce solid waste generation.**

The project would include a system to collect and recycle glass, aluminum and plastic containers, as well as corrugated cardboard. All recyclable materials would be collected, separated and stored in recycling receptacles to be picked up by the recycling franchisee for this area or a private hauler. Used equipment oil is to be recycled by a private contractor.

Most of the grass clippings from turf mowing would be left in place. Mulching blades would be attached to mowers to facilitate such "grass cycling." The grass clippings not left in place (e.g., from the greens) and landscape debris would be composted on-site or at an approved off-site location. Any on-site composting operations would comply with applicable regulations and the necessary permits would be obtained. Additional measures would be implemented pursuant to the Waste Management guidelines of the Audubon Sanctuary Program.

Conclusion. **With respect to solid waste, the impact of the project would be less-than-significant.**

W. ENERGY

Environmental Setting

Current energy consumption on the project site is very low, consisting only of electricity used for ranch operation and residences.

Ordinances and Regulations that Address Energy

Architecture and Site Approval Guidelines: The guidelines require that tentative subdivision maps include an energy conservation plan showing how buildings would be sited and designed for solar access, passive cooling, energy efficiency and other measures to reduce reliance on mechanical systems.

California Administrative Code, Title 24: These regulations require that energy efficient design standards be incorporated into new construction.

Significance Criteria

With respect to energy, Appendix G of the CEQA Guidelines state that a project will normally have a significant effect on the environmental if it will:

"(n) Encourage activities which result in the use of large amounts of fuel, water, or energy; or
(o) Use fuel water, or energy in a wasteful manner."

Impacts and Mitigation

Impact 1. **The project would result in the consumption of non-renewable energy resources in both the construction and operational phases of the project. (Less-than-Significant Impact)**

During the construction phase, gasoline and diesel would be used to power equipment, and electricity would be required for power tools. Upon completion and occupancy of the project, electricity and fuel would be used for heating, cooling, lighting, office equipment, recharging golf carts, as well as in the operation of maintenance equipment and for pumping water and wastewater.

A number of energy-efficient features are included in the proposed project. The golf course irrigation system would operate during non-peak periods of power demand, and would deliver water according to specific plant needs reducing overall pumping requirements.

The compacted earth building technique proposed for the clubhouse and overnight complex would create 24-inch thick walls with excellent heat retention and cooling properties. The main golf course buildings would also include dual pane windows, high-rated insulation, and low-wattage lighting fixtures. To the extent feasible, the buildings would be designed to maximize solar orientation, with strategic landscaping to maximize passive heating and cooling. Natural lighting opportunities would be maximized, and appliances would be selected for energy efficiency.

Mitigation 1. **Energy conservation measures would be incorporated into the project in accordance with Title 24 of the California Administrative Code. The project would also incorporate other energy efficient features in building design and construction, and in the operation of the irrigation system.**

Conclusion. **With the implementation of energy conservation features, as required, the project impacts to energy resources would be less-than-significant.**

IV. CUMULATIVE IMPACTS

The potential impacts resulting from any individual development project may not be significant, or may be mitigated to less-than-significant levels. However, when the remaining less-than-significant levels of impact are considered along with the incremental effects of other projects, the resulting cumulative impact may become significant. The discussion of cumulative impacts is required under CEQA when such impacts may be significant, although the level of discussion may be general in nature.

The CEQA Guidelines define a cumulative impact as: "The change in the environment which results for the incremental impact of the project when added to other closely related past, present and reasonable foreseeable probable future projects" (CEQA Guidelines § 15355 (b)). This analysis of cumulative impacts considers the effects of other approved, pending or anticipated projects in the vicinity which would collectively result in potentially significant impacts when combined with the incremental effects of the project. Other projects in the Morgan Hill/San Martin vicinity which were considered in this cumulative analysis include the following: 10 single-family residential projects with a total of 324 dwellings, one senior housing project with 33 units, one RV park with 272 spaces, two commercial projects with a total floor area of 49,000 square feet, and the South County Court Facility in San Martin with a total floor area of 37,000 square feet.

In terms of land use, the character of this area is essentially a mixture of urban and rural areas. Therefore, these projects do not represent a fundamental change in character of the area, individually or collectively, but are incremental additions to the ongoing gradual shift from a rural to a more urban character. Each of these projects conforms with the applicable General Plan and zoning provisions, and has undergone discretionary review and environmental clearance. These projects were approved in consideration of their land use compatibility with adjacent uses, with design mitigations incorporated as appropriate. The remaining incremental land use effects of these projects would not result in a cumulatively significant impact.

The Lion's Gate project and the other local projects would result in the loss of prime farmland. Although the severity of this impact is reduced because these lands are no longer economically viable for agricultural production, and is offset at the Lion's Gate site by the planting of vineyards, the collective loss of prime farmland from all of these development sites represents a cumulatively significant impact.

In terms of parks, recreation and open space, none of these projects represents a major conversion of open space to urban use, or a major increase in the demand for recreational resources. Thus the cumulative impact of these projects on open space is not significant.

Geologically, these projects would be subject to some degree of seismic hazard, and potentially unstable soil conditions. Specific mitigations to be implemented for each project would maintain the level of cumulative geologic impact to less-than-significant levels.

In terms of drainage and flooding, all of these projects would alter the drainage patterns on their sites, and could potentially contribute to downstream flooding within the Llagas Creek drainage basin. However, since the Lion's Gate project would mitigate all of its potential flooding impact on-site, it would not contribute to cumulative flooding impacts elsewhere in the basin.

The potential erosion resulting from the projects could result in sedimentation of downstream water bodies. However, these projects would implement stringent erosion control measures, as required, such that cumulative sedimentation would not be significant.

Biologically, all of these projects are located on sites that have been substantially altered or previously converted to agricultural use. Due to the presence of urban uses and human disturbance in the areas of the other development sites, the general habitat value of these sites is minimal. Any impacts to special status species and wetlands would be mitigated at the site-specific level such that cumulative biological impacts would not be significant.

Potential impacts to archaeological and historic resources would be avoided or mitigated in all these projects, and where necessary would provide for contingent mitigation if previously undiscovered resources are encountered during construction. Thus cumulative impacts to cultural resources would not be significant.

Visually, all of the proposed projects would result in changes to their settings. The individual visual impacts of the projects, if any, would be mitigated to less-than-significant levels. When considered together, the cumulative visual impact would likewise not be significant, since these projects constitute part of an ongoing shift from rural to urban character in the area, a visual trend that has been in progress for some time.

The cumulative traffic impacts for all approved and pending projects were taken into account in the traffic analysis for the Lion's Gate project. As discussed in Section *III. K. Traffic and Circulation*, these projects would not result in a significant cumulative impact upon roadway facilities potentially affected by the Lion's Gate project.

The analysis of potential noise impact resulting from the project included an evaluation of noise resulting from cumulative near-term traffic. As discussed in Section *III. L. Noise*, no cumulatively significant noise impacts would result from the Lion's Gate project, taken together with other projects in the vicinity.

The calculation of air pollutant emissions discussed in Section *III. M. Air Quality*, took into account the cumulative emissions resulting from the other local projects. The air quality analysis concluded that there would be no cumulatively significant traffic-related emissions at the local level. At the regional level, neither the Lion's Gate project nor other local projects would result in significant impacts, but they would contribute to the cumulative degradation of overall air quality. This cumulative effect would be off-set by stricter emissions standards, reformulated fuels and improved fuel efficiency, which would result in lower overall levels of air pollution over time. During the construction phase, the projects would generate dust, although most of it would be suppressed through dust abatement measures, as required. Since these projects are unlikely to be constructed at exactly the same time, and since dust generation is highly localized, the cumulative effect would not be significant.

The use of hazardous materials at the Lion's Gate project site would be strictly controlled to prevent leaks or spills that could contaminate soil or groundwater. The other projects in the vicinity are predominantly residential which would be unlikely to utilize quantities of hazardous materials. The gas station project approved in Morgan Hill would be subject to strict local, state and federal regulations for handling and storage of petroleum products. The potential cumulative impacts from hazardous materials would therefore not be significant.

The Lion's Gate project would utilize a combination of three water supply sources: the West San Martin Water Works, Twin Valley, Inc., and on-site groundwater. These water sources would be utilized for domestic and irrigation supply in a manner that would not exceed the safe yield for any of these sources. Additionally, the project demand for water from these sources would not adversely affect existing users or constrain the ability to provide water to future users. Thus there would be no cumulative impact with respect to water supply.

The disposal of wastewater for the Lion's Gate project would occur in accordance with the requirements of the Regional Water Quality Control Board and County Department of Environmental Health, such that there would be no significant water quality impacts. The other projects located in Morgan Hill, and the South County Court Facility would be connected to the central sewer with wastewater treatment and disposal at the Gilroy Wastewater Treatment Plant. The 11-lot subdivision on Highland Avenue would utilize individual septic and leachfield systems, but it would be located one-mile to the east of Lion's Gate site. Therefore, no cumulatively significant water quality impacts would result from wastewater disposal.

The potential impacts to schools resulting from the Lion's Gate project and the other local projects would be fully mitigated through participation in Mello-Roos districts to finance the resulting improvements needed to school facilities. Consequently, there would be no cumulatively significant impact upon schools.

The potential project impacts on solid waste disposal capacity would be reduced by on-site recycling facilities and measures to minimize green waste. The other residential projects in the vicinity would be served by curbside recycling pickup. There would be an incremental effect in terms of reduction of overall solid waste disposal capacity, but this is not considered to be a cumulatively significant impact.

In summary, the Lion's Gate project combined with other projects in the vicinity would not result in cumulative impacts, with the exception of the loss of prime farmland which represents a cumulatively significant impact.

V. ALTERNATIVES TO THE PROPOSED PROJECT

The CEQA Guidelines, at §15126(d), stipulate that EIRs contain a discussion of alternatives to be proposed action, as follows:

> Describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives.

This discussion provides an evaluation of 5 alternatives to the proposed project, as follows:

1) No Project

2) No General Plan Amendment Alternative

3) Higher Density Alternative

4) Lower Density Alternative

5) Alternative Project Location

A. NO PROJECT

The No Project alternative would involve the continuation of the existing cattle grazing operation on the Li n's Gate site. Under the No Project alternative, there would be no change in land use on the site, and no conversion of semi-natural open space to residential and managed recreational uses.

The No Project alternative would avoid exposure to potential geologic and soils impacts associated with the project, although these impacts can be mitigated to less-than-significant levels under the proposed project.

The No Project alternative would not result in the flooding and drainage impacts, although the potential flooding and drainage impacts of the proposed project would be fully mitigated on-site.

The biological impacts of the proposed project, including filling of wetlands and impacts to habitat of special status species, would be avoided by the No Project alternative. Under the proposed project, these impacts would be mitigated to less-than-significant levels.

The No Project alternative would avoid impacts to potential cultural resources on the site, although these impacts to would be avoided or fully mitigated under the proposed project.

The No Project alternative would not result in traffic, noise or air quality impacts, although the project also would not result in significant impacts in these areas.

The No Project alternative would not result in exposure to hazardous materials or electromagnetic fields, although these potential impacts would be avoided or fully mitigated in the proposed project.

The No Project alternative would not require additional water supplies or wastewater treatment, and would not increase demands for public services and utilities. The proposed project likewise would not result in significant impacts with respect to water supply, wastewater treatment or the provision of public services.

In summary, the No Project alternative would generally avoid the impacts associated with the proposed project. As such, the No Project alternative would be environmentally superior to the project as proposed. The No Project alternative was not selected because it does not meet the project objective of developing the Lion's Gate site with a championship golf course and cluster residential development.

It should be noted that under the No Project alternative, the project site could be subdivided as permitted under existing zoning. That could involve: the subdivision of the 260 acres zoned A-Exclusive Agriculture into 13 lots of 20 acres each; the subdivision of the 1381-acre Hillsides area into 8 parcels of at least 160 acres each; and the subdivision of the 32-acre Rural Residential parcel into 6 lots of 5 acres each. This alternative was not presented because it could not reasonably attain the project objective and because much of this scenario is represented by the No General Plan Amendment alternative described below.

B. NO GENERAL PLAN AMENDMENT ALTERNATIVE

This alternative considers the effects of the project in the absence of the proposed General Plan Amendment to change 259 acres from "Agriculture-Medium Scale" to "Hillsides" under the County General Plan. Under this alternative, the 144-acre field adjacent to Turlock Avenue would not be used to cluster residential density from the Hillsides area. Likewise, the 115-acre parcel along Watsonville Road would not be devoted to permanent open space. Instead, these parcels would be subdivided into 20-acre lots, as permitted under the existing General Plan designation, resulting in a total of twelve 20-acre lots. The 6-lot rural residential subdivision proposed for the northeast parcel, west of Coolidge Avenue, would not be affected. The remaining 23 lots in the Hillsides-designated area would be clustered around the golf course in the interior of Hayes Valley. The configuration of the golf course itself would likely be modified somewhat to accommodate the surrounding cluster subdivision.

