Appendix A

Area Specific Management Directives

BELLA LAGO

AREA-SPECIFIC MANAGEMENT DIRECTIVES

Prepared for
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and

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February 2003

A. INTRODUCTION

The purpose of this document is to provide guidance to land managers, biologists and residents of the Bella Lago development project regarding management of open space lands required to be preserved as a condition of approval of the residential project. The open space within the Bella Lago development is a part of a region wide habitat conservation planning effort called the Multiple Species Conservation Program (MSCP). The MSCP Subarea preserve in the City of Chula Vista will be assembled largely through dedications of open space land in conjunction with the development entitlement process. The boundaries of the MSCP preserve in the City have been identified through a combination of: (1) project by project evaluation of habitat and species data conducted as part of project entitlement processing, project environmental review as part of the California Environmental Quality Act, and evaluation by the state and federal wildlife agencies and (2) as a result of compliance with regional and subregional wildlife and habitat distribution and habitat preserve design elements.

In Chula Vista, the majority of the MSCP preserve will be comprised of areas designated for 100% conservation in association with "Covered Projects" such as Bella Lago. Covered Projects are development projects that provide biological open space consistent with the goals and objectives of the MSCP Framework Plan for incorporation into the Chula Vista preserve system. The Bella Lago MSCP preserve area ("preserve area") is the result of negotiations between the developer, the wildlife agencies and the City of Chula Vista. Authorization for the incidental take of listed species (both federal- and state-listed) will be based on the assured dedication of the preserve area related to the project and implementation of project-specific mitigation programs and specific management directives consistent with those defined in the City of Chula Vista MSCP Subarea Plan. According to the Subarea Plan, Covered Projects will not be subject to the City's Habitat Loss and Incidental Take Permit Ordinance or any other additional mitigation or land preservation requirements beyond those that have been incorporated into the Bella Lago project approvals.

Development of Bella Lago will result in approximately 86.5 acres of on-site preserve area being dedicated to the preserve out of a total of approximately 180 acres of land. Approximately 2.5 additional acres will be added to the preserve off-site, , for a total of 89 acres preserved. It is anticipated that the San Diego National Wildlife Refuge will eventually take title to the preserve area and be responsible for long-term management. Alternatively, the City of Chula Vista or other appropriate management entity would provide long-term management of the preserve area. The Bella Lago Homeowners Association or its designee will be responsible for management of the interface between the developed and preserve areas.

Contained within this document are the Area-Specific Management Directives (ASMD) for the Bella Lago project, as required by the Chula Vista MSCP Subarea Plan. The ASMD is comprised of specific mitigation programs and management procedures that are designed to maintain the habitat value within the open space areas. The ASMD is based on the known or potential presence of sensitive species and the associated conditions of coverage in the Chula Vista MSCP Subarea Plan.

B. SITE DESCRIPTION AND PHYSIOGRAPHY

Bella Lago lies north of Proctor Valley Road and sits at the southern base of San Miguel Mountain contiguous with the San Diego National Wildlife Refuge. The site is located on the north side of Proctor Valley Road where a gentle slope starts climbing the south face of San Miguel Mountain. The most distinct landmarks are the SDGE transmission lines which traverse the southern portion of the property and a group of about three Eucalyptus trees growing just at the inside of the elbow of the "L" shaped property. (See Figure 1, Regional Project Location, and Figure 2, Project Location on USGS 7.5' Jamul Mountains Quadrangle.)

Access to the property is currently via an unnamed dirt road off of Proctor Valley Road. There is currently no adjacent development, although development activities are proceeding to the west. To the south and west is the Rolling Hills Ranch property. To the north is the south slope of San Miguel Mountain, and Proctor Valley extends to the east within the County of San Diego. The property has never been developed; historically, small numbers of cattle occasionally grazed on the property, but there was never a long-term intensive grazing program on the property. The majority of the property is covered with native grasslands intermixed with coastal sage scrub species. (See Figure 3, Biological Resources).

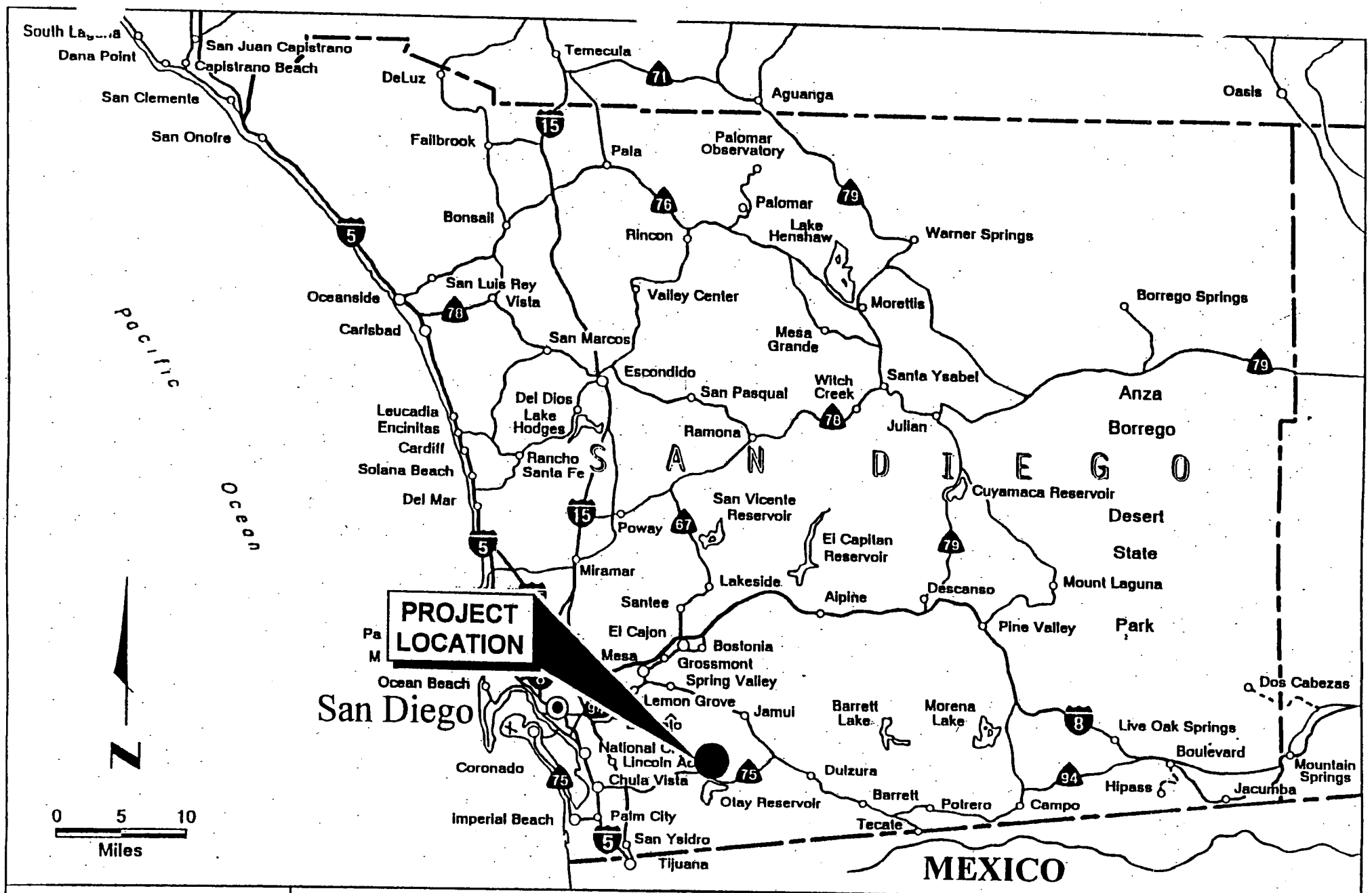
The property is generally a large gently sloping plain. Portions support a mima-mound like topography, but there is no evidence of vernal pools on-site. In the northwest corner where it ascends about 300 feet up San Miguel Mountain, the topography is much steeper. At the base of this slope is an unnamed drainage, shown as an intermittent blue line stream on the Jamul Mountains 7.5' USGS Quadrangle (see Figure 2). The northeastern corner of the property includes a much smaller drainage. There are two large rock outcroppings southwest of the smaller drainage. (See Figure 4, Aerial Photograph with Project Site Boundaries).

Soils mapped on-site include San Miguel-Exchequer rocky silt loams, 9-70% slopes; Olivenhain cobbly loam, 2-9% slopes; Olivenhain cobbly loam, 9-30% slopes; and Diablo clay, 2-9% slopes.

C. BIOLOGICAL RESOURCES

In 1997, biological surveys were conducted on the Bella Lago site. The purpose of the resulting biological resources report was to establish a baseline inventory of the biological resources on the site, and to assess potential impacts of a conceptual development plan prepared for the property. Over the next five years, additional fieldwork was done on the Watson-McCoy site and an adjacent 18-acre parcel known as the Clarkson-Turner property. Together, these parcels comprise the entire 179.6-acre Bella Lago property.

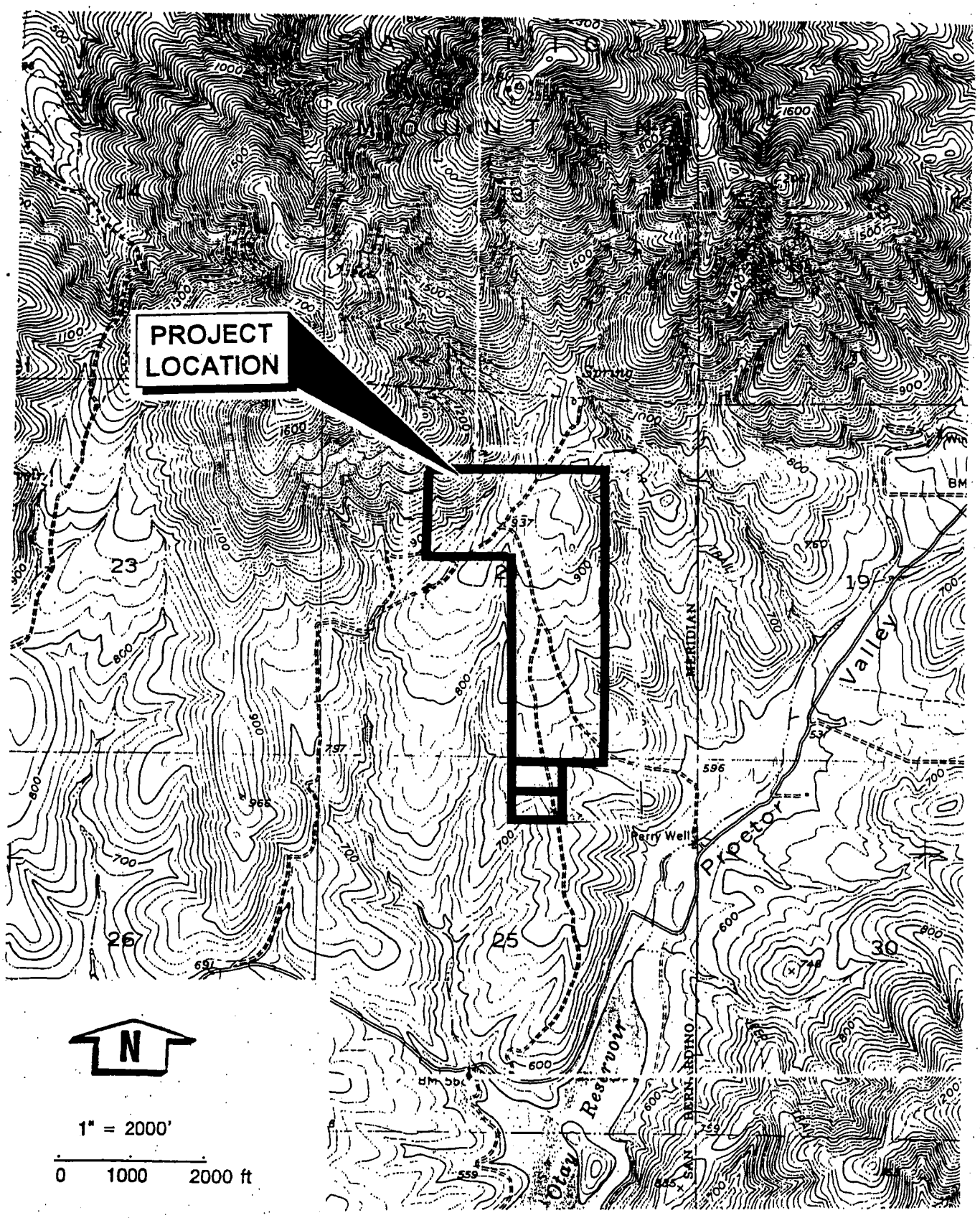
Emphasis was placed on looking for all Multiple Species Conservation Plan (MSCP) narrow endemics which might occur on-site, as well as sensitive species listed by San Diego County and the California Native Plant Society (CNPS). Protocol surveys were conducted for the federal-listed Threatened coastal California gnatcatcher (*Polioptila californica californica*) and the federal-listed Endangered Quino checkerspot butterfly (*Euphydryas editha quino*).



Affinis
Shadow Valley Center
847 Jamacha Road
El Cajon, CA 92019

REGIONAL LOCATION IN SAN DIEGO COUNTY

FIGURE 1



Affinis Shadow Valley Center 847 Jamacha Road El Cajon, CA 92019	**PROJECT LOCATION ON USGS 7.5' JAMUL MTNS QUADRANGLE**	**FIGURE 2**

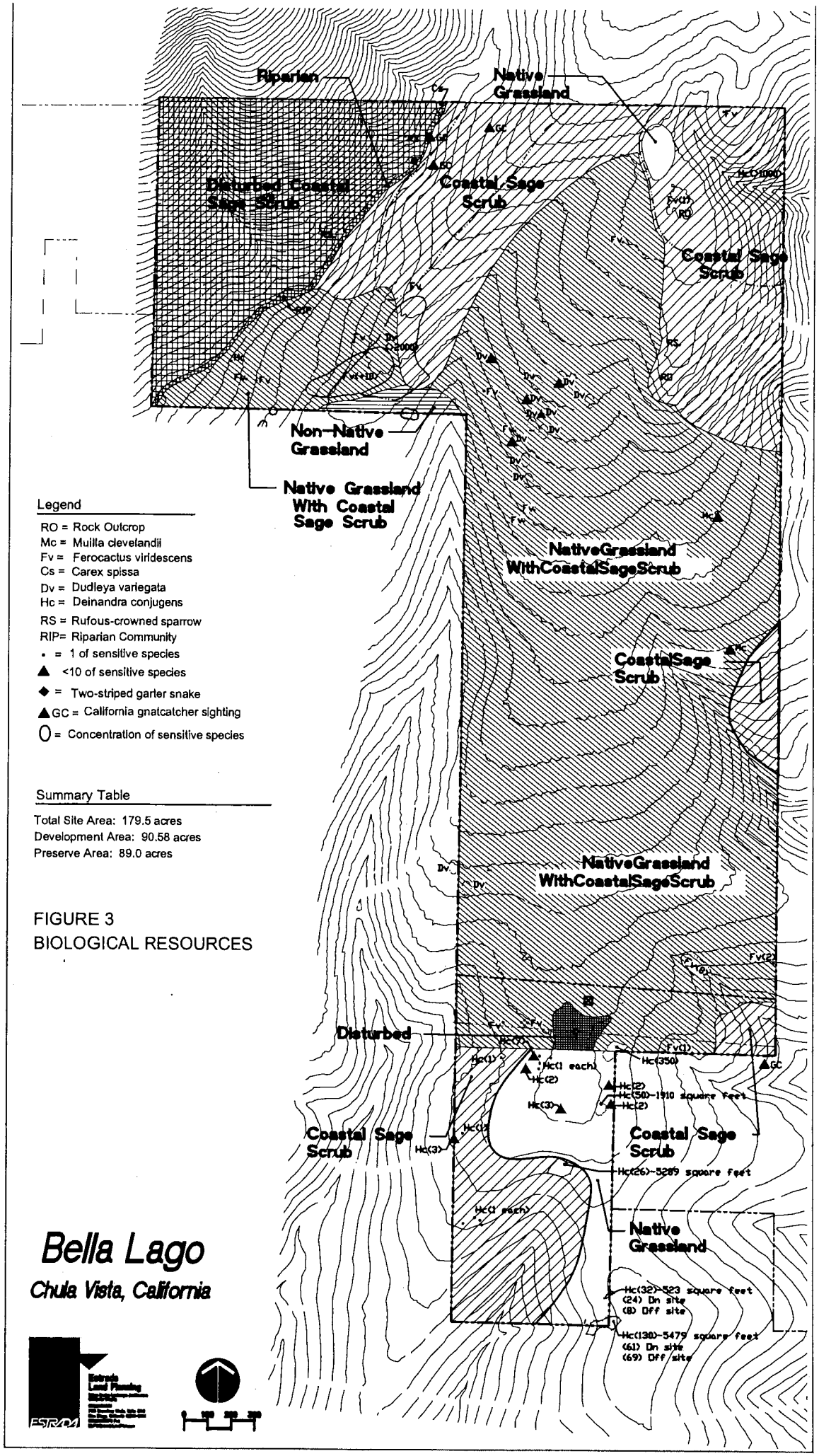


FIGURE 3
BIOLOGICAL RESOURCES

Bella Lago

Chula Vista, California



FIGURE 4

AERIAL PHOTOGRAPH
WITH PROJECT SITE BOUNDARIES

Focused surveys were also conducted to map and quantify populations of the narrow endemic species variegated dudleya (*Dudleya* variegata), and the state-and federal-listed Otay tarplant (*Deianandra [Hemizonia] conjugens).*

1. Vegetation

Six habitats occur on the property; these are summarized in Table 1.

The site is dominated by native grassland, mostly purple needlegrass (*Nassella pulchra*). Some exotic grasses such as wild oat (*Avena* sp.) occur along the margins of the native grasslands where they border dirt roads. There are a small number of coastal sage-affiliated shrubs which are intermixed with the grasses, including coast sagebrush (*Artemisia californica*), buckwheat (*Eriogonum fasciculatum*), and bladderpod (*Isomeris arborea*). This habitat was mapped as native grassland/coastal sage scrub, totaling approximately 101.7 acres on-site, although it should be noted that there has been a marked increase in non-native grasses since first evaluate in 1997.

Approximately 47.2 acres of coastal sage scrub, dominated by coast sagebrush, buckwheat, laurel sumac (*Malosma laurina*), and coast goldenbush (*Isocoma menziesii* var. *menziesii*), occur primarily in the northern portion of the property (Figure 3). The coastal sage scrub supports a large component of purple needlegrass as well as populations of several sensitive plant species (*Muilla clevelandii*, *Dudleya variegata*, and *Ferocactus viridescens*; see Section 3 below). Large rock outcrops are also present in the coastal sage scrub in the northeastern corner of the property.

Table 1. Habitat Types Occurring On-Site

Habitat Type	Total Acres	Acres Preserved
Native grassland/ coastal sage scrub	101.7	34.2
Coastal sage scrub	47.2	29.3
Disturbed coastal sage scrub	20.2	20.2
Riparian	0.8	0.8
Non-native grassland	1.0	1.0
Native grassland	7.9	0.6
Disturbed	0.8	0.4
Total	179.6 acres	86.5 acres

Areas where the dominant habitat is coastal sage scrub with a large component of exotic species were mapped as disturbed coastal sage scrub (Figure 3). The exotics are primarily grasses, particularly dense areas of wild oat. Approximately 20.2 acres were mapped on the slope of San Miguel Mountain. There are also many rock outcrops of varying sizes on the slope.

Riparian habitat is associated with the intermittent stream running northeast to southwest in the northwestern portion of the property (Figure 3). The habitat is dominated by dense San Diego marsh elder (*Iva hayesiana*) along the entire length of the stream, with occasional spiny rush (*Juncus acutus*). During the surveys, small pools of water were observed in the rockier portions of the drainage. Immediately north of the property a patch of southern willow scrub occurs along the stream, but the 0.8-acre of riparian habitat on-site lacks the willows, mulefat, and other species commonly associated with riparian areas.

A small area of non-native grassland (1.0 acre) occurs near the Eucalyptus trees on-site (Figure 3). This area is grown to exotic grasses, with little or no native vegetation present. Approximately 7.9 acres of native grassland, dominated by purple needlegrass, occurs on the Clarkson-Turner parcel. Otay tarplant (*Deinandra conjugens*) is also found in this area (see Section 3). A disturbed area, totaling about 0.8 acre, is in the extreme southern portion of the property. This area is associated with the SDGE right-of-way and is essentially barren.

2. Wildlife

A total of 22 bird species, 4 reptiles, and 4 mammals or signs of mammals were observed during the surveys. The property is used by both common and sensitive species.

The most common bird species observed were grasshopper sparrows (*Ammodramus savannarum*), meadowlarks (*Sturnella neglecta*), and horned larks (*Eremophila alpestris*). Other avian species associated with open areas observed include white-tailed kites (*Elanus caeruleus*), golden eagles (*Aquila chrysaetos*), and Cassin's kingbirds (*Tyrannus vociferus*).

Two lizard and two snake species were noted on the property. Western fence lizards (*Sceloporus occidentalis*) and side-blotched lizards (*Uta stansburiana*) were observed in coastal sage scrub, disturbed coastal sage scrub, and native grassland habitats. A western Pacific rattlesnake (*Crotalus viridis*) was heard in dense brush near the largest rock outcrop. A two-striped garter snake (*Thamnophus hammondii*) was observed in a pool of standing water in riparian habitat.

Mammals identified by sign included mule deer (*Odocoileus hemionus fulginatus*) and coyote (*Canis latrans*). Mounds of pocket gopher (*Thomomys bottae*) were noted and Audubon's cottontails (*Sylvilagus audubonii*) were seen. Many small rodents of the genera *Peromyscus* and *Microtus* would also be expected on the property. There is the potential for larger carnivores such as bobcats (*Lynx rufus*) and mountain lions (*Felis concolor*) to use the site on occasion.