In terms of land use impacts, this alternative would result in the placement of residential lots directly along the eastern and western frontages of the site. Without the buffer zone included in the proposed project, there would be a greater potential for conflicts with nearby agricultural operations.

Without the General Plan Amendment, substantially less area of the site would be preserved as permanent open space. The 115-acre parcel on Watsonville Road would be devoted to large-lot residential instead of open space, and the proposed open space areas immediately adjacent to the golf course would be devoted to the cluster subdivision and additional roadway to provide access to these residences.

The amount of agricultural land conversion would be approximately the same under this alternative as under the proposed project, although the net effect would not be significant in either case since the site is no longer economically viable for cultivation. Although the 144-acre field along Turlock Avenue would nominally remain in the "Agriculture-Medium Scale" General Plan designation, the division of this area into 20-acre parcels would effectively preclude any potential agricultural activity.

Geologically, this alternative would result in a greater level of potential impacts than the proposed project. The 23 dwellings in the Hillside subdivision and the access road for those lots would be constructed along the foot of the hillsides adjacent to the golf course. These areas pose slope stability concerns and are subject to landslides and debris flows from the adjacent hillsides. While these potential impacts could be mitigated, they would be largely avoided in the proposed project.

The potential flooding impacts would be greater for this alternative than for the proposed project, because the additional length of roadway needed for access to the dispersed residential lots would increase the overall impervious coverage and thus increase the runoff generated at the site. In addition, the subdivision of the field adjacent to Turlock Avenue into 20-acre parcels would preclude the ability to provide a flood detention lake in this area, as proposed. Without this on-site mitigation, this alternative would likely result in downstream flooding impacts.

Biologically, this alternative would likely result in greater impacts to special-status species and wetlands than the proposed project. The additional roadways and homesites in the interior of the site would likely require more filling or piping of streams, and the internal traffic would result in greater potential mortality to California tiger salamanders and western pond turtles. It would also result in greater loss of upland habitat for the tiger salamander and pond turtle. Construction of homesites and an access road along the foot of the southern hillside would also necessitate removal of oak woodland in this area, an impact not associated with the proposed project. Additionally, the introduction of dispersed residential uses into the interior of the site would reduce the general value of the site for wildlife habitat. The presence of human activity, particularly at night when many species are active, would exclude wildlife species which are not adapted to the built environment. In comparison, the proposed project would only involve nighttime activity at the clubhouse and overnight complex, thus confining the impact of human activity to a relatively small area.

Potential impacts to cultural resources would be slightly greater under this alternative, because the greater coverage of the site by development would increase the chances of disturbance to previously undiscovered cultural resource sites.

The visual impacts of the No General Plan Amendment alternative would be greater than under the proposed alternative. The creation of 20-acre lots at the eastern and western ends of the site could result in unsightly uses of those parcels due to inadequate weed control or outside storage. Also, such parcelization would preclude the permanent preservation of the area of the site along Watsonville Road. It would also preclude the creation of a bermed and landscaped buffer zone along Turlock Avenue at the eastern end of the project site.

The traffic generated by the No General Plan Amendment alternative would be the same as the proposed project, since they would have the same number of dwelling units. However, under the alternative, an access road would be needed to provide access to the 5 residential parcels at the western end of the site. It is also likely that the internal access road would be connected to the Watsonville Road access to provide through circulation across the site. This would likely result in a greater use of Watsonville Road to gain access to the golf course as well. However, the impacts of such increased traffic along the Watsonville Road would not be significant.

The noise and air quality impacts of the alternative would be similar to those associated with the proposed project, mainly because traffic generation would be about the same. The change in project configuration would not result in new noise or air quality impacts. The clustering of residential uses around the golf course would expose more of the proposed residences to mower noise, but this condition would presumably be accepted by buyers prior to purchase of the residential properties.

The wastewater impacts under the No General Plan Amendment alternative would likely be greater than for the proposed project. The cluster subdivisions would likely have effluent piped to a community facility as in the proposed project. However, such connection would likely be prohibitive for the 20-acre residential parcels at the eastern and western ends of the site. Although each site would be required to have adequate percolation and depth of groundwater, the potential for nitrate loading would be greater than under the proposed project where no residential leachfields are proposed.

The potential exposure to hazardous materials and electromagnetic fields would be the same under the alternative and the proposed project, since the potential impacts would be fully mitigated or readily avoided in both cases.

The demand for water supply, utilities and public services would be the same under the alternative and the proposed project, except that the alternative would require longer extensions of pipeline and utility lines to reach the dispersed residences. Likewise, response times for emergency services would be longer for the dwellings located in the interior of the valley under this alternative.

In summary, the No General Plan Amendment alternative would generally result in greater or the same levels of impact compared to the proposed project. As such, this alternative would not represent an environmentally preferable alternative to the project as proposed.

C. HIGHER DENSITY RESIDENTIAL ALTERNATIVE

This alternative would consist of approximately 800 single-family dwellings surrounding a championship golf course. A project of this magnitude would involve annexation to the City of Morgan Hill, and possibly the construction of a municipal wastewater treatment facility on the Hayes Valley site.

In terms of land use, the Higher Density Residential alternative would represent a significant expansion of urban-density development into the San Martin area. It would result in the conversion of more open space for urban uses, with less open space remaining for permanent preservation, than proposed under the project alternative.

The Higher Density alternative would result in the conversion of approximately the same amount of Class II soils as the proposed project, although the net effect would not be significant in either case since this site is no longer economically viable for cultivation. However, it is unlikely that this project would accommodate the 100 acres of vineyards, as proposed in the project to offset the loss of prime farmland.

Geologically, the higher density alternative would expose more residences to potential geologic and soils impacts, although these impacts would be fully mitigated under both the Higher Density alternative and the proposed project.

Potential flooding impacts would be greater under the Higher Density alternative since the substantially greater impervious surface coverage would result in greater runoff than under the proposed project. Also the greater development density would provide fewer opportunities to provide on-site mitigation in the form of a large detention lake as is included in the proposed project. Thus some form of off-site mitigation would likely be required, probably in the form of downstream flood detention facility or major channel improvements. Any off-site mitigation would be expensive and problematic, especially considering the need for property acquisition. Thus flooding would be a significant impact of the Higher Density alternative.

Biologically, the Higher Density alternative would likely result in filling of a greater proportion of on-site wetlands compared to the proposed project, and would also result in greater impacts to the habitats of special status species such as the California tiger salamander and the western pond turtle. Also, with greater coverage of the site with development, there would be fewer opportunities to provide on-site mitigation for displaced habitat. Thus the Higher Density alternative would result in greater potential biological impacts than the proposed project alternative.

Impacts to cultural resources would be similar under the Higher Density alternative and the proposed project, since these impacts would be avoided or fully mitigated in either case.

Visual impacts would be greater under the Higher Density alternative, primarily because residential development would likely be sited up to the project boundaries on Coolidge and Turlock Avenues in the east, and Watsonville Road in the west. There would not be the opportunity to provide buffer zones of open space at these peripheral areas of the site, as under the proposed project. With additional dwellings near the northeastern parcel located on Coolidge Avenue, a soundwall would likely be required along this site frontage to meet County noise standards. Even with architectural treatment, such a sound wall would be visually incompatible with the surrounding area. The traffic generated by the higher density project would be almost 20 times that of the proposed project. This increment of traffic would have potential impacts on roadways and intersections in the vicinity and would likely require off-site roadway improvements.

Noise and air quality emissions from traffic under this alternative would also be greater than under the proposed project. The potential exposure to hazardous materials would be the same under the Higher Density alternative as the proposed project since the same mitigation requirements would apply. However, it would be difficult to provide adequate setbacks from high voltage power lines to avoid EMF impacts under the Higher Density alternative. The demand for water supply and other public services and utilities would also be much greater under the Higher Density alternative than for the proposed project.

In summary, the Higher Density alternative would result in greater levels of impact than the proposed project alternative. As such, it would not represent an environmentally preferable alternative to the proposed project.

D. LOWER DENSITY ALTERNATIVE

A lower density alternative might consist of a championship golf course with 20 residential lots, and no overnight units at the clubhouse. Under this alternative, the residential cluster subdivision might be set back further from Turlock Avenue than under the proposed project.

In terms of land use, the slightly smaller scale of the Lower Density alternative would not result in a substantial reduction of impacts, which are already minimal in the proposed project. The amount of open space that would be gained would be minor, perhaps 40 acres, of a total permanent open space area of over 1,200 acres already proposed in the project alternative. The conversion of agricultural land to residential subdivision would be slightly less under this alternative, but the net effect would be the same in either case since the site is no longer economically viable for cultivation.

The geologic, flooding, biological, and archaeological impacts of the Lower Density alternative would be about the same as under the proposed project.

Visually, the Lower Density alternative affords the opportunity to set back the residential cluster subdivision several hundred feet further to the west. However, visual impacts under the proposed project would be mitigated by a 200 to 1,400 setback and a landscaped berm to reduce project visibility. The additional benefit that would provided by further setback distance under the Lower Density alternative would be marginal.

The traffic, noise and air quality impacts of the Lower Density alternative would not be significant, as is the case under the proposed project.

The potential exposure to hazardous materials and electromagnetic fields would be mitigated or readily avoided under both the Lower Density alternative and the proposed project.

The demand for water supply, wastewater treatment and other public services and utilities would not be substantially lower under the Lower Density alternative, compared with the proposed project.

In summary, the Lower Density alternative would result in slightly lower levels of impact relative to the proposed project alternative. As such, it would represent an environmentally superior alternative to the proposed project. This alternative would not meet the project objective of including 45 units of overnight accommodation in the golf course, and of creating a 41-lot residential development as permitted under current General Plan and zoning.

E. ALTERNATIVE PROJECT LOCATION

An alternative site in Coyote Valley was selected for the evaluation of an alternative to the project location, as shown in Figure 24. Coyote Valley is an elongated valley located along Coyote Creek north of Morgan Hill, and is enclosed by the Mount Hamilton Range on the east and the Santa Teresa Hills on the west. A suitable alternative site may be located in the central portion of the Valley, south of Laguna Avenue and west of Monterey Road. Within this area there are approximately 2,000 acres of cultivated land with little of the scattered rural residential development that characterizes the southern portion of Coyote Valley, where a project of this size would likely be precluded. Although a specific site within central Coyote Valley was not selected, it is assumed that the project would be located near the foot of the Santa Teresa Hills west of Santa Teresa Boulevard.

Development of the project at this site would likely involve the conversion of prime agricultural land, which is also the case with the proposed project.

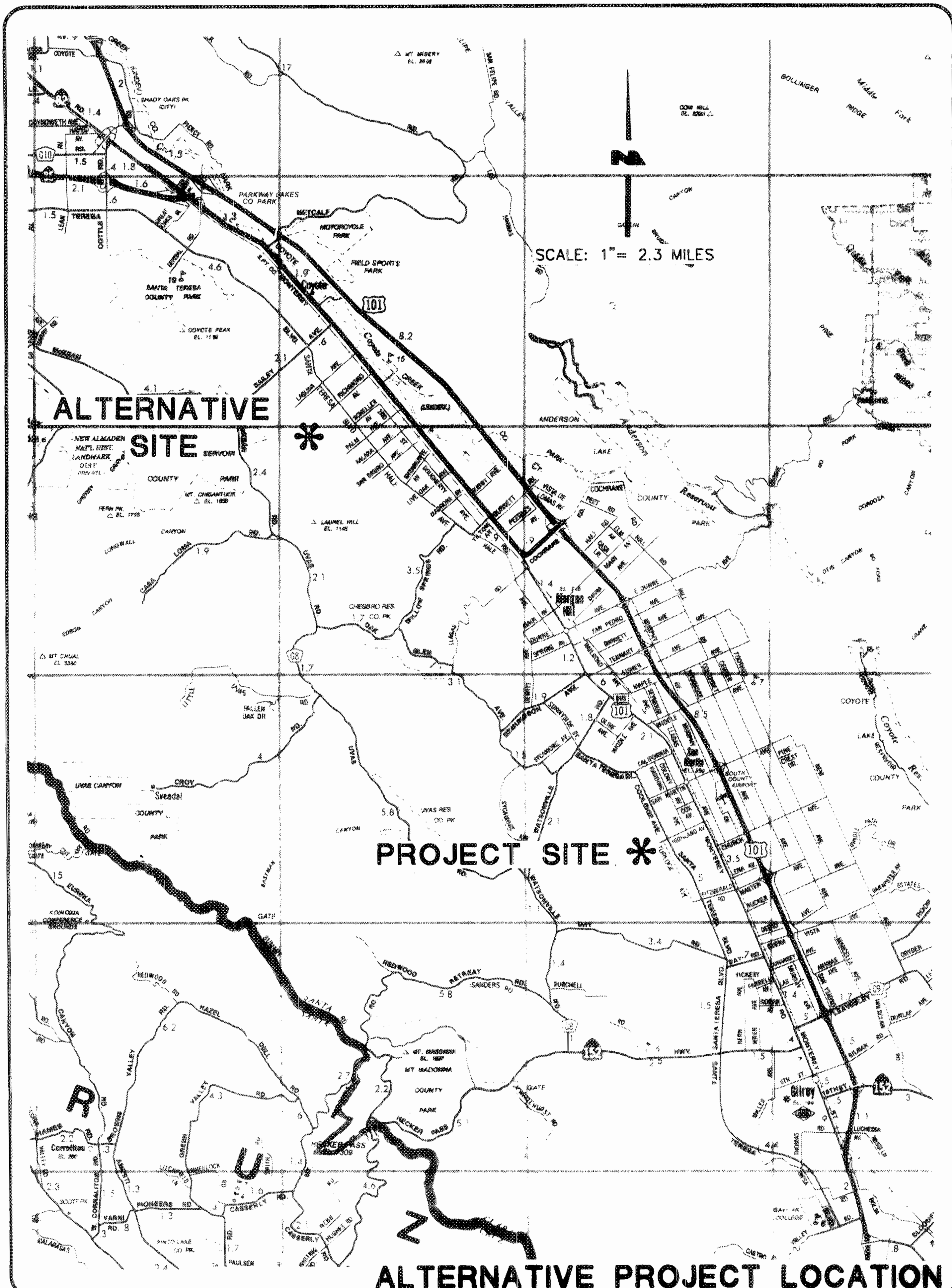

SCALE: 1" = 2.3 MILES
ALTERNATIVE SITE
PROJECT SITE
ALTERNATIVE PROJECT LOCATION

FIGURE 24

No earthquake faults occur in this area, but the soils in Coyote Valley are highly susceptible to liquefaction, a condition not found on the proposed project site. This area is also subject to seasonally high groundwater levels, and in some areas groundwater rises to the surface in winter, causing localized ponding. Thus, any structures would need to be constructed on fill pads, a constraint not found on the proposed project site.

Flooding is a common problem along Fisher Creek, a tributary of Coyote Creek which flows from south to north through the area. During major storm events, sheet flows inundate much of the western portion of the valley. This potential flooding would not act as a major constraint to the golf course itself, although the clubhouse and residential areas would need to be elevated above the 100-year flood elevation. Flooding is also a constraint on the eastern portion of the proposed project site, although conditions at the Lion's Gate site can be mitigated on-site as part of the project.

Biologically, the Coyote Valley site has little in the way of vegetation and trees, except for scattered oaks along the base of the hillsides, and there are no species of concern present. However, there are areas of seasonal wetland which would be subject to Corps jurisdiction, as would the channel of Fisher Creek. The total area of wetlands affected would likely be significant. Thus, while the alternative site would not involve impacts to special species habitats as would occur on the project site, it would probably result in substantially more elimination of wetland habitat.

In terms of cultural resources, the Coyote Valley site would not involve significant impacts to archeological resources, while potential impacts to cultural resources at the project site would be avoided or fully mitigated.

Visually, the Coyote Valley site is not aesthetically remarkable, nor does it lie within a major viewshed along a heavily-traveled route. The construction of the project here would not result in significant visual impacts. Although the proposed project site is in a visible location along a major local roadway, little of the site can actually be seen from off-site viewpoints, and landscaped berms and setbacks would be provided for visual screening and buffering, thus mitigating the potential visual impact.

Traffic generated by the golf course and residential subdivisions would be relatively light, and would not result in level of service impacts at either the Coyote Valley site or the proposed project site. Likewise, noise and air quality impacts would not be significant for either site.

The potential exposure to hazardous materials would be fully mitigated at both the project site and the alternative site in Coyote Valley.

There would be no potential exposure to electromagnetic fields at the Coyote Valley site since no high voltage power lines are present in the immediate vicinity. Exposure to EMFs would be avoided on the proposed project site by providing setbacks adequate for all structures.

Water supply for irrigation would likely be abundant for the Coyote Valley site, given the confined aquifer underlying the valley. Groundwater pumping for irrigation supply may even have the beneficial effect of lowering the high water table. Neither the alternative site nor the proposed project site would be subject to water supply constraints.

Wastewater treatment and disposal would likely be problematic for the Coyote Valley site. The presence of high groundwater would probably preclude leachfields, so reclamation involving spray irrigation of treated effluent over the golf course would be the only feasible option. This would necessitate a package treatment plant and a reservoir for the winter storage of treated effluent. Again, the high groundwater poses a constraint to the reservoir, which would need to be sealed or located upslope in the adjacent hills to prevent leaching into the groundwater. There are no constraints to wastewater disposal at the proposed Lion's Gate site.

The impacts on public services and utilities would be essentially the same at the Coyote Valley site as at the proposed project site.

In summary, an alternative project location in Coyote Valley would involve generally greater constraints and impacts than the proposed Lion's Gate site. Therefore, an alternative site in Coyote Valley would not represent an environmentally superior alternative to the proposed project site.

F. SUMMARY - ENVIRONMENTALLY SUPERIOR PROJECT ALTERNATIVE

Of the 5 project alternatives considered above, all but 2 would result in generally greater levels of impact than the project as proposed. The alternatives with greater impacts include the No General Plan Amendment Alternative, the Higher Density Residential Alternative and the Alternative Project Location in Coyote Valley. Of the remaining two alternatives, the lower Residential Density Alternative would result in slightly lower levels of impact in some categories, but the difference would not be substantial. The No Project Alternative would avoid the potential impacts of the proposed project, and therefore would represent the environmentally superior alternative. However, this alternative was not selected because it does not meet the project objective of developing the site for a championship golf course and 41 residential lots as proposed.

G. ALTERNATIVES FOR WASTEWATER TREATMENT AND DISPOSAL

As discussed in Section *III. Q. Wastewater Treatment and Disposal*, two alternative systems were studied for the proposed project. One alternative would place the residential portions of the project on individual septic systems, while serving the main golf course facilities with a centralized system as proposed. The second alternative would involve placing the entire project on conventional gravity sewers, with centralized treatment of all wastewater, and without the use of septic tanks at the residential lots or at the golf course facilities. Each of these alternatives is discussed below.

Individual Residential Septic Systems

Under this alternative, all of the residential lots, as well as the equestrian center and the swim and tennis center, would be on individual leachfields for the disposal of effluent. The treatment facilities for the main golf course facilities would be the same as for the proposed project, except that they would be reduced in scale without the residential component.

Although all proposed residential lots have sufficient separation from groundwater and adequate soil percolation characteristics, the level of treatment provided by leachfields would not be as high as the proposed secondary treatment and spray irrigation system. Thus the nitrate loading from individual septic systems would be greater than it would be under the proposed system. Given the elevated nitrate levels that already exist in the Llagas Groundwater Basin, this alternative would result in a lower quality of effluent to be disposed than the proposed system. In addition, individual septic systems would not be subject to the maintenance and management authority of a public district and certified wastewater personnel, while the centralized system proposed would include this higher level of operational management.

In other respects, there would be no significant difference in environmental effect between the on-site leachfield alternative and the proposed wastewater system.

Conventional Gravity Sewers

This alternative would involve placing the entire project on conventional gravity sewers. Thus there would be no individual septic tanks at the residential lots or the golf course facilities. The treatment plant would therefore include an additional screening and sludge handling process, with disposal of sludge at an approved landfill site. Also, the treatment plant would require additional emergency storage, to make up for the extra storage provided by the septic tanks and lift stations under the proposed system.

Since this system would not utilize individual leachfields, the potential nitrate loading would be about the same as for the proposed treatment system. However, the centralized handling and screening of solids at the treatment plant site would result in a greater potential to generate unpleasant odors than the proposed system.

In other respects, there would be no significant difference in environmental effect between the conventional gravity sewer alternative and the proposed wastewater system.

VI. GROWTH-INDUCING EFFECTS OF THE PROPOSED PROJECT

Section 15126(g) of the CEQA Guidelines stipulates that the growth-inducing impact of a project be addressed, as follows: "[d]iscuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment."

Precedent for Further Development

The proposed project reflects the level of development that would be permitted under the existing zoning and General Plan designations applicable to the property. Although the proposed action includes a General Plan Amendment and rezoning on approximately 260 acres of the site, this change would not affect the intensity of development allowed but is intended to facilitate the more efficient and environmentally sensitive clustering of residential units on the site. Since the project would not result in an intensification of development beyond that already permitted on the site, it would not set a precedent for allowing more intense growth than permitted under the General Plan for other similarly situated properties in the County.

The potential for inducing residential growth in the adjacent area of San Martin Planning Area to the east is a possibility, but this area has already been planned for Rural Residential development under the San Martin Community Plan. If the construction of rural residential projects in the planning area accelerates as a result of the Lion's Gate project, such growth would be planned and designed in the manner already prescribed by the Community Plan. There is a narrow band of land bordering the site on the southeast and extending southward along the base of hillsides that is designated "Agriculture-Medium Scale" in the County General Plan. It is possible that the approval of the General Plan Amendment from "Agriculture-Medium Scale" to "Hillsides," as proposed for the Lion's Gate project, could result in proposals for similar General Plan Amendments for these lands to the south. However, the net effect of such redesignations would be imperceptible since the minimum lot size for the two designations is the same, at 20 acres. Thus such General Plan Amendments would not increase the permitted density of development. However, if any such parcels are large enough to be subject to the clustering provisions of the Hillside Zoning Ordinance, a change in the character of such development could result. However, since clustering of residential development with open space preservation is preferable to the creation of 20-acre residential parcels, this would represent a positive change.

Additional Development Attracted by the Golf Course

There is a potential for golf course projects to act as a magnet for residential development on contiguous parcels, and possibly also commercial development. In the case of the Lion's Gate project, much of the demand for contiguous residential development would be taken up by the 41 lots proposed for the project itself. With the on-site preservation of open space buffers on all sides of the golf course and residential subdivisions, there would be no further opportunity for additional residential development adjacent to or within sight of the golf course. Although the golf course would be visible from adjacent properties to the north, this area has already been fully developed with 20-acre residential parcels. Since the adjacent areas to the east are already designated Rural Residential, at worst the Lion's Gate project could have an accelerating effect on the residential built-out of this area of San Martin.

On the western side of the project site, along Watsonville Road, the attraction for residential development would be weak since the golf course would be almost one mile away and out of sight, and because no public access to the golf course would be available from the west.

The potential for the golf course project to attract commercial development would be somewhat diminished by the provision of services such as overnight accommodations and a restaurant within the Lion's Gate project itself. Any proposals for nearby commercial development outside the project boundaries would be subject to the San Martin Community Plan, which firmly establishes the central area of San Martin as the commercial center, and the outlying areas near the Lion's Gate site as Rural Residential. Thus for a commercial project to be located near the Lion's Gate site would require an amendment to the County General Plan and the San Martin Community

Plan. Since there is no precedent for such a land use change in the area, such a proposal would have little chance of success.

Growth Induced by Increased Infrastructure Capacities

In cases where projects result in the extension of service capacities beyond the needs of the project, further growth could be accommodated thereby. In the project case, the West San Martin Water Works would provide domestic water service to the site, but pipes would be sized as needed to service the project, without excess capacity. The wastewater treatment and disposal system proposed for the project would not have any excess capacity beyond what is needed for the project. Thus the project would not induce further growth through the creation of excess service capacities which could serve other future development nearby.

Stimulus for Economic Growth

The proposed golf course would stimulate economic growth through direct employment, as well as indirect growth by increasing the demand for goods and services. This would contribute to incremental secondary effects such as increased hiring by suppliers. Given the relatively low level of economic activity that would result from the project, the indirect impacts from this minor increment of economic growth would not be significant.

The proposed residential development on the site would not induce direct economic growth since it would not create new permanent employment opportunities, as compared with industrial or commercial development. Residential development is generally considered a product rather than a cause of economic growth. However, during the construction phase, temporary jobs would be created and others supported in the purchase of materials. The project would also have a minor secondary impact on economic growth resulting from the consumer demand for goods and services by future residents.

Population and Housing Growth

The project would result in the direct creation of jobs at the golf course, and some indirect employment would be generated at suppliers and service companies. To the extent that employees of the country club would not already live within commuting range of the Lion's Gate project, there could be a slight increase in housing demand in the area. However, this minor increase in potential housing demand would not be significant.

In summary, the proposed project would not result in significant growth inducement by way of setting a precedent for similar projects, attracting additional growth to the area, creating excess infrastructure capacity, stimulating significant economic growth, or by generating significant unmet demand for housing.