No amphibians were observed during the survey, but the pools in the riparian habitat could support species such as California chorus frog (*Pseudacris regilla*).

3. Rare or Endangered Species

Narrow Endemics. Narrow endemics are species with restricted geographic ranges, due to specific soil or habitat requirements. These species are highly susceptible to

habitat loss. Each MSCP subarea plan is required to address specific conservation measures for the narrow endemics. Avoidance is the preferred method, with unavoidable encroachment not exceeding 20%. The allowed encroachment is determined by the sensitivity of the species and the population size. Two narrow endemic plant species were observed on the property.

A major population of variegated dudleya (*Dudleya variegata*), with several thousand individuals, was observed in the northwestern portion of the property (Figure 3). Scattered smaller populations, ranging from a single plant up to about 2,000 individuals, were seen to the south and east of the largest population. Variegated dudleya is a federal Species of Concern, a narrow endemic, and is a covered species under the MSCP.

Otay tarplant (*Deinandra [Hemizonia] conjugens*) is a federal-listed Threatened and state-listed Endangered species. It is also a narrow endemic and MSCP covered species. One individual plant was observed in the northwestern portion of the site on the Watson-McCoy parcel (Figure 3). Several populations, totaling 540 plants, were mapped on the Clarkson-Turner parcel. Otay tarplant is generally restricted to the Otay Mesa and Otay Mountain areas of San Diego County. On the Bella Lago site, it occurs only on two areas of Diablo clay soils. Otay tarplant is a covered species under the MSCP.

San Diego goldenstar (*Muilla clevelandii*) is California Native Plant Society (CNPS) List 1B species (rare or endangered in California and elsewhere) which occurs in two large populations on-site (Figure 3). In the northeastern part of the property, there is a significant population of over 1000 individuals. A smaller population of about 300 scattered individuals is in the north-central part of the property. Two smaller populations (less than 10 individuals) are along the eastern side of the site. One plant was found on the Clarkson/Turner property during the June 2, 1999 survey. San Diego goldenstar is a covered species under the MSCP.

Coast barrel cactus (*Ferocactus viridescens*) is also an MSCP covered species, and a CNPS List 2 species (rare in California, but more common elsewhere). There are many scattered individuals and small populations throughout the site, but the majority occurs in the northwestern portion of the property.

Other Sensitive Plant Species. San Diego marsh elder (*Iva haysiana*) is a CNPS List 2 species. It occurs throughout the drainage in the northwestern portion of the site.

Munz's sage (*Salvia munzii*) is a CNPS List 2 species. A single individual was seen growing on the largest rock outcropping on the site.

Western dichondra (*Dichondra occidentalis*) is a CNPS List 4 species (plants of limited distribution). Dichondra was observed in the disturbed coastal sage scrub on the slopes of San Miguel Mountain.

San Diego sunflower (*Viguiera laciniata*) is a CNPS List 4 species. It occurs commonly throughout the southern half of San Diego County and was found throughout the property.

Palmer's grappling hook (*Harpagonella palmeri*), a CNPS List 4 species, was noted on a

portion of the property during the 2001 surveys for the Quino checkerspot.

Ashy spike moss (*Selaginella cinerascens*) was formerly a CNPS List 4 species, but it has been removed from the list as it is now considered too common. This occurs abundantly on the property especially in coastal sage scrub habitat.

Animals. Seven sensitive wildlife species were observed on the property. Additionally, the host plant for the federal-listed Quino checkerspot butterfly occurs on site.

Species Identified by the MSCP. Golden Eagles (*Aquila chrysaetos*), a CDFG Species of Concern, were observed foraging on the property. An historic nest site in the project vicinity was discovered in the early 1900's by one of four known eagle egg collectors at that time. Chicks have been produced from this nest in recent years. Golden eagles are a MSCP covered species.

A pair of golden eagles was seen on various occasions flying overhead during two surveys. One eagle was observed catching prey on-site. Approximately 15% of the property is within 4,000 feet of the known nest location. Due to the vulnerability of nesting chicks to poachers, additional details are in a confidential appendix provided to the City of Chula Vista.

California gnatcatchers (*Polioptila californica californica*), a federal-listed Threatened species, were observed in coastal sage scrub habitat on and adjacent to the property. During the first survey, one family group was observed in the northwestern portion of the property in disturbed coastal sage scrub adjacent to the riparian habitat. The male from this family group was observed in coastal sage scrub east of the riparian area and was also seen during the third survey. During that survey, a single adult gnatcatcher was seen about 10 feet south of the property near the southeastern corner of the site; its sex was indeterminate. A family and a pair of gnatcatchers were observed during the June 2nd, 1999 survey on the Clarkson/Turner parcel. California gnatcatchers are a covered species under the MSCP.

Rufous crowned sparrows (*Aimophila ruficeps canescens*) were identified at several locations on the property. They are associated with coastal sage scrub. They are a CDFG Species of Concern and are a covered species in the MSCP.

Sign of mule deer (*Odocoileus heminous*) was found on the parcel. While not considered sensitive, the MSCP identifies this species as needing protection for aesthetic and intrinsic value, as it is the only large herbivore remaining in local habitats. The mule deer is a MSCP covered species.

As noted above, protocol surveys for the federal-listed Endangered Quino checkerspot butterfly (*Euphydryas editha quino*) were conducted in 1998, 1999, and 2001. Although the 1998 survey was rejected by the wildlife agencies and 1999 was not considered an optimal year for detecting Quino, all three surveys were negative. The 2001 survey report is attached as Appendix 7 to the Biological Resources Report. The Quino checkerspot is proposed to be a covered species under the Chula Vista MSCP Subarea Plan.

Other Sensitive Species. Though outside the known range of the Harbison's dun skipper (*Euphyes vestris harbisoni*), the host plant (*Carex spissa*) for this butterfly was observed

along the northern boundary of the property. The Harbison's dun skipper is proposed for federal listing as Endangered.

Horned larks (*Eremophila alpestris*) are a CDFG Species of Concern. They are year-round residents of San Diego County, inhabiting disturbed areas, beaches, grasslands and agricultural fields. They are most abundant in the fall when winter migrants arrive (Unitt 1984). They were frequently observed using the dirt roads that are on the site.

The two-striped garter snake (*Thamnopsis hammondii* ssp. *hammondii*) is a federal and state Species of Concern and is protected by the CDFG. They occur near permanent or nearly permanent water sources, often living in pools among rock outcroppings. A single individual was seen in pooled water in the drainage in the northwest portion of the site.

The white-tailed kite (*Elanus caeruleus*) is a relatively common resident in San Diego County (Unitt, 1984). This is a federal Species of Concern and nesting kites are fully Protected by the CDFG. A pair of kites were observed roosting in the eucalyptus trees near the inside corner at the center of property. According to Unitt (1984) the population of this species has increased in the county during this century. They forage in open grassy areas and nest in riparian woodlands bordering grassy fields

A high density of grasshopper sparrows (*Ammodramus savannarum*) was observed on the property, with several nests easily observable. The birds were seen and heard primarily on the flatter portions of the property using the areas of native needlegrass for nesting and foraging. A grasshopper sparrow was also detected on the Clarkson/Turner parcel during the June 2, 1999 survey. Grasshopper sparrows are utilizing all areas shown supporting native grassland in Figure 3. While this species has no state or federal status due to widespread populations, it is considered sensitive by the National Audubon Society.

4. Habitat Management Needs Assessment

The Bella Lago property has had little disturbance over its one hundred-plus years of modern occupation. The regional decline of native grasslands makes the abundance of native grassland on this site an important resource. The site is also different from much of its surrounding habitat making it an important part of a mosaic of different habitats needed when maximizing diversity. Because the overall the quality of the biological resources on the site is high, long-term management of the open space will be focused primarily on protecting existing habitat values from diminution due to human and other effects on the preserve areas. On-going monitoring of the overall status of the habitat types on the property will be conducted on an annual basis. If a significant change in the existing habitat values is observed (e.g. a significant increase in non-native grasses) adaptive management measures may be employed. However, the on-going conversion of adjacent lands from agricultural uses to urban development will likely have the net effect of reducing any encroachment of non-native grasses. It is also noted that, due to the limited number of existing trails on the site, there is no need to remove and restore redundant trails.

D. AREA-SPECIFIC MANAGEMENT DIRECTIVES

This section of the plan addresses the area specific management directives required of the Bella Lago development program, which are largely based on the Subarea Plan's conditions of coverage for the sensitive species found within the open space preserve created as a result of the development of the property. (See Figure 5, Development Plan Overlain on Biological Resources). This plan proposes methods to reduce potential edge effects resulting from the development program and addresses species-specific management directives.

Reduction of Edge Effects

Most of the species present within the preserve require management directives that address detrimental edge effects. Reducing edge effects helps sustain viable, high quality habitat. Edge effects include, but are not limited to trampling, dumping, vehicular traffic, competition with exotic and/or invasive species, predation by domestic animals, noise, collecting, recreational activities and other human intrusion. The following text describes a number of methods that are expected to reduce potential edge effects within the preserve that may result from Bella Lago's development. The following Table summarizes the management actions and associated implementation period and frequency, as described in more detail below.

Table 2. Timetable for Implementing Edge Effect Reduction Actions

Action	Implementation Period	Frequency
Preserve Interface Grading, Fencing and Landscape Planning	Short Term/Construction	N/A
Invasive Species Monitoring and Maintenance	Short Term/ Construction and Long Term	Semi-annually
Litter/Trash Removal and Materials Storage	Short Term/Construction and Long Term	Semi-annually
Selected Community Trail Barriers and/or Signage	Short Term/Construction	N/A
Trail Barrier and/or Signage Monitoring and Maintenance	Long Term	Semi-annually
Preserve Barrier and Wall Monitoring and Maintenance	Short Term/Construction and Long Term	Semi-annually
Dissemination of Educational Information	Short Term/Construction and Long Term	N/A

Adjacency Management Issues

Because the Bella Lago preserve areas will be adjacent to an estate home development, a number of management issues must be addressed to reduce the potential indirect impacts and edge effects to the preserve that may occur as a result of the development project. The adjacency guidelines and management issues described in the Chula Vista MSCP Subarea Plan text apply to all areas of Bella Lago that are immediately adjacent

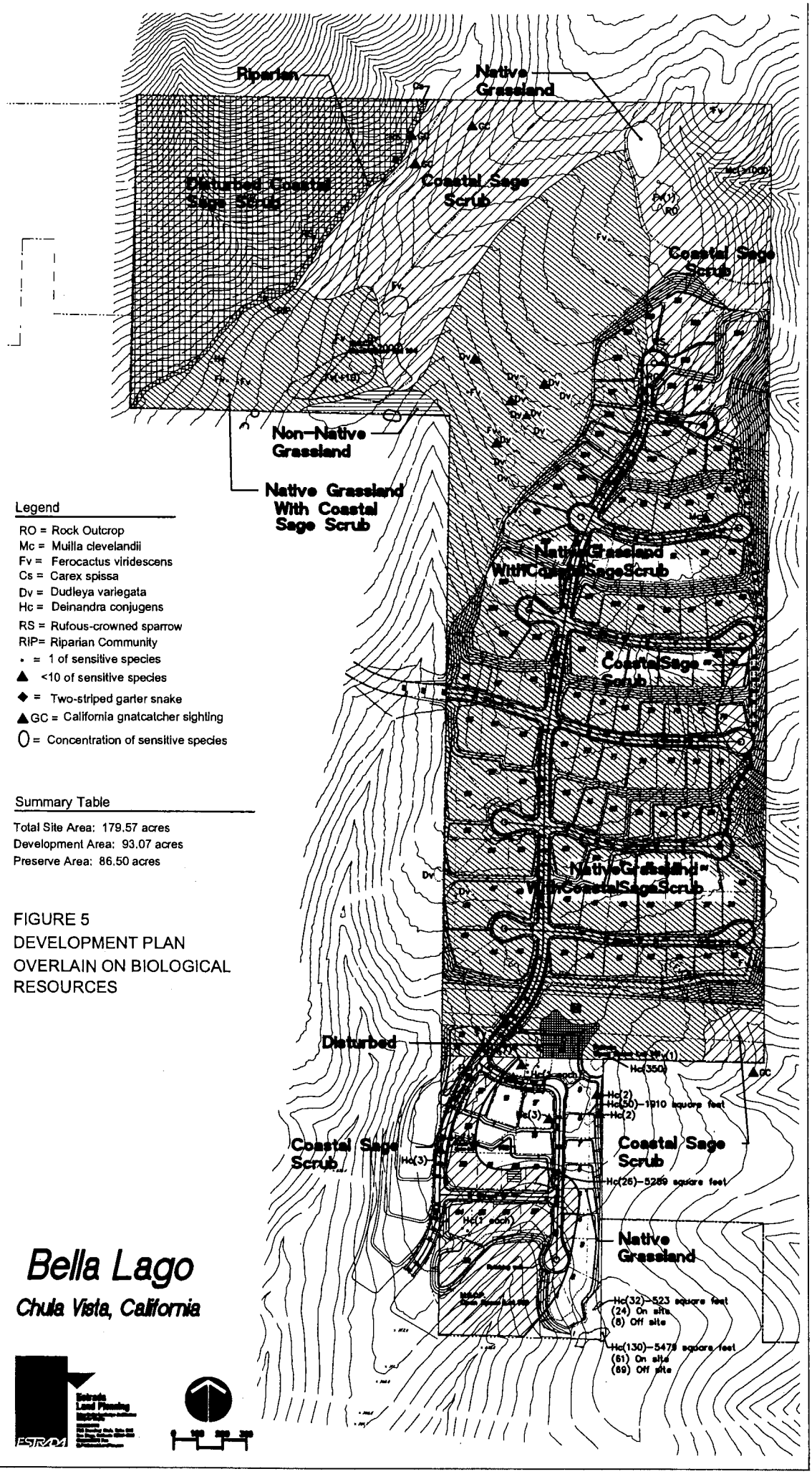


FIGURE 5
DEVELOPMENT PLAN
OVERLAIN ON BIOLOGICAL
RESOURCES

Bella Lago

Chula Vista, California

to the preserve once the property has been dedicated to permanent open space and also is accepted as part of the preserve system, including the San Diego National Wildlife Refuge. Open space dedications will be made at the same time that grading permits are issued. In the event that construction happens to occur adjacent to the preserve after it has been dedicated and accepted as part of the regional preserve system, such construction will adhere to the preserve adjacency guidelines in this document, including those for drainage, toxic substances, lighting, noise, invasive and exotic species, and buffers.

The most significant biological resource, beside the intrinsic value of the native grassland, is the large population of the narrow endemic, variegated dudleya, and the smaller populations of Otay tarplant on the site. Other significant resources are the sensitive species noted above and the relative proximity of the property to a known golden eagle nesting site. The following ASMD's will provide for the long-term viability of the biological resource values in the open space areas of the site, and are consistent with the MSCP Plan and the Chula Vista MSCP Subarea Plan.

The ASMD's are broken into the following three categories:

1. Establishment of Preserve: Short-Term/Construction Management and Implementation of Project Conditions of Coverage

During this initial phase of management, preserve establishment will be handled as a private site improvement requirement of the developer. The developer would be fully responsible for funding any required walling/fencing, signage and other maintenance work required to establish a defensible biological preserve. Work would be completed through private contracting. Any contractors utilized during the preserve establishment phase will be approved by the City of Chula Vista. Minimum qualifications of the biological monitor shall be those of a biological consulting firm on the City of Chula Vista's approved list. Work associated with the preserve establishment phase would be bonded as determined necessary by the City. The bonds will be released upon fulfillment of work under, as determined by the City. Costs for the completion of the preserve establishment period work are outlined in Appendix A. Management elements proposed during the Establishment of Preserve phase include Project Specific Conditions of Coverage and are further described as the following:

a) Access Controls. Construction of permanent physical barriers (fences/walls and gates) and signage to control the access of unauthorized people, vehicles, and livestock into and within the preserve areas. Includes construction of boundary fencing and signage, trail fencing and signage, sensitive resource barriers, and the placement of appropriate gates for trail and SDG&E access. Signage will be posted at accessible points to the preserve, such as at the end of cul-de-sacs along the eastern property boundary, to direct access to appropriate locations at designated trail entrances. Design and construction of the physical barriers shall be consistent with the residential theme of the adjacent development.

   In addition, to reduce development edge effects on the populations of the MSCP-covered Otay tarplant, a six-foot, solid block masonry wall or other barrier will be installed, as approved by the Chula Vista Fire Marshal for adequate fire management, at the Otay tarplant locations shown on Figure 6. The block wall, non-native landscaping and development areas will be no closer than twenty-five

feet from the nearest Otay tarplant polygon. The developer will erect signage to direct human access to the preserve away from the Otay tarplant and *Dudleya variegata* locations. Access will be limited to preserve managers and no public/ private access to the preserve will be permitted from these areas.

Figure 7 identifies the location of all perimeter fencing adjacent to preserve lands.

b) Baseline Assessment. Collection of all baseline data, including identification of existing vegetation communities, location of sensitive species within the preserve areas, and overall habitat value. Documentation of initial site condition will be made with photographs and detailed maps.

c) Trash/Litter Removal and Illegal Storage of Materials. Construction crews will not be permitted to leave any litter/ trash on-site unless it is contained within a secured receptacle within the development footprint. Preserve litter removal will begin when construction of the first home is completed and continued from that point forward on a semi-annual basis.

d) Trails – No new trails are proposed within the preserve. Trails will be in the existing dirt roads located in the northern portion of Bella Lago, and continuing east off site and west towards Rolling Hills Ranch. The roads will be maintained on as needed basis. No improvements to the existing roads are proposed. The SDG&E access road within the preserve may be paved.

Trail fences or other barriers will be installed at strategic locations along existing trails where protection of sensitive resources is required. Barriers such as vegetation, rocks/boulders, or fencing may be necessary to protect highly sensitive areas and the appropriate barrier will be established based upon location, setting and use. Fencing consistent with architectural design may be an appropriate barrier to control most trail adjacency issues. Signage will be utilized in conjunction with any sensitive resource restriction fencing and will help direct access to appropriate locations at designated trail entrances. Trails are to be monitored for degradation and off-trail access and use on a semi-annual basis. This monitoring may be conducted simultaneously with trash/litter monitoring work. Trail and associated barrier repair/ maintenance will be provided as needed based on the results of monitoring.

e) The following construction related measures will be observed by the Bella Lago developer while the project is under construction. These measures are intended to minimize the effects of noise, light, dust and other negative impacts due to development on the adjacent wildlife preserve. The following measures will be included as conditions of development approval:

1) Monitoring of Grading - To protect biological resource areas not approved for development, for all development areas adjacent to Preserve Category A (i.e. along the eastern property boundary adjacent to the "Inverted L" property), a qualified biological monitor will be onsite during clearing, grubbing and/or grading activities to ensure that the approved limits of disturbance are not exceeded and that dust control measures are being implemented.

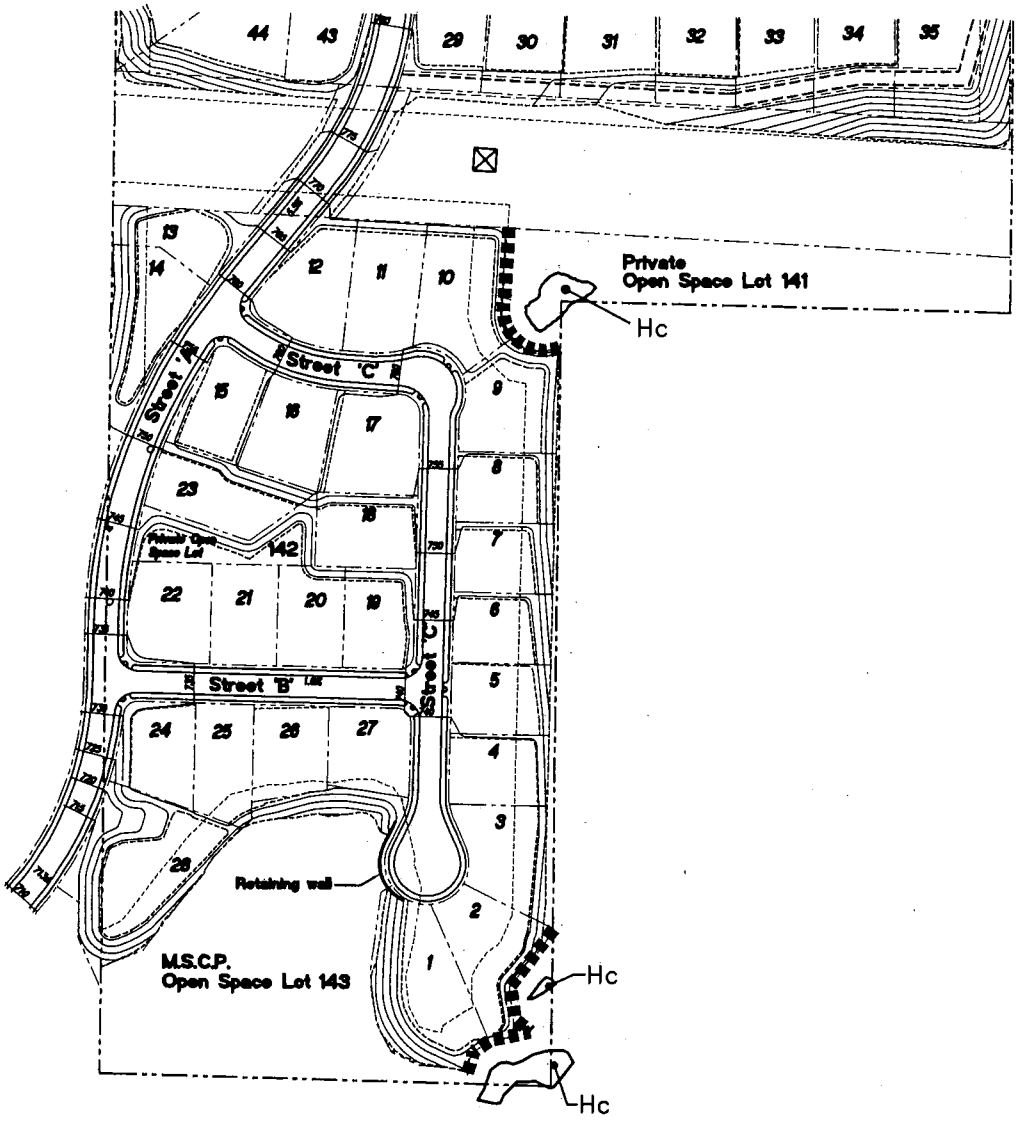


Figure 6

0 100 200 300
SCALE IN FEET

Note:
All wall locations shall not encroach within 25' of existing Otay Tarplant (shown as polygons labeled Hc)