VII. SIGNIFICANT UNAVOIDABLE IMPACTS AND IRREVERSIBLE ENVIRONMENTAL CHANGES

As discussed throughout this EIR, the project would not result in significant unavoidable impacts. The project would result in irreversible environmental changes. The alteration of site topography, while relatively minor, would represent an essentially permanent change since it is unlikely that the site would ever be returned to its existing topography. The construction of the proposed residences would also be a permanent change. The construction of golf course itself would not represent an irreversible change, but the proposed clubhouse and overnight complex would essentially be permanent. The change in character of the developed portions of the site from semi-natural open space to a managed open space character dominated by human activity would likely be a permanent change. Beneficial changes resulting from the project would include: the protection of over 1,200 acres as permanent open space; the provision of a trail easement to allow a cross-site trail connection; and the enhancement of over one mile of riparian corridor along the on-site reach of West Branch Llagas Creek.

Other irreversible changes resulting from the project would include the consumption of non-renewable building materials and energy resources during the construction phase, and the on-going consumption of energy for lighting, air conditioning, space and water heating, and travel to and from the site during project operation.

VIII. VIEWS OF LOCAL GROUPS

In response to the Notice of Preparation (NOP) for this EIR, the County of Santa Clara Department of Planning and Development received several letters from local groups and individuals including the Loma Prieta Chapter of the Sierra Club, the Greenbelt Alliance, and Gretchen K. Koch. These letters are included in Appendix A of this EIR. The main concerns raised in these letters are listed below.

<u>SIERRA CLUB - LOMA PRIETA CHAPTER</u>

- Preclusion of site for use as a water reservoir
- Impacts on groundwater levels
- Potential flooding
- Impacts of golf course chemicals
- Effect on existing groundwater nitrate contamination
- Wildlife impacts
- Traffic
- Air quality
- Noise
- Hazardous materials
- Impacts on emergency response times
- Cumulative impacts
- Growth inducement

<u>GREENBELT ALLIANCE</u>

- Growth-inducing impacts
- Impacts on the overall watershed system including Llagas Creek and the riparian corridor, the natural spring and underground water quality
- Impact on local water supply
- Impact on wildlife corridors and habitat areas
- Compliance with General Plan environmental policies for golf courses

<u>GRETCHEN K. KOCH</u>

- Loss of riparian corridor
- Water contamination from the golf course
- Impacts to trees and wildlife
- Scale of commercial development
- Conversion of natural open space
- Management of the permanent open space area
- Possibility of future development of the permanent open space area
- Inducement of urbanization in West San Martin
- Wildfire hazard
- Police protection
- Drying up of small wells in the area
- Water usage by the golf course
- Exacerbation of existing groundwater contamination
- Traffic generation
- Archaeological resources and Native American burials

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[NOTE: Additional references are found in the technical reports contained in the appendices to this EIR.]

B. PERSONS AND ORGANIZATIONS CONSULTED

County of Santa Clara

Planning and Development:	Jaunell Waldo Hugh Graham Rans Bratton Bill Shoe Mike Lopez Don Weden Dennis De Mattei
County Geologist:	Jim Baker
Environmental Health:	Art Kaupert Linda Crawford
Parks and Recreation:	Julie Bondurant
Sheriff's Department:	Sargent Navarro
Fire Marshal's Office:	Wes Good
South Santa Clara County Fire District/CDF:	Ron Gorman

Santa Clara Valley Water District	Sue Tippets Belinda Allen
West San Martin Water Works	Bob Ukestad
Twin Valley, Inc.	Steve Havens
Morgan Hill Unified School District	Mike Morman
Pacific Gas and Electric	Dave Gregory

[NOTE: Persons and organizations consulted in the preparation of the technical reports are not listed here.]

C. EIR AUTHORS AND CONSULTANTS

Author

Department of Planning and Development
County of Santa Clara

Hugh Graham, Senior Planner
Jaunell Waldo, Associate Planner

Consultants

Nolte and Associates
Engineers / Planners / Surveyors
San Jose, California

Maurice P. Abraham, Associate-in-Charge
Bert Verrips, Project Manager
Jacqueline Kohndrow, Word Processing
Ellis Green, Graphics

Audubon Conservation Services
Environmental Management Plan
Cary, North Carolina

Applied GeoSciences
Soil Contamination Assessment
San Jose, California

Archives and Architecture
Historic Resources
San Jose, California

Basin Research Associates
Cultural Resources
San Leandro, California

Center for Conservation Biology
Invertebrate Surveys
Stanford, California

Elmore Bohan Design
Architects
Palo Alto, California

Forsgren Associates
Golf Course Architects
Salt Lake City, Utah

H.T. Harvey & Associates
Biological Resources
Alviso, California

Illingworth & Rodkin
Acoustical Engineering
Fairfax, California

LSA Associates
Biological Resources
Point Richmond, California

MO'C Physics Applied
Air Quality Analysis
Palo Alto, California

Questa Engineering
Wastewater Systems
Point Richmond, California

Pacific Geotechnical
Engineering
Morgan Hill, California

Robert Trent Jones II
Golf Course Architect
Palo Alto, California

Schaaf & Wheeler
Hydrologic Engineering
San Jose, California

TJKM
Transportation Consultants
Pleasanton, California

APPENDIX A

Responses to Notice of Preparation (NOP)

ENCLOSURE A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND
CANDIDATE SPECIES THAT MAY OCCUR IN THE AREA OF
SANTA CLARA COUNTY, CALIFORNIA
(1-1-94-TA-865, APRIL 13, 1994)

Listed Species

Fish
winter-run chinook salmon, *Oncorhynchus tshawytscha* (E)

Birds
bald eagle, *Haliaeetus leucocephalus* (E)
American peregrine falcon, *Falco peregrinus anatum* (E)
Aleutian Canada goose, *Branta canadensis leucopareia* (T)
California brown pelican, *Pelecanus occidentalis californicus* (E)
California clapper rail, *Rallus longirostris obsoletus* (E)
California least tern, *Sterna antillarum (=albifrons) browni* (E)
western snowy plover, coastal population, *Charadrius alexandrinus nivosus* (T)

Mammals
salt marsh harvest mouse, *Reithrodontomys raviventris* (E)
San Joaquin kit fox, *Vulpes macrotis mutica* (E)

Invertebrates
bay checkerspot butterfly, *Euphydryas editha bayensis* (T)

Proposed Species

Amphibians
California red-legged frog, *Rana aurora draytonii* (PE)

Invertebrates
vernal pool fairy shrimp, *Branchinecta lynchi* (PE)
California linderiella, *Linderiella occidentalis* (PE)

Plants
Coyote Valley California-lilac, *Ceanothus ferrisae* (PE)
Santa Clara Valley dudleya, *Dudleya setchellii* (PE)
Metcalf Canyon jewelflower, *Streptanthus albidus* ssp. *albidus* (PE)

Candidate Species

Fish
green sturgeon, *Acipenser medirostris* (2R)
longfin smelt, *Spirinchus thaleichthys* (2)

Santa Clara County continued

Amphibians

California tiger salamander, *Ambystoma californiense* (2■)
western spadefoot toad, *Scaphiopus hammondi hammondi* (2R)
foothill yellow-legged frog, *Rana boylei* (2)

Reptiles

northwestern pond turtle, *Clemmys marmorata marmorata* (2)
southwestern pond turtle, *Clemmys marmorata pallida* (2)

Birds

ferruginous hawk, *Buteo regalis* (2)
tricolored blackbird, *Agelaius tricolor* (2)
California horned lark, *Eremophila alpestris actia* (2)
loggerhead shrike, *Lanius ludovicianus* (2)
salt marsh common yellowthroat, *Geothlypis trichas sinuosa* (2)
Alameda (South Bay) song sparrow, *Melospiza melodia pusillula* (2)

Mammals

salt marsh vagrant shrew, *Sorex vagrans halicoetes* (1)
riparian brush rabbit, *Sylvilagus bachmani riparius* (1)
San Francisco dusky-footed woodrat, *Neotoma fuscipes annectens* (2)
Pacific western big-eared bat, *Plecotus townsendii townsendii* (2)
greater western mastiff-bat, *Eumops perotis californicus* (2)

Plants

Mt. Hamilton harebell, *Campanula sharsmithiae* (2)
Mt. Hamilton thistle, *Cirsium fontinale* var. *campylon* (1)
South Bay clarkia, *Clarkia concinna* ssp. *automixa* (2)
northcoast bird's-beak, *Cordylanthus maritimus* ssp. *palustris* (2)
Mt. Hamilton coreopsis, *Coreopsis hamiltonii* (2)
clustered lady's-slipper, *Cypripedium fasciculatum* (2)
interior California larkspur, *Delphinium californicum* ssp. *interius* (2)
Hoover's button-celery, *Eryngium aristulatum* var. *hooveri* (1R)
talus fritillary, *Fritillaria falcata* (2)
fragrant fritillary, *Fritillaria liliacea* (2)
Contra Costa goldfields, *Lasthenia conjugens* (1)
delta tule-pea, *Lathyrus jepsonii* ssp. *jepsonii* (2)
smooth lessingia, *Lessingia micradenia* var. *glabrata* (2)
Gairdner's yampah, *Perideridia gairdneri* ssp. *gairdneri* (2)
Mt. Diablo phacelia, *Phacelia phacelioides* (2)
hairless allocarya, *Plagiobothrys glaber* (2)
rock sanicle, *Sanicula saxatilis* (2)
most beautiful (uncommon) jewelflower, *Streptanthus albidus* ssp. *peramoenus* (1)
Mt. Hamilton jewelflower, *Streptanthus callistus* (2)
showy Indian clover, *Trifolium amoenum* (2*)
caper-fruited tropidocarpum, *Tropidocarpum capparideum* (2*)

Santa Clara County continued

(E)--Endangered (T)--Threatened (P)--Proposed (CH)--Critical Habitat

(1)--Category 1: Taxa for which the Fish and Wildlife Service has sufficient biological information to support a proposal to list as endangered or threatened.

(2)--Category 2: Taxa for which existing information indicated may warrant listing, but for which substantial biological information to support a proposed rule is lacking.

(1R)-Recommended for Category 1 status.

(2R)-Recommended for Category 2 status.

(■)--Listing petitioned.

(*)--Possibly extinct.

ENCLOSURE B

The goal of the U.S. Fish and Wildlife Service is to conserve, protect and enhance fish, wildlife, and their habitats by timely and effective provision of fish and wildlife information and recommendations. To assist us in accomplishing this goal, we would like to see the items described below discussed in your environmental documents for the proposed project.

Project Description. The document should very clearly state the purposes of, and document the needs for, the proposed project so that the capabilities of the various alternatives to meet the purposes and needs can be readily determined.

A thorough description of all permanent and temporary facilities to be constructed and work to be done as a part of the project should be included. The document should identify any new access roads, equipment staging areas, and gravel processing facilities which are needed. Figures accurately depicting proposed project features in relation to natural features (such as streams, wetlands, riparian areas, and other habitat types) in the project area should be included.

Affected Environment. The document should show the location of, and describe, all vegetative cover types in the areas potentially affected by all project alternatives and associated activities. Tables with acreages of each cover type with and without the project for each alternative would also be appropriate. We recommend that all wetlands in the project area be delineated and described according to the classification system found in the Service's <u>Classification of Wetlands and Deepwater Habitats of the United States</u> (Cowardin 1979). The Service's National Wetland Inventory maps would be one starting point for this effort.

The document should present and analyze a full range of alternatives to the proposed project. At least one alternative should be designed to avoid all impacts to wetlands, including riparian areas. Similarly, within each alternative, measures to minimize or avoid impacts to wetlands should be included.

Lists of fish and wildlife species expected to occur in the project area should be in the document. The lists should also indicate for each species whether or not it is a resident or migrant, and the period(s) of the year it would be expected in the project area.

Environmental Consequences. The sections on impacts to fish and wildlife should discuss impacts from vegetation removal (both permanent and temporary), filling or degradation of wetlands, interruption of wildlife migration corridors, and disturbance from trucks and other machinery during construction and/or operation. These sections should also analyze possible impacts to streams from construction of outfall structures, pipeline crossings, and filling. Impacts on water quality, including nutrient loading, sedimentation, toxics, biological oxygen demand, and temperature in receiving waters should also be discussed in detail along with the resultant effects on fish and aquatic invertebrates. Discussion of indirect impacts to fish, wildlife, and their habitats, including impacts from growth induced by the proposed project, should also be addressed in the document. The impacts of each alternative should be discussed in sufficient detail to allow comparison between the alternatives.

The cumulative impacts of the project, when viewed in conjunction with other past, existing, and foreseeable projects, need to be addressed. Cumulative impacts to fish, wildlife, wetlands and other habitats, and water quality should be included.