Clarkson-Turner
Otay Tarplant Protection Walls

Bella Lago

Legend

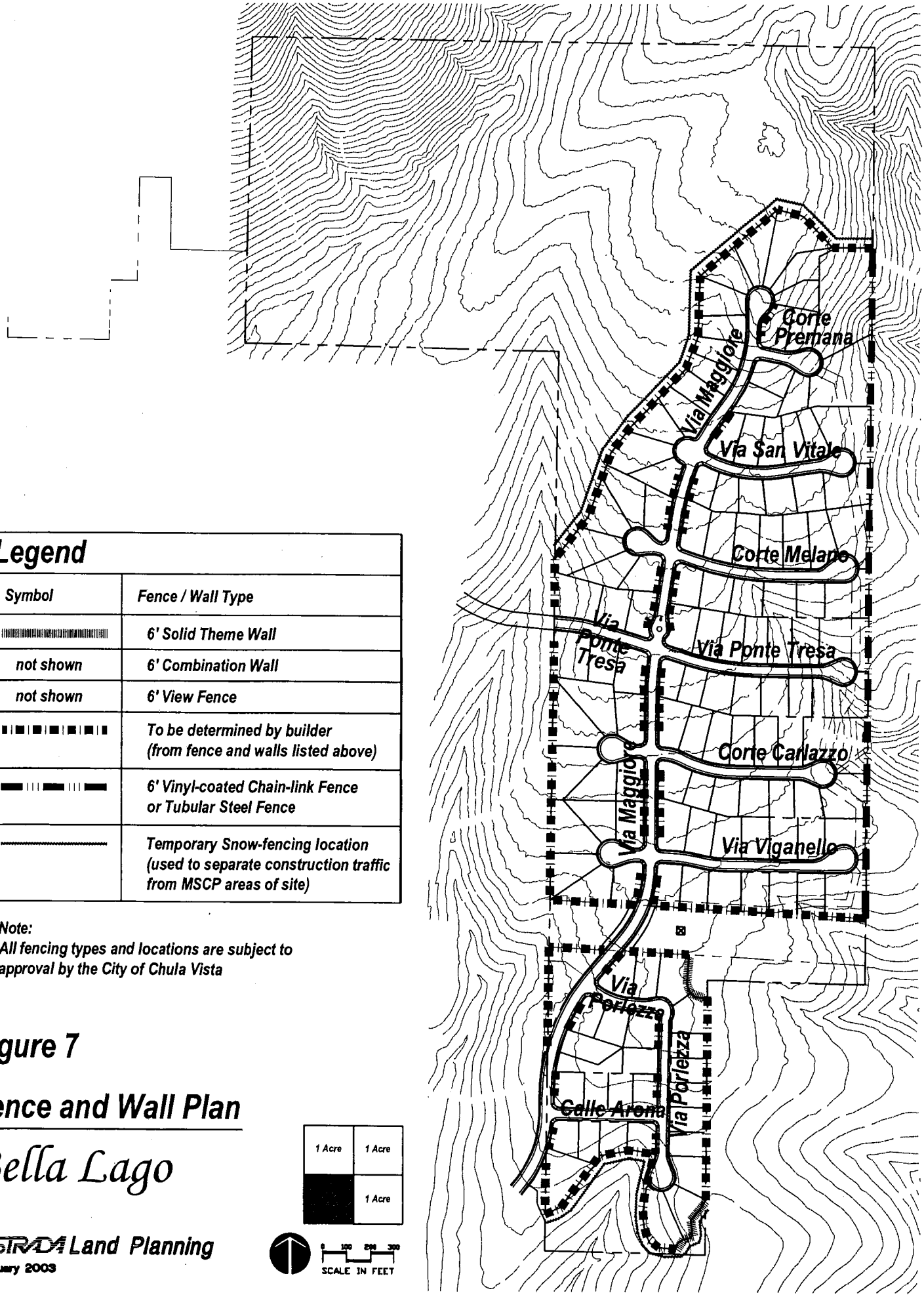
Hc = Deinandra conjugens

Concentration of sensitive species

Wall locations

ESTRADA Land Planning

Sept 11, 2002



Legend	
Symbol	Fence / Wall Type
	6' Solid Theme Wall
not shown	6' Combination Wall
not shown	6' View Fence
	To be determined by builder (from fence and walls listed above)
	6' Vinyl-coated Chain-link Fence or Tubular Steel Fence
	Temporary Snow-fencing location (used to separate construction traffic from MSCP areas of site)

Note:
All fencing types and locations are subject to approval by the City of Chula Vista

Figure 7

Fence and Wall Plan

Bella Lago

1 Acre	1 Acre
	1 Acre

SCALE IN FEET

ESTRADA Land Planning

February 2003

If high-visibility fencing is erected, the monitor will visit the site at least once per week during clearing, grubbing and/or grading operations to ensure that the fencing is being maintained and remains in the appropriate location. If the limits of disturbance are simply flagged or staked, the monitor will check the site daily to ensure that the approved limits of disturbance are not exceeded.

2) Noise – To minimize indirect impacts associated with noise, if construction occurs during the breeding season, a pre-construction survey will be conducted to determine the presence/absence of nesting birds. If an occupied raptor (from January 15 to July 31) or gnatcatcher (from February 15 to August 15) nest is discovered during a pre-construction survey, noise reduction techniques shall be incorporated into the construction plans before construction proceeds. Outside of the bird-breeding season, no restrictions shall be placed on temporary construction noise.

3) Invasive Species Control - To minimize indirect impacts due to development, no invasive non-native species shall be introduced into areas immediately adjacent to or within the preserve. All open space slopes immediately adjacent to the preserve shall be planted with native species that reflect the adjacent native habitat. (See Bella Lago Precise Plan for list of approved landscape species). In addition, the residential community's CC&R's will prohibit the use of invasive ornamental plant species on slopes adjacent to the reserve areas. (Table 3). The preserve manager will encourage residents adjacent to the preserve to remove invasive exotics from their landscaping and will provide these residents with information on invasive plants and animals harmful to the preserve.

Table 3. List of Prohibited Invasive Ornamental Plant Species

Common Name	Scientific Name
Pampas Grass	*Cortaderia sp.*
Fountain Grass	*Pennisetum setaceum*
Sea Fig	*Carpobrotus chilensis*
Hottentot-fig	*Carpobrotus edulis*
Ngaio	*Myoporum laetum*

4) Lighting - Project lighting will be directed away from the preserve consistent with public safety requirements. The developer will encourage residents to use non-invasive, native plant materials, earthen berming and/or other methods in order to limit the amount of light that enters the preserve.

5) Drainage - Project runoff (nuisance water and "first flush" from rainfall) will be directed away from the preserve to the maximum extent practicable. The developer will design and install natural detention basins, grass swales or mechanical trapping devices, where necessary, to prevent the release of toxins, chemicals, petroleum products, exotic plant materials and other elements that might degrade or harm the natural

environment or ecosystem process within the preserve and to maintain those devices as needed to ensure proper functioning. Maintenance may include dredging out sediments, removing exotic plant materials and adding chemical-neutralizing compounds (e.g. clay compounds) when necessary and appropriate.

2. LONG-TERM MANAGEMENT PHASE

The transition from the Preserve Establishment Phase to the Long Term Management Phase is marked by the completion of adjacent construction and finalization of all establishment management elements (as defined above), including conveyance of the preserve areas to the City or other appropriate management entity. Detailed long term management elements for the preserve areas include the following:

a) Access controls. Semi-annual monitoring and maintenance of physical barriers (fences and gates) and signage to control the access of unauthorized people, vehicles, and livestock into the preserve areas. Maintain a six-foot, solid block masonry wall or other barrier, as approved by the Chula Vista Fire Marshal for adequate fire management, for the Otay tarplant locations as shown on Figure 6.

b) Invasive Species Control. Prohibit invasive non-native species into or contiguous to the preserve. Maintain policy and activities as described in Preserve Establishment phase above. Semi-annual control of non-native annual grasses and other exotic species within the preserve areas will include semi-annual monitoring program to assess invasion or re-invasion by exotics. The primary goal of this program will be to control exotic, invasive species within the preserve and to reduce invasion from neighboring areas. Monitoring will occur in conjunction with the fence and wall maintenance/ encroachment monitoring on a semi-annual basis. Any of the exotic vegetation listed in Table 3 found within the preserve will be eradicated through state-of-the-art weed abatement techniques that may be refined over time using principles of adaptive management.

Subsequent control or eradication of problematic species within the preserve over the maintenance period may involve chemical measures (i.e. herbicide) and/or hand weeding, depending upon the particular species of concern and the local level of infestation. Species, which are to be cut or hand-pulled, will also be removed from the site to prevent possible seed or roots from establishing on the site. If occurrence of non-native grasses within the coastal sage scrub increases to the point where significant adverse impacts to covered species or their habitats could result, measures may be taken to remove and re-seed with low-growing native species such as Dot-seed Plantain, Common Goldfields, and Purple Needle grass. These enhancement measures are not required of the Bella Lago project but may implemented by the preserve manager as an adaptive management measure during the long term management phase if recommended by on-going monitoring efforts. The estimated long term management costs cover such adaptive management measures.

Various invertebrate (i.e., insects, snails, etc.) and vertebrate (i.e. gophers, etc.) species are potentially detrimental to the native vegetation communities and covered species within the preserve. In general, due to natural predation and ecological cycles, such species are not expected to occur in numbers that would

jeopardize the preserve's success. However, in the event that one or more such species are identified as significantly adversely impacting populations of covered species, the preserve manager will review potential remedial measures with the monitoring biologist, City, wildlife agencies, and preserve owner, to determine if control measures are warranted.

c) Resident Outreach/ Information Dissemination. Information will be provided to the residents of the Bella Lago community regarding restrictions surrounding the preserve and appropriate actions to ensure the long-term success of the preserve. Informational pamphlets will be provided to residents living adjacent to the preserve to heighten environmental awareness of the preserve's goals and purpose, and inform residents of limited access, appropriate plantings, prohibited construction or disturbance within preserve boundaries, pet control, fire management and other adjacency issues, The developer or designee may produce pamphlets in conjunction with other property owners or the City, so as to provide a consistent message.

d) Trash/Litter Removal. Due to limited public access, minimal trash and litter is expected in the preserve area. Litter will be removed from the preserve semi-annually. The biological preserve will be kept free of debris, trash, homeless encampments, and all other potential obstructions to wildlife movement. Permanent storage of materials (e.g. hazardous and toxic chemicals, equipment, etc.) within the preserve will be prohibited. Storage of materials in adjacent areas, that may impact the preserve due to potential leakage, may be permitted only if such materials are stored in compliance with appropriate City regulations.

e) Trails. A trail system through the preserve areas is not proposed by the project development. If in the future, a regional trails system is proposed through the preserve, locate all trails within existing dirt roads in the preserve areas. Use signage and/or native plant barriers to direct access to appropriate locations (designated trail entrances). Avoid paving trails unless management and biological monitoring evidence indicates the need. Provide trail repair/maintenance as needed to existing dirt roads. Use signage to discourage the incompatible use of off-road vehicles adjacent to the preserve.

f) Annual Assessment of Preserve Habitat Value. The overall status of the preserve areas will be monitored on an annual basis and documented in a written report. Site conditions will also be documented by photographs. Data will be maintained in preserve manager databases and provided to the wildlife agencies upon request.