Mitigation Planning. Under provisions of the Fish and Wildlife Coordination Act, the Service advises the U.S. Army Corps of Engineers on projects involving dredge and fill activities in "waters of the United States", of which wetlands and some riparian habitats are subcategories. Since portions of this proposal may ultimately require a Corps permit, the Service will subsequently be involved under the Coordination Act. Therefore, if you have not done so already, we suggest that you or your representative consult the Corps regarding onsite wetlands and related habitats that may fall under their jurisdiction, and include this information in the draft document. When reviewing Corps public notices, the Service generally does not object to projects meeting the following criteria:

1. They are ecologically sound;

2. The least environmentally damaging reasonable alternative is selected;

3. Every reasonable effort is made to avoid or minimize damage or loss of fish and wildlife resources and uses;

4. All important recommended means and measures have been adopted, with guaranteed implementation to satisfactorily compensate for unavoidable damage or loss consistent with the appropriate mitigation goal; and

5. For wetlands and shallow water habitats, the proposed activity is clearly water dependent and there is a demonstrated public need.

The Service may recommend the "no project" alternative for those projects which do not meet all of the above criteria, and where there is likely to be a significant fish and wildlife resource loss.

When projects impacting waterways or wetlands are deemed acceptable to the Service, we recommend full mitigation for any impacts to fish and wildlife. The Council of Environmental Quality regulations for implementing the National Environmental Policy Act define mitigation to include: 1) avoiding the impact; 2) minimizing the impact; 3) rectifying the impact; 4) reducing or eliminating the impact over time; and 5) compensating for impacts. The Service supports and adopts this definition of mitigation and considers the specific elements to represent the desirable sequence of steps in the mitigation planning process. Accordingly, we maintain that the best way to mitigate for adverse biological impacts is to avoid them altogether.

The document should describe all measures proposed to avoid, minimize, or compensate for impacts to fish and wildlife and their habitats. The measures should be presented in as much detail as possible to allow us to evaluate their probable effectiveness.

Because of their very high value to migratory birds, and their ever-increasing scarcity in California, our mitigation goal for wetlands (including riparian and riverine wetlands) is no net loss of in-kind habitat value or acreage (whichever is greater).

For unavoidable impacts, to determine the mitigation credits available for a given mitigation project, we evaluate what conditions would exist on the mitigation site in the future in the absence of the mitigation actions, and compare those conditions to the conditions we would expect to develop on the site with implementation of the mitigation plan.

Mitigation habitat should be equal to or exceed the quality of the habitat to be affected by the project. Baseline information would need to be gathered at the impact site to be able to quantify this goal in terms of plant species diversity, shrub and tree canopy cover, stems/acre, tree height, etc. The ultimate success of the project should be judged according to these same measurements at the mitigation site.

Criteria should be developed for assessing the progress of the project during its developmental stages as well. Assessment criteria should include rates of plant growth, plant health, and evidence of natural reproduction. Success criteria should be geared toward equaling or exceeding the quality of the highest quality habitat to be affected. In other words, the mitigation effort would be deemed a success in relation to this goal if the mitigation site met or exceeded habitat measurements at a "model" site (plant cover, density, species diversity, etc.).

The plan should present the proposed ground elevations at the mitigation site, along with elevations in the adjacent areas. A comparison of the soils of the proposed mitigation and adjacent areas should also be included in the plan, and a determination made as to the suitability of the soils to support habitats consistent with the mitigation goals.

Because wetland ecosystems are driven by suitable hydrological conditions, additional information must be developed on the predicted hydrology of the mitigation site. The plan should describe the depth of the water table, and the frequency, duration, areal extent, and depth of flooding which would occur on the site. The hydrologic information should include an analysis of extreme conditions (drought, flooding) as well as typical conditions.

The plan must include a time frame for implementing the mitigation in relation to the proposed project. We recommend that mitigation be initiated prior to the onset of construction. If there will be a substantial time lag between project construction and completion of the mitigation, a net loss of habitat values would result, and more mitigation would be required to offset this loss.

Generally, monitoring of the mitigation site should occur annually for at least the first five years, semi-annually for years 6 through 11, and every five years thereafter until the mitigation has met all success criteria. The monitoring period should begin again if success criteria are not met during the first five years. Some projects will require monitoring throughout the life of the project. Reports should be prepared after each monitoring session.

The plan should require the preparation of "as-built" plans. Such plans provide valuable information, especially if the mitigation effort fails. Similarly, a "time-zero" report should be mandated. This report would describe exactly what was done during the construction of the mitigation project, what problems were encountered, and what corrections or modifications to the plans were undertaken.

The plan should detail how the site is to be maintained during the mitigation establishment period, and how long the establishment period will be. It will also be important to note what entity will perform the maintenance activities, and what entity will untimately own and manage the site. In addition, a mechanism to fund the maintenance and management of the site should be established and identified. A permanent easement should be placed on the property used for the mitigation that would preclude incompatible activities on the site in perpetuity.

Finally, in some cases, a performance bond may be required as part of the mitigation plan. The amount of the bond should be sufficient to cover the costs of designing and implementing an adequate mitigation plan (and purchasing land if needed) should the proposed plan not succeed.

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STATE OF CALIFORNIA - THE RESOURCES AGENCY

PETE WILSON, *Governor*

DEPARTMENT OF FISH AND GAME
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5500

April 20, 1994

Ms. Jaunell Waldo
County of Santa Clara
70 West Hedding Street
San Jose, California 95110

Dear Ms. Waldo:

Lion's Gate Project, File #4039-67-28-93
Notice of Preparation (NOP) of a
Draft Environmental Impact Report (DEIR)

Department of Fish and Game personnel have reviewed the NOP of a DEIR for the proposed Lion's Gate project. The project involves creation of 55 residential lots and a golf course on a 1200-acre parcel south of Morgan Hill. We believe the following issues need to be addressed in the DEIR.

The DEIR should address potential impacts to biotic resources and mitigation measures, as well as alternatives which would avoid impacts. Particular attention needs to be paid to State- and Federally-listed and candidate species, and unlisted species whose status is of regional concern. We request that subsequent documents related to this project be submitted for our review.

Specific measures to adequately mitigate unavoidable impacts need to be incorporated into project design prior to certification of the EIR. The Department recommends the following overall measures to lessen or minimize impacts.

1. Avoidance or minimization of impacts to important plant and wildlife habitats.

2. Revegetation using native species.

3. Conformance with the Department's Wetland Policy which requires no net loss of either wetland acreage or habitat value for unavoidable impacts.

4. Require a 100-foot setback from the edge of riparian vegetation to protect riparian habitat.

The Department has direct jurisdiction under Fish and Game Code sections 1601-03 in regard to any proposed activities that would divert or obstruct the natural flow or change the bed, channel, or bank of any stream. We recommend early consultation since modification of the proposed project may be required to avoid impacts to fish and wildlife resources. Formal notification under Fish and Game Code Section 1603 should be made after all other permits and certifications have been obtained. Work cannot be initiated until a streambed alteration agreement is executed.

The U. S. Army Corps of Engineers also has jurisdiction over the discharge of fill to streams and wetlands under Section 404 of the Clean Water Act. We recommend that the Corps be contacted to determine if they have jurisdiction and require a permit.

If you have any questions regarding our comments, please contact Jeannine M. DeWald, Associate Wildlife Biologist, at (408) 429-9252.

Sincerely,

Ken Aasen
for
Brian Hunter
Regional Manager
Region 3

STATE OF CALIFORNIA - THE RESOURCES AGENCY PETE WILSON, Governor

DEPARTMENT OF CONSERVATION

DIVISION OF ADMINISTRATION
DIVISION OF MINES AND GEOLOGY
DIVISION OF OIL AND GAS
DIVISION OF RECYCLING

801 K Street
SACRAMENTO, CA 95814-3514

Telecommunications
Device for the Deaf
(916) 324-2555
Correspondent's Telephone
(916) 445-8733
Fax
(916) 324-0948

May 11, 1994

Jaunell Waldo
Santa Clara County Advanced Planning
Environmental Planning Section
Gov. Center, East Wing, 7th floor
70 W. Hedding Street
San Jose, CA 95110

Dear Jaunell Waldo:

Subject: Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR) for the Lion's Gate project.
SCH# 94043016

The Department of Conservation (Department) has reviewed the County of Santa Clara's DEIR for the project referenced above. The Department monitors farmland conversion on a statewide basis and administers the California Land Conservation (Williamson) Act. No Williamson Act lands have been identified on or directly adjacent to the proposed project site. Since the project could have environmental impacts on other agricultural lands, however, the Department offers the following comments.

The project proposes to develop a residential cluster of up to 55 two-acre lots plus open space on approximately 1200 acres of non-prime land with 90% of the cluster area retained as open space. The project also includes construction of an 18-hole public daily fee championship golf course and a small 5,000 square-foot clubhouse on approximately 200 acres. In addition, five (5) parcels at 20 acres each will be created on that portion of the site designated for medium scale agriculture.

The DEIR should provide information on the number of acres of agricultural land to be developed, the potential agricultural value of the site, the impacts of farmland conversion, and possible mitigation actions. Specifically, we recommend that the DEIR contain the following information to ensure the adequate assessment of impacts in these areas.

- **The agricultural character of the planning area, including:**
  - Types and relative yields of crops grown.
  - Agricultural potential of the area's soils, as defined by the Department's Important Farmland series mapping.

Jaunell Waldo
May 11, 1994
Page Two

o **Impacts related to soil erosion:**

The Department recommends development of a control plan for soil erosion and sedimentation at the project by a Certified Professional Erosion and Sediment Control (CPESC) Specialist. That plan should outline specific strategies for long term control of soil erosion within the site. The Department also recommends that the following information be included regarding the project site:

- Soil types and inherent erodibilities(water/wind) maps
- Slopes and slope lengths, before and after grading.
- Vegetative cover, before and after development.
- Wind speeds, as well as duration and distance of exposure in direction of prevailing winds.
- Estimates of water and wind induced soil erosion likely to result from land disturbances due to site development.

o **Farmland Conversion Impacts:**

- Type, amount and location of farmland conversion expected to result from implementation of the specific plan.
- Impacts on current and future agricultural operations.
- Cumulative and growth-inducing impacts of the plan.

o **Mitigation measures/alternatives to lessen conversion impacts:**

Public Resource Code 21081.6 requires public agencies to adopt reporting or monitoring programs for project changes which mitigate or avoid significant environmental impacts. Possibilities include:

- Protecting other, existing farmland of equivalent, or better, quality through planning policy that relies on an active and strategic use of the Williamson Act.
- Establishing setbacks, berms, greenbelts and open space buffer areas to separate farmland from urban uses.
- Implementing right-to-farm ordinances to diminish nuisance impacts of urban uses on neighboring agricultural operations, and vice-versa.
- Adopting a farmland protection program utilizing planning tools such as transfer of development rights, purchase of development rights or conservation easements, and trusts.

The Department appreciates the opportunity to comment on the NOP. If I can be of further assistance, please feel free to call me at (916) 455-8733.

Sincerely,

Jason Marshall
Environmental Analyst

cc: Kenneth E. Trott
Office of Land Conservation

Loma Prieta Resource Conservation District

STATE OF CALIFORNIA PETE WILSON, *Governor*

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD —
CENTRAL COAST REGION
81 HIGUERA STREET, SUITE 200
SAN LUIS OBISPO, CA 93401-5427
(805) 549-3147

April 15, 1994

Jaunell Waldo
Santa Clara County
Advance Planning Office
County Government Center, East Wing, 7th Floor
70 West Hedding Street
San Jose, CA 95110

Dear Ms. Waldo:

RESPONSE TO NOTICE OF PREPARATION, LION'S GATE, SANTA CLARA COUNTY (SCH # NA)

Thank you for the opportunity to review your March 25, 1994 initial study regarding the proposed project. The project proponent may be required to address the following issues:

1. For construction projects with land disturbance activities greater than five acres which discharge storm water to surface waters, a National Pollutant Discharge Elimination System storm water permit is required.

2. If any part of the project is conducted below the ordinary high water mark, resulting in the discharge of dredge or fill material under permit from the U.S. Army Corps of Engineers, then a recommendation of water quality certification or waiver will be required from this office. The proponent will be required to mitigate project impacts to beneficial uses and ensure that water quality standards are maintained.

Your agency should address potential impacts and required permitting regarding the above issues.

If you have any questions, please contact **Adam White (805) 549-3694** between the hours of 8--10 a.m. and 1--5 p.m. Monday through Friday.

Sincerely,

ROGER W. BRIGGS
Executive Officer

AW/IIII:lion.ltr

c: State Clearinghouse
1400 Tenth Street
Sacramento, CA 95814

TA Transportation Agency

Santa Clara County Bus, Light Rail, Roads, Aviation

3331 North First Street
San Jose, CA 95134-1906

MEMORANDUM

DATE: April 28, 1994

TO: Jaunell Waldo
Advance Planning Office

FROM: Ashok Vyas
T/A Land Development

SUBJECT: Notice of Preparation (NOP) of a Draft Environmental Impact Report
Lion's Gate - Watsonville Road

Your March 25, 1994 NOP along with the attachments has been reviewed. Our comments are as follows:

(1) The Draft EIR should include a traffic analysis addressing the traffic impacts of the potential traffic generated due to the project. The traffic report should include the necessary mitigation measures and also identify the funding source of the required mitigation.

(2) At the time of the site development, the developer will be required to meet the County's standard dedication and improvement policies as related to County maintained road ways adjacent to the project.

(3) The site is located in a drainage/flooding problem area. At the time of the development, the developer will be responsible to show that the surface runoff from the site is carried to an acceptable outfall of adequate capacity.

(4) A County encroachment permit should be obtained prior to the beginning of any work within the County's right-of-way.

(5) We may have additional comments at the time of future reviews.

(6) On April 21, 1994 the Transportation Consultants have faxed us trip distribution assumptions for the proposed project. We will respond to the consultants after we have completed our review.

Please call me at X4208 if you have questions.

Thank you for the opportunity to review this matter.

cc: HK, AKC, MA, File

County of Santa Clara

Environmental Resources Agency
Department of Environmental Health

Central Office
2220 Moorpark Avenue, East Wing, Room 100
San Jose, California 95128-2690
(408) 299-6060 FAX 298-6261

MEMORANDUM

Date: April 27, 1994

To: Juanell Waldo

From: Art Kaupert AK
Sr. Environmental Health Specialist

Re: File # 4039: EIR Notice of Preparation

This Department has reviewed the referenced notice of preparation, and suggests that the following items be addressed in the EIR.

1. The additional nitrate loading on the ground water, from the proposed septic systems, should be discussed.
2. Soils analysis and percolation testing done to evaluate the suitability of the site for septic systems, and the size of those systems, must be accomplished under supervision of the Department of Environmental Health.
3. A geotechnical report will be required where septic systems are proposed to be installed on slopes in excess of 20%. The Department of Environmental Health should be contacted for details.
4. The anticipated use of the clubhouse should be discussed, including any adjacent swimming pool, snack bar, etc.
5. Any site assessment for hazardous materials contamination must be coordinated through the Department of Environmental Health.
6. The temporary handling and storage of any construction related hazardous materials should be discussed: Submission and approval of a plan, etc.

County of Santa Clara

Environmental Resources Agency
Parks and Recreation Department

298 Garden Hill Drive
Los Gatos, California 95030
(408) 358-3741 ~~FAX 358-3751~~

April 26, 1994

Juanell Waldo, Associate Planner
Advance Planning Office
County of Santa Clara
70 W. Hedding St., 7th Floor
San Jose, CA 95110

re: File #4039-67-28-93

Dear Juanell,

Santa Clara County Parks and Recreation Department has received and reviewed the Notice of Preparation of a Draft Environmental Impact Report for the Lion's Gate project in Hayes Valley, South Santa Clara County. The Notice of Preparation concerns the proposed development of a residential cluster subdivision, 18 hole golf course, 20 acre agricultural lots and 1200 acres of dedicated open space.

The Draft EIR should address the following items regarding Parks, Recreation and Open Space;

- The Regional Parks, Trails, and Scenic Highways element of the County General Plan indicates a regional trail along Watsonville Road. The standard trail easement dedication is 25 feet wide. This alignment should take into account future widening of Watsonville Road. The trail will be multi use, i.e., equestrian, pedestrian and bicycling.

- The Regional Parks, Trails, and Scenic Highways element of the County General Plan designate Watsonville Road as a state scenic route.

- The Report of the Preservation 2020 Task Force regarding the Hayes Valley area designates Watershed, Viewshed and Buffer values as resources to be protected.

- Responsibility for the management of the dedicated Open Space area should be addressed. Additionally, the DEIR should evaluate the potential for inclusion of the open space within the Santa Clara County Open Space Authority.

Santa Clara County Parks and Recreation appreciates the opportunity to review and comment on the subject NOP. Please forward a copy of the DEIR to our offices when the document becomes available.

Sincerely,

Mark Frederick

Mark Frederick
Park Planner

cc: David Pierce
file:CPO:4039-93:Hayes

H:\MFmf\CPO\4039

County of Santa Clara

Environmental Resources Agency

Integrated Waste Management Program (408) 441-1198
Pollution Prevention Program (408) 441-1195
1735 North First Street, Suite 275
San Jose, California 95112
FAX (408) 441-0365

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To Jaunell Waldo		From Michael Perry
Co.		Co.
Dept.		Phone # 441-1198
Fax # 279-8537		Fax # 441-0365

TO: Jaunell Waldo
Advance Planning Office

FROM: Michael Perry MP
Integrated Waste Management Program

DATE: April 19, 1994

SUBJECT: Preparation of Draft EIR for Lion's Gate Project

The scope and content of environmental information related to the Integrated Waste Management Program which should be included in the Draft EIR is as follows:

During the planning stage of the project:

- What will be the impact of this construction project on solid waste generation?
- How can solid waste generation be minimized during construction of this project? For solid waste that is generated, how can the impact on landfill capacity be mitigated through recycling and yard waste collection programs?
- What can be designed into the project to minimize solid waste generation by Lion's Gate residents, the golf course, and the clubhouse once the area is inhabited? What can be designed into the project to aid recycling and yard waste collection once the area is inhabited?
- Adequate storage space for recycling containers is required by County ordinance in all new development projects. Provisions should be made to comply with this ordinance.

Once construction is completed:

- Garbage collection/recycling service is mandatory for unincorporated area residences and businesses. Provisions should be made to ensure that upon occupancy of each single family residence (upon close of escrow?) and upon the commencement of business at the golf course and clubhouse, South Valley Disposal and Recycling, Incorporated (the franchised residential and commercial garbage hauler) is notified of new service addresses so service can be initiated.
- Golf course and clubhouse management should make provisions for recycling collection and either on-site composting or collection and transportation of green waste generated by the golf course to a compost processing facility.

County of Santa Clara
Environmental Resources Agency
Land Development Engineering & Surveying Office

MEMORANDUM

Date: March 30, 1994

To: Jaunell Waldo

From: Muriel Fulford

Re: File # 4039-67-28-93 Lion's Gate. Scope of Wor

The section on Water Quality in the above referenced EIR should also contain an assessment of, and mitigations for, the pollution of stormwater that will be generated from the golf course once it is operational. The use of fertilizer, herbicides and pesticides is usually quite heavy in order to maintain a good golfing surface, and these chemicals can cause harm to wildlife and habitat when they are washed into the stormwater and into the receiving waters (in this case Monterey Bay, a wildlife refuge).

The regulating agency that issues National Pollutant Discharge Elimination System (NPDES) permits for the Hayes Valley area is the Central Coast Regional Water Quality Control Board, and a Stormwater Management Plan prepared in compliance with a General Construction Permit must contain measures to control post-construction pollution, as well as control measures to minimize pollution during the construction phase.

Gilroy Unified School District

Serving the Youth of Gilroy Since 1852

7810 Arroyo Circle • Gilroy, California 95020 • Telephone: (408) 847-2700 • Fax: (408) 842-1158

Kenneth A. Noonan, Superintendent

April 26, 1994

Jaunell Waldo
Associate Planner
Advance Planning Office
Environmental Planning Section
County of Santa Clara
East Wing, 7th Floor
70 W. Hedding Street
San Jose, California 95110

Subject: **Response to Notice of Preparation:
Lion's Gate Project, Hayes Valley**

Dear Ms. Waldo:

The Notice of Preparation indicates that school capacity impacts will be addressed as both project-specific public service impacts and as part of the project's cumulative impacts. We will closely review the EIR's analysis of these impacts.

The map provided with the Notice of Preparation did not clearly show whether the residential portions of the proposed project fall in the Gilroy or Morgan Hill school district. This issue should be addressed in much more clarity in the EIR.

The EIR should address the need for a paved bus pull-out or on-site turn around location for school buses.

For information on impacts to the Gilroy Unified School District, please contact me at (408) 847-2230.

Thank you for the opportunity to respond on this project.

Sincerely,

Teresa M. Wenig

Teresa M. Wenig
Director of Facilities & Planning

TMW/mh

LOMA PRIETA
RESOURCE CONSERVATION DISTRICT

8352 Church Street, Suite D
Gilroy, California 95020
(408) 847-4161

April 20, 1994

Jaunell Waldo
County of Santa Clara
Advance Planning Office
Environmental Planning Section
County Government Center
East Wing, 7th Floor
70 W. Hedding St.
San Jose, Ca. 95110

Dear Jaunell,

Thank you for the opportunity to respond to the Notice of Preparation for Hayes Valley Project.

The Board met April 19, for their regular monthly meeting. The preparation of the DEIR was reviewed. The only issue that did not seem to be addressed was the fact that; Some years back, the Gavilan Water District recognized that this site was the only feasible location for a future South County reservoir. We hope that this has been considered in the plan for development. Other than this important issue all other topics seem to be covered.

Thank you,

Patty Marfia

Patty Marfia,
District Clerk

April 21, 1994

To: Jaunell Waldo, Associate Planner
From: Julia Bott/Loma Prieta Chapter, Sierra Club
Re: Lion's Gate Notice of Preparation (file # 4039-67-28-93)

Attached are the Loma Prieta Chapter's comments on the Scope of Work for the Draft Environmental Impact Report to be prepared for the Lion's Gate Project.

Hydrology and Flooding

We are very concerned that the project will also impact ground water levels (and also quality--see below). The Scoping document does not indicate that the project's impacts on ground water levels will be addressed. How will the potential impact of flooding be determined? What impact will the flood mitigation have on ground water? How will this mitigation plan be monitored? Will the funneling of run-off from the impervious surfaces to a storm drain system decrease the natural recharge of the aquifer? How will the potential for this impact be measures? Will all three components of the project be served by San Martin Water Company? Will there be any auxiliary or back-up wells? Will agricultural or residential wells be allowed? What impact will these have on the ground water level?

Water Quality

We are very concerned that the project will also impact the quality of the region's ground water. We do not believe it is adequate to base conclusions upon the statement "The project sponsor indicates....chemicals will be minimized..." The EIR should include an impact analysis of at least 3 detailed chemical management options (high, medium, minimized). What impact will the project have the nitrate problem found in the region's ground water?

We believe that subsurface flow and quality should be monitored as part of the EIR process so as to determine the current status. Further, a continued monitoring plan should be required as part of any mitigation monitoring plan.

Sierra Club • Loma Prieta Chapter
3921 East Bayshore Road, Suite 204
Palo Alto, CA 94303
415 390-8411

Gretchen K. Koch

12835 Coolidge Avenue
San Martin, CA 95046

Telephone (408) 683-4799

Juanell Waldo, Associate Planner
County of Santa Clara, California
Advance Planning Office, Environmental Planning Section
County Government Center, East Wing, 7th Floor
70 West Hedding Street
San Jose, Ca 95110

April 20, 1994

Dear Juanell:

As a neighbor of the projected Lions Gate Project, file # 4039-67-28-93 e proposed project. I am requesting that my concerns be included in the draft environment impact report. My concerns are as follows:

VEGETATION AND WILDLIFE:

1. There will be a loss of the riparian corridor which links Little Llagas Creek (which is not shown on the map I received) to Llagas Creek. The creekbed is lined with native plants, oaks, willow and provides a water source and wildlife corridor. I am also concerned that this major drainage creek will become contaminated with chemical runoff from the golf course lining its banks. Not only will this contaminate the wildlife drinking water it will also eventually drain into the underground LLagas Aquifer which provides water for South County and add tremendously to the ever-increasing nitrate level.

2. The springs shown on the map are critical to the survival of the wildlife in Hayes Valley and should not include housing development /club house/golf course . They should be protected during all phases of the development so there will not be a loss of wildlife. It would appear that no water sources will be available for wildlife and that houses or golf course are planned in all the water areas.

3.When the greens are built the sandy damp soil will encourage grubs, worms, etc. Wildlife will attempt to dig up these greens in search of food. Many golf courses trap or kill the animals in order to protect their major investment. Because this is a remote and rural area there is much wildlife-what will be done to protect them ?

4.. There are golden eagles on the property (and many varieties of raptors in addition to Western Bluebirds, Meadowlarks, Orioles, woodpeckers, flickers, herons, warblers, goldfinches, owls, and other varieties of songbirds) . The original research done was not adequate. A pair of golden eagles was observed last fall by Mr. Hix, his associates, and members of the Audoban Society, Sierra Club, the Native Plant Society and the Live Oaks Association. The eagles were perched on the power lines running close to where the club house is planned - an older bird and an young bird.

In addition, there are many Acorn Woodpeckers near the projected clubhouse area nesting along Little LLagas Creek. There is a huge dead oak tree located near the dirt road that crosses the creek at the West end. A representative of Hix development indicated that they would be removing that tree. That tree is full of thousands of acorns and is a "warehouse" tree for the woodpecker. It's removal could mean the loss of most of the woodpeckers food supply. I would hope this tree could be protected in some manner - it could be of interest to people who visit the area.