Long-term perpetual management of the preserve area will be financed through establishment of an endowment fund to generate a regular revenue stream for management use by a managing agency or organization to address the long-term management needs of the preserve. Bella Lago proposes to fund the maintenance of the preserve open space by posting a one time deposit to a perpetual endowment or City trust account that will generate income similar to the $55/acre/year amount specified in the Chula Vista MSCP Subarea Plan. Funding for the long term management of the preserve will be established prior to issuance of grading permits for the residential development.

3. Species-Specific Management Directives

The Chula Vista MSCP Subarea Plan and Table 3-5 of the MSCP Framework Plan list specific management directives for certain covered species. The following Table 4 addresses these specific mandates and includes species monitoring and management directives that are provided by the Bella Lago project consistent with the Chula Vista MSCP Subarea Plan and the MSCP Framework Plan.

Table 4 – Species Specific Condition of Coverage and Bella Lago Project Measures to Meet Conditions

Scientific Name/Common Name	MSCP Conditions of Coverage	Project Measures to Meet Conditions
***Aimophila ruficeps canescens*/ California rufous-crowned sparrow**	Area-specific management directives must include maintenance of dynamic processes, such as fire, to perpetuate some open phases of coastal sage scrub with herbaceous perpetuate components.	Project soil types, solar aspect and rainfall favor open CSS and grassland without human intervention. Project provides important link of open CSS/grassland between Refuge and Rolling Hills Ranch
***Dudleya variegata*/ Variegated dudleya**	Area-specific management directives must include species-specific monitoring and specific measures to protect against detrimental edge effects to this species, including effects caused by recreational activities.	Major populations of species are conserved by the project's site design. Pursuant to the MSCP Biological Monitoring Plan (Ogden 1996), monitoring of significant populations are identified off site on San Miguel Mountain. Project area-specific management directives include use of specific measures such as appropriate landscaping, walls/fences, trail design, limitations on public access, litter control, invasives control & educational information. Project measures contribute to conservation of *Dudleya variegata* by ensuring that the conservation areas designated for permanent, managed open space and containing viable populations within the Bella Lago property continue to contribute to the regional conservation of the species
***Ferocactus viridescens*/ San Diego barrel cactus**	Area-specific management directives must Include measures to protect species from edge effects, unauthorized collection; and include appropriate fire management practices to protect against too frequent fire cycles,	Major populations of species are conserved by the project's site design. Project area-specific management directives include use of specific measures such as appropriate landscaping, walls/fences, trail design, limitations on public access, litter control, invasives control & educational information. Site soils and vegetation do not favor frequent fires. Project measures contribute to conservation of *Ferocactus viridescens*

		by ensuring that the conservation areas designated for permanent, managed open space and containing viable populations within the Bella Lago property continue to contribute to the regional conservation of the species.
Deinandra (Hemizonia) conjugens/ **Otay tarplant**	Area-specific management directives must include monitoring of populations, adaptive management of preserves (taking into consideration the extreme population fluctuations from year to year) and measures to protect against detrimental edge effects to the species. .	Major populations of species are conserved by the project's site design. Pursuant to the MSCP Biological Monitoring Plan (Ogden 1996), monitoring of significant populations are identified off-site on San Miguel Mountain. Due to generally inappropriate soils on the site, the Otay tarplant is sparsely located within the Bella Lago project. Project area specific management directives include the use of specific measures such as appropriate landscaping, walls/fences, trail design, limitations on public access, litter control, invasives control & educational information. Project measures contribute to conservation of *Deinandra conjugens* by ensuring that the conservation areas designated for permanent, managed open space and containing viable populations within the Bella Lago property continue to contribute to the regional conservation of the species.
Muilla clevelandii **San Diego goldenstar**	Area-specific management directives must include monitoring of any transplanted populations and specific measures to protect against detrimental edge effects to this species.	Project area-specific management directives include use of specific measures such as appropriate landscaping, walls/fences, trail design, limitations on public access, litter control, invasives control & educational information. No populations are proposed for transplanting, therefore no monitoring required. Project measures contribute to conservation of *Muilla clevelandii* by ensuring that the conservation areas designated for permanent, managed open space that contain viable populations within the Bella Lago property continue to contribute to the regional conservation of the species.

***Polioptila californica californica/* California Gnatcatcher**	Area-specific management directives must include measures to reduce edge effects and minimize disturbance during the nesting period, fire protection measures to reduce the potential for habitat degradation due to unplanned fire and management measures to maintain or improve habitat quality including vegetation structure. No clearing of occupied habitat within the cities MHPA's and within the County's Biological Resources Core Areas may occur between March 1 and August 15.	The project's site design conserves an important habitat connection at the south face of San Miguel Mountain. The grassland/CSS mixture is a rare and important component of the mosaic of habitat types in the Chula Vista/South County MSCP preserves. The onsite coastal sage scrub that supports gnatcatchers is in good condition and does not need restoration. Maintenance activities will be conducted as necessary, and as described below, will include the removal of any litter or trash and the eradication of invasive, exotic vegetation. Edge effects will be minimized with appropriate landscaping, walls/fences, trail design, limitations on public access, litter control, invasives control & educational information. Measures to reduce indirect noise effects associated with project construction during the breeding season have also been included. No clearing of habitat within the preserve area is proposed by the project. Project measures contribute to conservation of Polioptila californica californica by ensuring that the conservation areas designated for permanent, managed open space and containing viable populations within the Bella Lago property continue to contribute to the regional conservation of the species.
Euphydryas editha quino/ Quino checkerspot butterfly	Conservation measures for the QCB should include measures to protect habitat (lands identified as critical habitat), maintain connectivity along key linkages, manage preserve lands for the benefit of the QCB; restore and enhance QCB habitat, at selected locations; and minimize project impacts to QCB.	The project's site design preserves all of the areas designated as critical habitat for the QCB and therefore provides habitat protection as anticipated by the Chula Vista MSCP Subarea Plan. Further, the location of the preserved lands provides an identified east-west linkage between habitat areas located to the east and west of the site. Due to soil and topographic constraints, habitat restoration is not proposed within the preserved lands. Habitat restoration and/or enhancement, including site selection and funding, will be consistent with the QCB conservation strategy identified in the Chula Vista MSCP Subarea Plan. High priority sites have preliminarily been identified to the south of the Bella Lago site within the Salt Creek portion of the Otay River Valley. Project area specific management directives include measures to limit "edge effects" as required for QCB coverage. Specifically, the

		directives provide 1) limitations on public access to preserve areas; 2) trail design measures, 3) invasive exotics control; 4) litter control; and 5) educational information to be disseminated to future residents of the adjacent development. Impacts to the preserve areas will be minimized during development of the site. Specifically, a qualified biological monitor will be on-site during clearing, grubbing and/or grading activities to ensure that the approved limits of disturbance are not exceeded and that dust control measures are being implemented. If high visibility fencing that clearly demarcates the limits of disturbance is erected, the monitor will visit the site at least once a week during clearing, grubbing and/or grading operations to ensure that the fencing is being maintained and remains in the appropriate location. If the limits are only staked or flagged, the monitor will check the site daily to ensure that the approved limits of disturbance are not exceeded.
***Aquila chrysaetos*/ Golden Eagle**	Area-specific management directives must include measures to avoid human disturbance while the nest is active, including establishment of a 4,000-foot disturbance avoidance area within preserve lands.	The development area of Bella Lago is located more than 4,000 feet from occupied *Aquila chrysaetos* nest. The species does not nest within the Bella Lago property due to a lack of high quality nesting habitat.

E. PRESERVE MANAGEMENT FUNDING

The establishment and management of the preserve will require funding to ensure the implementation of all aspects of the plan from the preserve establishment period through the later management phase. Further, the approaches to financing the work at the various stages of the project differ significantly. A greater amount of direct developer responsibility will be involved in the early preserve establishment since this period requires increased coordination with project approval processes and coordination of site development work. Conversely, the long-term management of the site lends itself to management under a non-developer managed structure, such as the San Diego National Wildlife Refuge or other appropriate management entity identified by the City.

For this reason, it is contemplated that program financing will be managed in different ways for the preserve establishment vs. long-term management phase of the program. The scenarios for the management phases are discussed in the preceding section. Estimates of the costs to complete the various tasks required are identified in Appendix A (attached). The expected total cost is $55/acre per year, consistent with the estimated management costs in the Chula Vista Subarea Plan. As previously stated, it is expected that Bella Lago will fund the maintenance of the preserve open space by posting a one-time deposit to a perpetual endowment or City trust account that will generate income similar to the $55/acre/year amount specified in the Chula Vista MSCP Subarea Plan. At a 3.5% rate of return, this amount equals approximately $137,500 endowment. Prior to the issuance of grading permits, the developer will assure management funding in perpetuity through a mechanism approved by the City.

Area Specific Management Directives

APPENDIX "A"

In the event an agreement cannot be reached with the San Diego Wildlife Refuge for monitoring, maintenance and management of the Bella Lago Onsite Preserve Lands, Bella Lago, LLC has agreed to fund an endowment in the amount of $ 137,500 that will earn interest at the rate of 3.5% (or more) per annum or $ 4,812.5 (or more) per year. This should adequately cover the estimated costs of $ 4,757.50 per year ($ 55.00 per acre x 86.5 acres onsite).

The endowment will generate a regular revenue stream for use by a managing agency or organization to address the long-term management needs of the preserve. Bella Lago, LLC proposes to fund the maintenance of the preserve open space by posting a one time deposit to a perpetual endowment or City trust account that will generate income similar to the $55/acre/year amount specified in the Chula Vista MSCP Subarea Plan. Funding for the long-term management of the preserve will be established prior to issuance of grading permits for the residential development.

This endowment would cover costs of the following:

a) Access controls. Semi-annual monitoring and maintenance of physical barriers (fences and gates) and signage to control the access of unauthorized people, vehicles, and livestock into the preserve areas. Maintain a six-foot, solid block masonry wall or other barrier, as approved by the Chula Vista Fire Marshal for adequate fire management, for the Otay tarplant on site.

b) Invasive Species Control. Prohibit invasive non-native species into or contiguous to the preserve. Maintain policy and activities as described in Preserve Establishment phase above. Semi-annual control of non-native annual grasses and other exotic species within the preserve areas will include semi-annual monitoring program to assess invasion or re-invasion by exotics. The primary goal of this program will be to control exotic, invasive species within the preserve and to reduce invasion from neighboring areas. Monitoring will occur in conjunction with the fence and wall maintenance/ encroachment monitoring on a semi-annual basis. Any of the exotic vegetation listed in Table 3 of the Bella Lago Precise Plan found within the preserve will be eradicated through state-of-the-art weed abatement techniques that may be refined over time using principles of adaptive management.

   Subsequent control or eradication of problematic species within the preserve over the maintenance period may involve chemical measures (i.e. herbicide) and/or hand weeding, depending upon the particular

species of concern and the local level of infestation. Species, which are to be cut or hand-pulled, will also be removed from the site to prevent possible seed or roots from establishing on the site. If occurrence of non-native grasses within the coastal sage scrub increases to the point where significant adverse impacts to covered species or their habitats could result, measures may be taken to remove and re-seed with low-growing native species such as Dot-seed Plantain, Common Goldfields, and Purple Needle grass. These enhancement measures are not required of the Bella Lago project but may implemented by the preserve manager as an adaptive management measure during the long-term management phase if recommended by on-going monitoring efforts. The estimated long-term management costs cover such adaptive management measures.

Various invertebrate (i.e., insects, snails, etc.) and vertebrate (i.e. gophers, etc.) species are potentially detrimental to the native vegetation communities and covered species within the preserve. In general, due to natural predation and ecological cycles, such species are not expected to occur in numbers that would jeopardize the preserve's success. However, in the event that one or more such species are identified as significantly adversely impacting populations of covered species, the preserve manager will review potential remedial measures with the monitoring biologist, City, wildlife agencies, and preserve owner, to determine if control measures are warranted.

c) Resident Outreach/Information Dissemination. Information will be provided to the residents of the Bella Lago community regarding restrictions surrounding the preserve and appropriate actions to ensure the long-term success of the preserve. Informational pamphlets will be provided to residents living adjacent to the preserve to heighten environmental awareness of the preserve's goals and purpose, and inform residents of limited access, appropriate plantings, prohibited construction or disturbance within preserve boundaries, pet control, fire management and other adjacency issues, The developer or designee may produce pamphlets in conjunction with other property owners or the City, so as to provide a consistent message.

d) Trash/Litter Removal. Due to limited public access, minimal trash and litter is expected in the preserve area. Litter will be removed from the preserve semi-annually. The biological preserve will be kept free of debris, trash, homeless encampments, and all other potential obstructions to wildlife movement. Permanent storage of materials (e.g. hazardous and toxic chemicals, equipment, etc.) within the preserve will be prohibited. Storage of materials in adjacent areas, that may impact the preserve due to potential leakage, may be permitted only if such materials are stored in compliance with appropriate City regulations.

e) Trails. A trail system through the preserve areas is not proposed by the project development. If in the future, a regional trails system is proposed through the preserve, locate all trails within existing dirt roads in the preserve areas. Use signage and/or native plant barriers to direct access to appropriate locations (designated trail entrances). Avoid paving trails unless management and biological monitoring evidence indicates the need. Provide trail repair/maintenance as needed to existing dirt roads. Use signage to discourage the incompatible use of off-road vehicles adjacent to the preserve.

f) Annual Assessment of Preserve Habitat Value. The overall status of the preserve areas will be monitored on an annual basis and documented in a written report. Site conditions will also be documented by photographs. Data will be maintained in preserve manager databases and provided to the wildlife agencies upon request.

Appendix B

Fire Protection Plan

April 17, 2006

FIRE PROTECTION PLAN
For The
K. Hovnanian Home - Bella Lago Development
City of Chula Vista, CA Tract 04-04

1.0 General Description

The Bella Lago Development is located in a declared high fire hazard zone within the City of Chula Vista. Fire protection is provided by the Chula Vista Fire Department. The area approved for development is surrounded by open space consisting of non-native and native grasses, intermixed with short (less than 3-feet tall) coastal sage scrub species. The area has been moderately grazed by cattle in the past.

Grazing is not planned to continue within the Open space in the future.



↑ **Photo 1: Proposed Development Site & Vegetative Fuels**

The Bella Lago Development project already has been approved by the City of Chula Vista as a 139 single-family, estate residential lot development and three large M.S.C.P open space lots (lots 141, 143 & 144) located on 179.58 acres of land. Lot 144 is scheduled to donated to the U.S. Department of Interior - Fish & Wildlife Service (F&WLS) as a San Diego National Wildlife Refuge. K. Hovnanian Homes (the developer) has retained RECON, an environmental monitoring firm, to provide ongoing monitoring of the MSCP parcels (lots 141, 143 & 144) until such time that title is transferred to another management entity approved by the City of Chula Vista. K. Hovnanian Homes shall be responsible for long-term management and maintenance of lots 141, 143 and 144 until the lot titles are transferred. It is important to note that the Chula Vista Fire Marshal may require vegetation management (fuel treatment) therein as in accordance with the currently adopted City MSCP direction. Historic records and photographs demonstrate that the existing grassland and short sage scrub native vegetation has not changed over the past 35 years. The only exception has been when wildland fires have burned over the local area. If by some unknown circumstance the native fuel loading (height & density) should increase in configuration over time, then the Chula Vista Fire Marshal must have the authorization to require some form of fuel treatment by the designated open space management agency to reduce this fuel load buildup.

The Bella Lago Fire Protection Plan (FPP) had been previously submitted as a Conceptual Fuel Modification Zone Plan (CFMZP) to and approved by the City of Chula Vista Fire Department. The City of Chula Vista Fire Department most recently requested that the previously approved CFMZP) document be resubmitted by the new owner/developer (K. Hovnanian Homes) as a Fire Protection Plan format. The City also requested that the 2002 CFMZP fire behavior projections be recalculated and validated to determine if the 50-foot wide fuel treatment buffer zone is still satisfactory based on an

October 2003 San Diego County fire weather scenario. The "Worst Case" fire weather scenarios used in the previous CFMZP and re-evaluated in this FPP document actually exceeded in severity the recorded October 2003 fire weather conditions. The two percent fine fuel (1-hour dead fuel) moisture content used in the fire behavior projections equate to 107 degree F temperature and a 10 percent relative humidity day. The 60-mile per hour wind speed was equivalent or slightly exceeded the localized (on-site) wind speeds observed during the 2003 fire siege.

BehavePlus Version 3.0 and the most recent set of new wildland fire fuel models called *Standard Fire Behavior Fuel Models: A comprehensive Set for Use with Rothermel's Surface Fire Spread Model* were the two principal documents used in preparing the revised wildland fire behavior calculations for this Fire Protection Plan. BehavePlus is a newer and more complete fire behavior prediction system over the previously used BEHAVE system; however, the results are quite similar. The Standard Fire Behavior Fuel Models are a more descriptive and complete set of fuel models than the original National Forest

Fire Laboratory (NFFL) fire behavior fuel models used in the original CFMZP submitted in August 2002. These newer fuel models allow many more options to choose from in trying to match the most appropriate fuel model for the vegetative types found within or surrounding the Bella Lago Project Development. Our recalculation of the Wildland fire projections did not change and validates that the 50 foot wide buffer strip and the 20 to 50 feet of Zone 1 irrigated and fire resistive back and/or side yard landscaping will be more than enough fuel treatment against the "severe fire weather" projected radiant and convective heat sources. As a redundant fire protection feature, whenever less than the standard 100 feet of the combined fuel treatment could not be obtained, "enhanced" fire protection features shall be applied to that residence. Refer to Section 5.1.5 for more detail on this issue.

This FPP assessed the overall (on-site and off-site) wildland fire hazards and risks that may threaten life and property associated with the planned Bella Lago residential development. In addition, the FPP addresses both the short-term and long-term fuel modification actions required to minimize any projected fire hazards and risks and assigns long-term annual maintenance responsibilities for each of the required fuel modification actions.

The purpose of this FPP is to provide fuel modification zone treatment direction for developers, architects, builders and City of Chula Vista Fire Department and Planning Officials to use in making all proposed structures safe from future wildland wildfires. The FPP includes:

- A wildland fire hazard rating assessment and expected fire behavior of off-site and on-site native vegetative fuels.

- A 50-ft. wide irrigated low fuel volume buffer zone along the project perimeter that separates the native open space vegetation from the private lot yard *"firewise"* landscaping. Only well spaced "vertical" fire resistive trees will be allowed in this buffer strip. Trees will be spaced so to allow for annual maintenance to prevent fuel laddering between the tree and under story grass and/or non-vertical tree-form shrub or shrub fire resistant species. All grass or shrub ground covers will be maintained to less than 18-inches in height. Single specimen shrubs under 48" in height are also allow within this buffer strip, but no shrub species over 18-inches in height shall not be placed under or within 6 feet of any tree canopy. Only plant species listed in APPENDIX "A" - Approved Plant List shall be used in this buffer zone. Typical trees (non-vertical growing types) with mature canopies on slopes, are not conducive to the

required maintenance by limbing and pruning to maintain appropriate vertical spacing between the tree canopy and the ground fuels.

- A listing of the "Enhanced Fire Protection Features" for structures located less than 100 feet from the highly flammable native brush open space lands. Refer to Section 5.1.6 for a listing of these "Enhanced" Fire Protection Features.

This FPP is based upon requirements listed in Ordinance No. 9111, amending Appendix II-a of the San Diego County Fire Code relating to wildland/urban interface standards. Ordinance No. 9111 was the document in existence at the time that this tract was approved by the City of Chula Vista Council Members. Many of the Fire Protection Plan recommendations in the original CFMZP exceeded at the time and now meet the near San Diego County Fire Code requirements.

2.0 Wildland Fire Hazard and Risk Assessment

2.1 On-site Fire Hazard and Risk Assessment

The proposed development area addressed in this FPP is located on a gentle (generally 8 to 10% with a few 15% side slopes in ravines) grassland ridgetop bench approximately twelve (12) air miles inland from the Pacific Ocean. Except for where the area is to be cleared for the home sites, streets and access roads, the parcel is vegetated with a healthy cover of non-native and native grasses intermixed with a variety of short, less than 3-feet tall and scattered coastal sage scrub species. Past cattle grazing has had some influence on keeping the native vegetative fuels from accumulating on the Project Area. However, Marcia Gross, AFFINIS Environmental Services, the developer's planning team plant ecologist does not anticipate with the stoppage of cattle grazing, that the existing open space vegetative types will change much over time due to the existing local soil types. Aerial photos from 1970 depict the site as generally covered with grasslands and short coastal sage scrub. In 1980 aerial photos, the coastal sage scrub appeared to be a bit denser, but overall with a fairly open growth pattern. The 1990 aerial photos depict the site as largely barren, as the whole area burned in 1988 and again in 2003. It is anticipated that the coastal sage scrub may re-establish to its 1970-1980 density, but the developer's team plant ecologists do not expect the property to ever support heavy, dense coastal sage scrub or chaparral habitat. In fact, local federal and state wildlife biologists have expressed a desire to manage the remaining M.S.C.P undeveloped open space lands for the enhancement of native grasses rather than allowing the marginal coastal sage scrub habitat to remain in its present condition. Refer to page 2 for the January 11, 2002 aerial photo of the overall project area and surrounding vegetation.