5. There are large areas full of oaks that must be at least 200-300 years old. They are located in the area where the golf course is planned. They will not survive the extensive watering of the course and cannot be replaced by seedlings (even though I know Mr. Hix has a "thousand acorns planted in coffee cans just waiting to be planted.") This is the developers idea of mitigating the removal of this old oak forest - it is not appropriate.

6. The valley floor is impassable all winter and much of spring due to large concentrations of water in the soil - it is very much a wetland area.

ZONING

1. .It seems that some reassessment of the lands has been done recently and that the land is being viewed as several separate parcels rather than as a whole - 200 acres agriculture and the remaining lands hillside/ranchland.

It is very misleading to refer to lands as agriculture zoned, hillside/ranchlands zoned and then to allow a commercial non ag. development to occur. The impact to San Martin citizens who have repeatedly said again and again that want to remain a rural area will be immense. This is a large scale commercial development. This golf course is solely intended to draw large numbers of individuals into this rural area forever . The golf course cannot be considered as open space for it will be filled from dawn to dusk with hundreds of golf carts, golfers and lawn mowers not to mention thousands in attendance at tournaments . The valley and hillsides will be graded and forever change the natural topography of this pristine valley.

Perhaps a golf course is appropriately considered Open Space (or greenbelt) in an urban setting but it certainly cannot be considered either when it is built in a remote and rural area that is already "Open" such as the Hayes Valley. This is last wild and natural valley left in South County and the area is currently open space with very limited mowing of wild oats and a very small herd of cattle (35-40) - allowing this valley to become a public or private golf course will set a precedent for all of Santa Clara County. Ranchers and farmers who are anxious to sell will leap on the "golf course" bandwagon and Santa Clara County will have no rural lands left.

2. It is the impression of my neighbors that zoning of parcels in San Martin was restricted to 5 acres or more because it was discovered by the county that homes on smaller parcels did not have enough land mass to adequately handle the septic lines necessary for sewage. It would seem appropriate that all new construction be expected to conform to what all others have done. Again, a precedence will built to allow for smaller (and smaller and smaller) parcels.

3. Who will be responsible for the Open Space? Will this be publicly held? What will it cost in terms of monitoring, etc. and who will pay? Will it be open for all public use? What type of use?

4. All useable lands appear to scheduled for development -this certainly stretches the term "cluster" . The homes are stretched along 200 acres - hardly clustered . In addition, the 100 + acres currently referred to as 5 "20 acre parcels" seems misleading. . As a neighbor and Co-Chairman of C.A.R.E.S. I am concerned that these remaining acres will be resubdivided again and again at some future date depending upon who is elected County Supervisor in the future. Since the developer is not planning to request a General Plan Amendment it would seem prudent to bring all remaining lands into a county controlled open space area. so the issue of rezoning this parcel is not raised again. It would also seem more appropriate to build houses and the golf course at the Watsonville end of the valley. This area has no riparian corridor but is generally a flat wild oat field.

Introduction of this golf course will forever urbanize all of West San Martin.

FIRE/POLICE/SAFETY

1. They are planning to build houses around the golf course and up into the hillsides. This is a major fire area, the west hillsides having burned 3 times in the last 13 years. The addition of thousands of golfers and tournament viewers with access to the dry lands will increase the fire danger tremendously. There appears to be only one public exit off Highland Ave - this is not adequate should a fire burn again in the Turlock/Highland area. Lives could be lost.

2. I do not believe the county or state has adequate manpower or equipment to protect the 55 planned homes or the golfers. Can you imagine someone tossing a cigarette out onto the dry hillsides on a windy day with the wind blowing from the South. The only exit would be for all the homeowners, golfers, staff to try and exit onto Highland Ave. while fire personnel are trying to enter at the same point . The steep valley hillsides will not allow escape by vehicle. Will the developer provide for additional manpower and equipment necessary to contain a fire of any magnitude in this valley.

3. There is very limited sheriff/highway patrol manpower available now. The addition of thousands of cars and people into this rural area will certainly increase crime, traffic problems, and accidents. Who will provide increased protection/ traffic management/fire safety & inspection - we need more safety officers now, we need safe places for our children to walk while they are going to and from the bus stop, we need safe places for bicyclists and horsebackriders. Coolidge and Highland were safe "pedestrian areas until Santa Teresa was cut through - There must be some plan for additional protection without further cost to a county and state already under a heavy burden. Will this create the necessity of widening and extension of Santa Teresa Blvd? This will create a whole new set of problems for local residents.

WATER/CONTANIMATION

1. Whose small wells will dry up when the golf course draws down the water from the Llagas Aquifer?

2. What will prevent contamination of the watershed/creek/underground aquifer?

3. Those of us who receive our water from the West San Martin Water Company have only 2" pipes connecting to our homes - not considered adequate for fire safety. Will we have loss of pressure if larger pipes are connected to the present system? Will we have loss of pressure when they are watering the course?

4. In the drought years we were never asked to conserve our water (although we certainly did). If a golf course is allowed with its massive water use will all be expected to cut back on current water use?

5. Citizens of Gilroy had to use alternate days to water and were expected to conserve water during these drought years. Many were fined and the city had a "water patrol". Since the golf course will be drawing water from the same source that Gilroy draws its water how will the citizens be affected? Since approval of the golf course would indicate that there is ample water will county officials make sure Gilroy citizens are no longer fined or expected to conserve? Who will monitor water use?

6. The current owner/builder may promise that there will be protection of the water system for small well owners, others connected to the W. San Martin Water Co. system, Gilroy citizens, etc. but what protection will be in place when he sells? Who will monitor this?

7. It is my understanding that the county has a study in progress to try and determine the cause and sources of all the nitrate contamination in South County and in particular the LLagas undergound aquifer.. Since this golf course will not only draw vast amounts of water from it but will also constantly contaminate it (a very vicous circle) - it would seem prudent that this project be delayed until the nitrate contamination study is completed.

TRAFFIC

1. Assuming that this course will draw as many players as San Jose Muni or Santa Teresa Golf course the traffic would be horrendous! Both San Jose Muni and Santa Teresa have approximately 105,000 rounds of golf played on each course per year. Most golfers "meet" at the course to play . It appears that the course/development has been designed so all traffic enters at Highland & Turlock - there needs to be access from Watsonville Road also. How many 10's of thousands of trips per day will be added to this little rural road. Compared to the traffic Highland and Turlock have now (and Coolidge also) what percentage increase can we expect for traffic/accidents/etc. The widening of Coolidge will only create greater risk for those who must walk in its ditches. Most of us living here have had many near misses since Santa Teresa was cut through. There is constant speeding and the Highway Patrol does not have enough manpower to monitor the area except on rare occasions.

INDIAN BURIAL GROUNDS

1. It is my understanding that local residents have been finding human bones washed down Little Llagas Creek for years. In addition, pottery and Indian artifacts have also been found. I believe there are Indians buried all along the riparian corridor. I do not believe the Indian Community has been notified of this and feel they should be included in this process.

I would hope the riparian corridor and old oak forest and all springs and water sources could be part of the Open Space , publically held and protected forever.

April 21, 1994
Julia Bott/Loma Prieta Chapter, Sierra Club
Lion's Gate Notice of Preparation (file # 4039-67-28-93)

Vegetation and Wildlife

What protocol and other study parameters were used? We request that these be included in the EIR. What does "focused" surveys mean? Have studies occurred in all 4 seasons? Have studies occurred over more than one year? Have local residents been contacted for their wildlife observations? Have any wildlife corridors been identified? Will the studies include migratory habits of the region's animals?

Traffic

The traffic study should analyze impacts from all approaches (i.e. off Watsonville Rd and off Highland). Review should include assessing the impacts of each of the above as both primary and secondary approaches. How will number of car trips be determined?

Air Quality

What does project generated traffic mean? Does it include all maintenance vehicles for the course?

Noise

Ambient (before project) noise levels should be measured. The project should be compared to this as well as to "adopted County standards for maximum acceptable noise levels."

Hazardous Materials and Safety

What are the management, storage and clean-up contingency plans for the course chemicals? What storm water run-off mitigations will be in place to reduce non-point source pollution?

Public Utilities and Services

Has the water supply of the San Martin Water Company been proven adequate to back up the stement "Water supply... is expected to be provided by the San Martin Water Company." Is there a contract on file? What plans are proposed 'r contingency or auxiliary wells?

'ddition to the impacts on public services "response time," what are the ntial increased demands on the County's budget?

April 21, 1994
Julia Bott/Loma Prieta Chapter, Sierra Club
Lion's Gate Notice of Preparation (file # 4039-67-28-93)

CEQA

Project Alternatives -- In addition to the 5 categories listed as project alternatives, we believe that discussion on impacts should be broken down by each of the three components: residential cluster; golf course; agriculture parcels.

Cumulative Impacts -- Will the potential for future developments be included the cumulative impacts analyses?

Growth Inducement -- It is too early to conclude that "this discussion will likely conclude that the project would not cause significant growth inducement." What methods will be used to determine the growth inducing impacts?

Greenbelt Alliance
PEOPLE FOR OPEN SPACE

April 27, 1994

Juanell Waldo
Associate Planner
Santa Clara County Advance Planning
70 W. Hedding
San Jose, CA 95110

Dear Juanell:

Greenbelt Alliance has the following comments on the Scope of Work for the Lion's Gate Environmental Impact Report.

Growth inducing impacts:

Golf course developments have often resulted in significant residential and commercial development over time. Golf courses draw a large number of players throughout the year and areas directly surrounding golf courses are highly desirable for residential development. Without a permanent conservation easement on the golf course property, the potential for further development is significant. Even if the original use permit for the golf course includes only a few ancillary buildings, the owner can clearly ask for changes to the use permit at a future date. Without a permanent conservation easement, the odds are not good that the golf course, over the long run, will remain as a low-intensity, low-impact use. This proposal also has the clear potential to induce growth on neighboring parcels.

We therefore respectfully disagree with the statement in the Draft Scope of Work which states that "Since the project would be in conformance with all County General Plan policies, and would occur in a virtually enclosed valley, this discussion would likely conclude that the project would not cause significant growth inducement."

On-site environmental impacts:

Hayes Valley is an environmentally sensitive and aesthetically beautiful area. A golf course and housing development in the Valley and a portion of the hillside area very likely will pose major environmental impacts. Of particular concern are:

- impact on the overall watershed system including Llagas creek and the riparian corridor, the natural spring and underground water quality

- impact on the water supply locally as we are headed into another dry year

- impact on wildlife corridors and habitat areas

In addition, this proposal should also comply with the recommend new policy in the County General Plan which states that:

"Privately-owned recreational land uses and facilities within rural unincorporated areas, including but not limited to golf courses... should not be approved unless compatable with

continued

the landscape and resources in the areas in which they are proposed. Potentially significant environmental impacts often associated with such land uses should be avoided or reduced to less than significant levels, including:

a. water supply demand;
b. traffic generation;
c. waste water generation and disposal;
d. alteration of natural topography, drainage patterns, habitat or vegetative cover;
e. application of harmful chemicals, such as pesticides and herbicides;
f. riparian area or heritage resources impacts; and
g. loss of prime soils or other significant impacts upon the viability of local agriculture."

This new policy provides extra assurance than golf courses are environmentally sound and appropriate to the area in which it is proposed.

Thank you for the opportunity to provide our comments. We would like to receive a copy of the draft EIR when it is completed.

Sincerely,

Vicki Moore

Vicki Moore
South Bay Field Director

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
Sacramento Field Office
2800 Cottage Way, Room E-1823
Sacramento, California 95825-1846

In Reply Refer To:
1-1-94-TA-865
PPN 1493

April 19, 1994

Ms. Juanell Waldo
Advance Planning Office
Planning Department
County Government Center, East Wing
70 West Hedding Street
San Jose, California 95110

Subject: Notice of Preparation for Lion's Gate Project, Santa Clara County, California (SCL number 4039-67-28-93)

Dear Ms. Waldo:

This responds to the Notice of Preparation for the proposed Lions Gate project (NOP), Santa Clara County, California. It is our understanding that the site is located in Hayes Valley on the east side of Watsonville Road between the towns of Morgan Hill and Gilroy. The U.S. Fish and Wildlife Service is concerned about the potential impacts of this project on the threatened bay checkerspot butterfly (*Euphydryas editha bayensis*), several proposed and candidate plant and animal species, and wetlands. The butterfly is fully protected under the Endangered Species Act of 1973, as amended (Act). The comments and recommendations in this letter are based on the NOP, dated March 25, 1994, which was received on March 31, 1994.

It is our understanding that the proposed project consists of a residential development on the approximately 1200-acre site. The project also includes an 18-hole golf course and five 20-acre parcels that will be designated for medium scale agriculture. The habitats occurring at the project site include serpentine and annual grasslands, woodlands, and wetlands.

Regarding fish and wildlife resources, the draft environmental impact report (DEIR) should assess fully the impacts of the proposal and its alternatives on species populations and their habitats, with emphasis on wetlands and endangered, threatened, or candidate species. The DEIR should state clearly the purposes of, and document the needs for the proposed project so that the capabilities of the various alternatives to meet those purposes and needs can be determined readily. The DEIR should include a thorough description of all the facilities to be constructed as part of the proposal. Figures accurately depicting proposed project features in relation to natural features in the project areas also should be included.

Section 9 of the Act prohibits the "take" of any federally listed species by any person subject to the jurisdiction of the United States. As defined in the Act, take means to "...to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." "Harm" has been further defined to include habitat destruction when it kills or injures a listed species by interfering with essential behavioral patterns, such as breeding, foraging or resting. Indirect adverse impacts, such as construction of buildings, roads or fences, that interrupt or prohibit the movement patterns of a listed butterfly species could be considered "take" by the Service. The term person is defined as "an individual, corporation, partnership, trust, association, or any other private entity; or any officer, employee, agent, department, or instrumentality of the Federal government, of any State, municipality, or political subdivision of a State, or any other entity subject to the jurisdiction of the United States."

Take incidental to an otherwise lawful activity may be authorized by one of two procedures. If a Federal agency is involved with the permitting, funding, or carrying out of the project, then initiation of formal consultation between that agency and the Service pursuant to section 7 of the Act is required if it is determined that the proposed project may affect a federally listed species. Such consultation would result in a biological opinion that addresses the anticipated effects of the project to the listed species and may authorize a limited level of incidental take. If a Federal agency is not involved with the project, and a federally listed species may be taken as part of the project, then an incidental take permit pursuant to section 10(a) of the Act would need to be obtained. The Service may issue such a permit upon completion of a satisfactory conservation plan for the listed species that would be affected by the project.

The larvae of the bay checkerspot butterfly feed on *Plantago erecta* and *Orthocarpus* species. The adults feed on the nectar of a number of flowering plant species. Populations of the bay checkerspot butterfly are found in the project area. The Service recommends that all serpentine grassland be mapped accurately, along with the locations and approximate numbers of the foodplants of the larvae and adult nectar sources of the threatened bay checkerspot butterfly. In addition, a qualified entomologist should conduct an adequate survey for the butterfly during its activity period. The scope of work should be reviewed and approved by the Service. The Service recommends avoidance of destruction or damage to any areas containing suitable habitat and potential movement corridors. If the project does not avoid adverse impacts to this species and its habitat, authorization for incidental take of the bay checkerspot butterfly should be obtained under section 7 or 10(a).

The Service is especially concerned about potential impacts of proposed projects on the California tiger salamander (*Ambystoma californiese*). This Federal candidate species is reported to inhabit the project site. The Service has been petitioned to list this amphibian as an endangered species. A 90-day finding has been made that indicates substantial information exists indicating the petitioned action may be warranted. We anticipate making a 12-month finding in the near future. Mitigation for the California tiger salamander must take into account the different biological and ecological requirements of the aquatic early stages and largely terrestrial adults.

Failure to adequately consider either of these life history stages may lead to elimination or a reduction of population of these animals. Mitigation for these animals should also be evaluated in a larger regional context that will ensure the long-term viability of salamander populations throughout southern Santa Clara County and surrounding areas even with future projects, including residential development.

Potential adverse impacts to candidate species for future Federal listing should be addressed adequately in the environmental document. Further information should be provided on the status of all of these species that may be found at the project site. We have included a list of listed, proposed, and candidate species that may be found in the project area with this letter. Although candidate species are not protected, the 1988 amendments to the Act require the Service to monitor their status. If any of these candidates decline precipitously, they could be listed under an emergency basis. The Service recommends that adequate surveys be conducted during the proper flowering or activity period. The findings of the surveys and measures that will be taken to avoid/mitigate any adverse impacts to these species should be included in the environmental documents. In addition, as part of a settlement agreement for a lawsuit brought by environmental groups, the Service will be issuing proposed rules in the near future to list a number of category-1 candidate animal and plant species, including some or all of those in the project area.

The Service also is concerned about the impacts of this proposed project on the burrowing owl (*Athene canicularia*). The owl is a State listed Species of Special Concern with protection under the Migratory Bird Treaty Act. We recommend the project site be surveyed using California Department of Fish and Game protocol by a qualified biologist for this species. The findings of the survey and measures that will be taken to avoid/mitigate any adverse impacts to the burrowing owl should be included in the environmental documents.

Please contact Chris Nagano at the letterhead address or at 916/978-4866 if you have any questions.

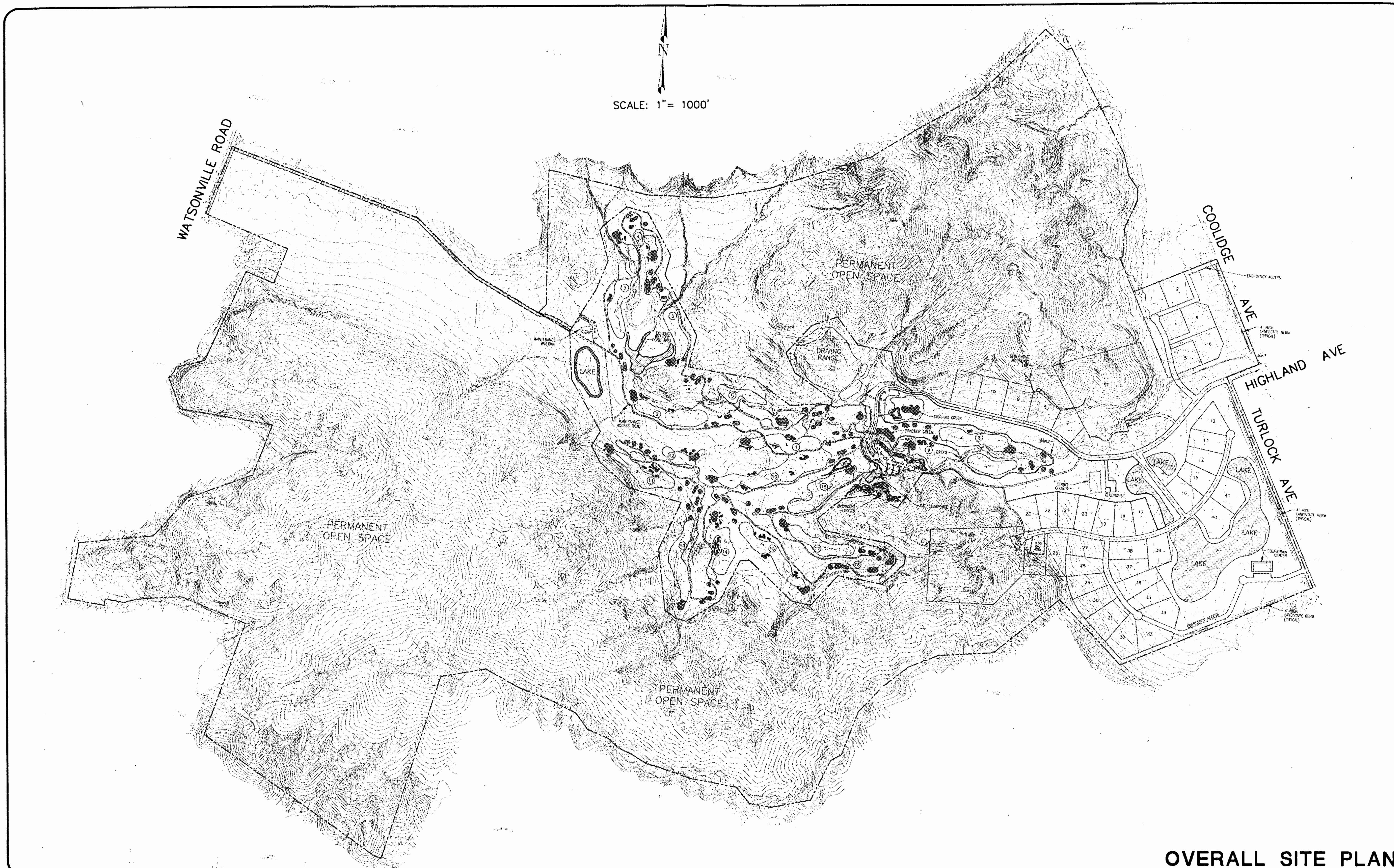
Sincerely,

Cay C. Gonda

for Dale Pierce
Acting Field Supervisor

attachment

cc: COE, San Francisco, CA (Attn: S. Mooreland)
CWQCB, Oakland, CA (Attn: W. Bruhns)
CDFG, Sacramento, CA (Attn. D. Warenycia)
CDFG, Yountville, CA (Attn: J. DeWald)
CDFG, Yountville, CA (Attn: C. Bean)
DOI, SOL, San Francisco, CA (Attn: R. Kohn Glazer)
FWS: LE, Chico, CA (Attn: Special Agent J.G. Mendoza)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SCALE: 1"= 1000'
WATSONVILLE ROAD
PERMANENT OPEN SPACE
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COOLIDGE AVE
HIGHLAND AVE
TURLOCK AVE
OVERALL SITE PLAN

FIGURE 9a

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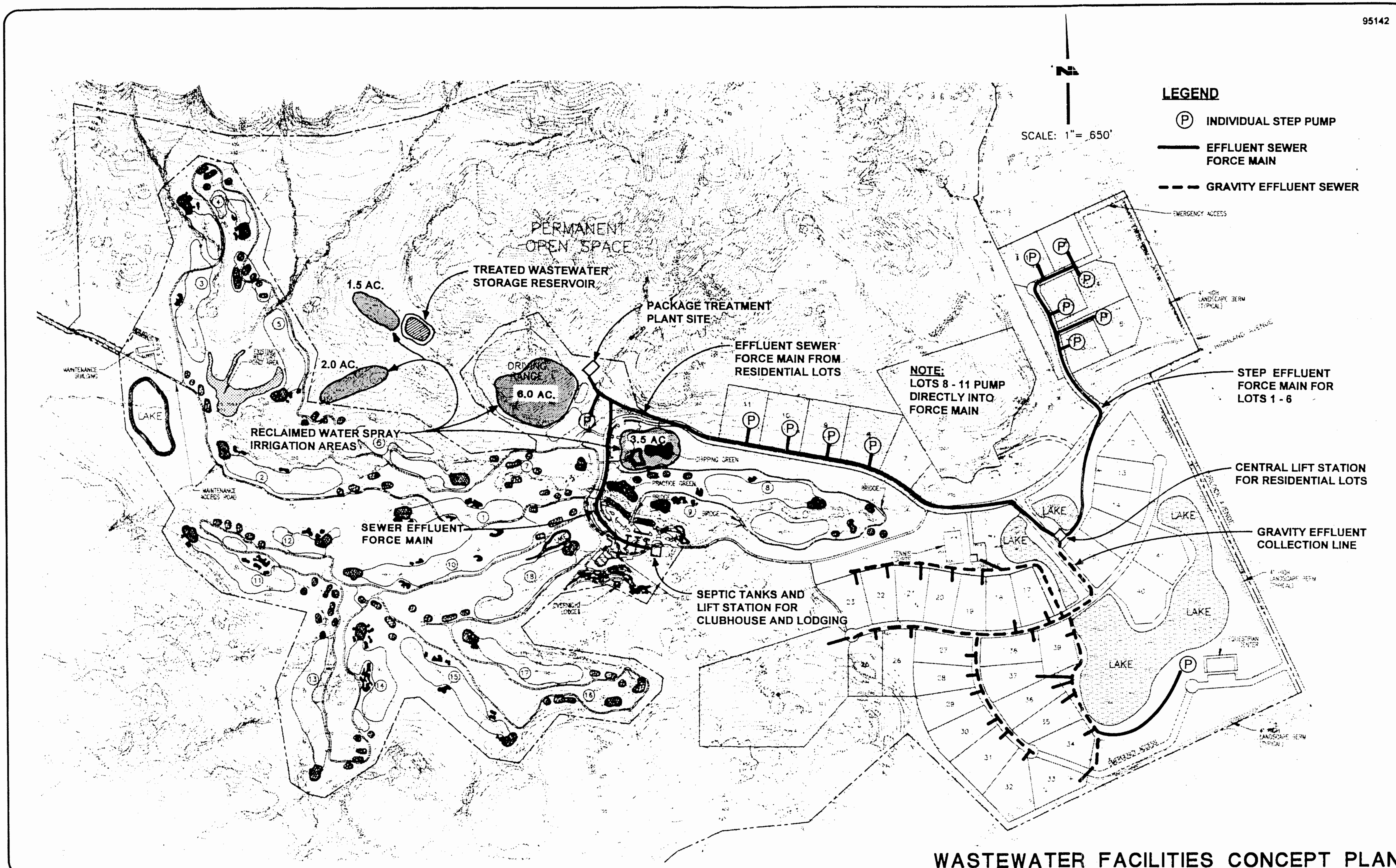

WASTEWATER FACILITIES CONCEPT PLAN

Source: Questa Engineering

FIGURE 23