When placing residential development and home sites interspersed with flashy vegetative fuels, the goal of any FPP is to minimize any potential loss of homes or personal property due to wildland fire. Structure loss will and can be minimized by applying the following ***FIREWISE* 2000** recommended concepts of:

1. Requiring Class "A" roof covering, plus all the "basic" fire-resistive features all proposed residential structures and the "enhanced" fire features on those designated structures..

2. Properly designing the homes and proper placement of these homes within their lot to minimize any threat from wildland fire.

3. Maintaining side and backyards to *"firewise"* landscaping criteria (irrigated Zone 1 fire resistive landscaping). Only plant species listed in APPENDIX "A" Approved Plant List will be allowed within this zone.

4. Providing for and maintaining an irrigated 50-feet wide low fuel volume buffer strip along the outer perimeter lots will be cleared and replanted with native grasses, fire resistant ground covers or shrubs. Except for well spaced, single specimen fire resistive trees, all surface native grasses and ornamental ground covers will be maintained to less than 18 inches tall. Trees within this zone will be annually pruned of all dead and dying woody material and limbed to a height three times the height of the surface fuels beneath the tree crown. These buffer strips may include all manufactured slopes within 50-feet of the project boundary and some portions of the 40-foot wide sewer easement/fire access road. No structures built of combustible building materials are allowed within this 50-foot wide buffer zone.

Implementing the above four fire protection concepts should more than mitigate any fire risk against wildland fire from either a northeastern "Santa Ana" wind or any strong, dry prevailing southwestern or southern winds.

2.2 Off-site Hazardous Fuels Assessment

The light flashy native vegetation surrounding the Bella Lago Development can be considered as a serious threat to carry a fast rate-of-spread and low to moderate intensity wildland fire from anywhere in the local vicinity. The key to how fast, how hot and at what intensity a wildland fire will burn is directly related to wind speed, wind direction and amount of moisture in the atmosphere. Wind direction usually determines how dry or moist (expressed as relative humdity) the air will be in the wind pattern.

The most critical wind pattern to the development area is a wind coming out of the east/northeast, typically referred to as a Santa Ana wind. Santa Ana wind conditions are usually associated with strong (>60 MPH), hot, dry winds with very low (<15%) relative humidity. Santa Ana winds originate over the dry desert land and can occur anytime of the year; however, they generally ocur in the late fall (September through November).

The typical prevailing summer time wind pattern is out of the southwest and normally is of a much lower velocity (10-15 MPH with occassional gusts to 30 MPH) and is associated with higher relative humidity readings (>15% and frequently more in the 30% range) due to a moist air off-shore flow.

All other (northwest, south, west) wind directions may be strong and gusty: however, they too are generally associated with cooler moist air, have higher relative humidity (>30%) and are not considered as severe as the northeast and east wildland fire weather conditions.

Since the historic records indicate that the native fuel loading has not changed over the past fifty years, the projected fire behavior models were run based upon the historic and projected fuel loading. A Combined Fuel Model [FM 1 - western grasslands (65%) and FM 2 – Scattered sage with grass (35%)] was the principal fuel model used in the original fire behavior calculations and this same fuel model was determined (in this revised FPP) to again be the most appropriate fuel model for today and in the future. Actually the scattered sage percentage (density) was increased in our original and current projections due fact that past cattle grazing probably kept the sage population down in the overall fuel loading. Due

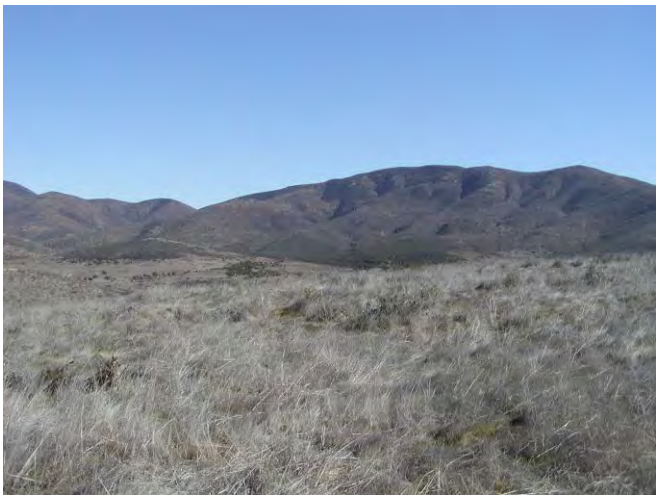
the type of soil in the local area, it is the opinion of the team plant ecologist that tall dense chaparral or other mixed chaparral species has not in the past, nor will not become established in the future.

A key component of this Bella Lago FPP is the projections of expected wildland fire behavior for the existing native fuels. Refer to Section 3.2.2 *Wildland Fire Behavior Calculations for the Off-site Hazardous Vegetative Fuels*, especially Tables 2.3.2-1 through Tables 2.3.2-6.

2.2.1 Northern Boundary Fuels

The native fuels adjacent to the northern boundary are non-native grasslands, with intermixed sparse coastal sage scrub (<3 ft. tall). The following wildland fire behavior projections along this northern boundary are for a fire burning under a Santa Ana wind Condition within a Combined Fuel Model [FM 1-grass (65%) & FM-2 scattered sage with grass (35%)]. The northeast perimeter is the most critical of the northern boundary fuels.

	Combined FM-1/FM-2
Rate of Spread	888 ft/min
Fireline Intensity	11,898 Btu/ft/sec
Flame Length	**33.7 ft**



↑ **Photo 2: Typical Northern Boundary Combined Fuel Model FM-1/ FM-2.**

2.2.2 Eastern Boundary Fuels

Fuels along the eastern boundary, especially the northeastern perimeter are in direct alignment with a northeast Santa Ana wind and poses the biggest wildfire threat to the Projec Area. The eastern boundary fuels are classified as a Combined Fuel Model [FM 1-grass (65%) & FM-2 scattered sage with grass (35%)]. Fire behavior projections are as follows:

	Combined FM-1/FM-2
Rate of Spread	888 ft/min
Fireline Intensity	11,898 Btu/ft/sec
Flame Length	**33.7 ft**



↑ **Photo 3: Northeastern and Eastern Boundary Fuels**

2.2.3 Southern Boundary Fuels

Fuel models adjacent to the southern boundary are classified as both FM 1- grass (southeasteastern corner) and a Combined Fuel Model [FM 1-grass (65%) & FM-2 scattered sage with grass (35%)] (southwestern corner). As previously mentioned, a southwest wind pattern does not bring the severe fire weather conditions associated with a Santa Ana wind pattern. Southwesterly winds are more moist and blow with a lesser velocity. Two fire behavior projections were made for this portion of the project area. The first fire behavior projection was calculated for a "*typical"* summer prevailing wind and the second projection was for a "*Non-typical"* infrequent strong, gusty southwest wind.



↑ **Photo 4: Looking North at the SW Boundary Fuels**

Fire behavior projections are as follows:

	FM-1 (15 MPH SW Wind)	FM-1 (30 MPH SW Wind)
Rate of Spread	174 ft/min	733 ft/min
Fireline Intensity	278 Btu/ft/sec	1,415 Btu/ft/sec
Flame Length	**6.0 ft**	**12.7 ft**

	Combined FM-1/2 (15 MPH SW Wind)	Combined FM-1/2 (30) MPH SW Wind)
Rate of Spread	174 ft/min	593 ft/min
Fireline Intensity	278 Btu/ft/sec	3,411Btu/ft/sec
Flame Length	**6.0 ft**	**19.0 ft**

2.2.4 Western Boundary Fuels

The western boundary, especially the SW corner has a short ravine with the heaviest amount of coastal sage scrub on the Project Area. This fuel model is also a Combined Fuel Model [FM 1-grass (65%) & FM-2 scattered sage with grass (35%)]. This ravine is in direct alignment with the typical SW wind pattern and the ravine will tend to direct the head of a wildfire up the ravine and parallel to the western boundary. Fire will spread upslope into the project area, but with less intensity than the main fire front.



↑ **Photo 5: Ravine and Fuels along the Western Project Boundary**

Fire behavior projections for the western boundary fuels are as follows:

Combined Fuel Model 1/2 (15-MPH SW Wind)		Combined Fuel Model 1/2 (30-MPH SW Wind)	
Rate of Spread	74 ft/min	Rate of Spread	593 ft/min
Fireline Intensity	645 Btu/ft/sec	Fireline Intensity	3,411 Btu/ft/sec
Flame Length	**8.8 ft**	Flame Length	**19.0 ft**

2.3 Predicting Wildland Fire Behavior

"Can wildland fire behavior really be predicted? That depends on how accurate you expect the answer to be. The minute by minute movement of a wildland fire will probably never be totally predictable. Certainly not from weather conditions forecast many hours before the fire.

Nevertheless, practice and experienced judgement in assessing the fire environment, coupled with a systematic method of calculating fire behavior, yields suprisingly good results (Rothermel 1983)".

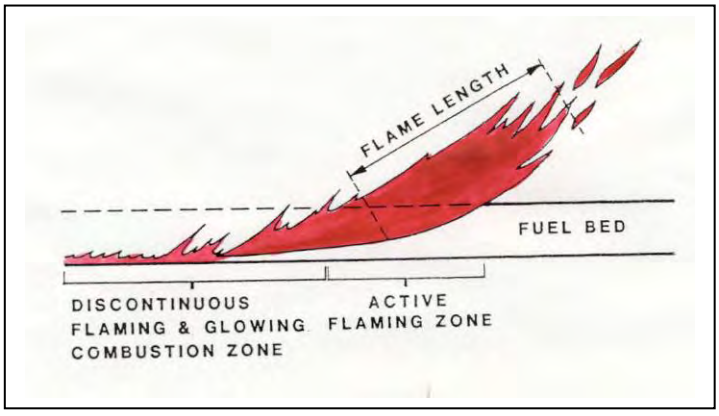


Photo 2: Typical Grass/short Coastal Sage Scrub fie Behavior

The BEHAVE: Fire Behavior Prediction and Fuel Modeling System–Burn Subsystem, Part 1 by Patricia L. Andrews, is one of the best systematic methods for predicting wildland fire behavior. The BEHAVE fire behavior computer modeling system was developed by USDA–Forest Service research scientists at the Intermountain Forest Fire Laboratory, Missoula, Montana, and is utilized by wildland fire experts nationwide. "Because the model was designed to predict the spread of a fire, the fire model describes the fire behavior only within the flaming front".

The primary driving force in the fire behavior calculations is the dead fuel less than one-fourth inch in diameter; these are the fine fuels that carry the fire. Fuels larger than 1/4-inch contribute to fire intensity, but not necessarily to fire spread. The BEHAVE fire model describes a wildfire spreading through surface fuels, which are the burnable materials within six (6') feet of the ground and contiguous to the ground.

Regardless of the limitations expressed, experienced wildland fire managers can use the BEHAVE modeling system to project the expected fire intensity (expressed as Btu/ft/sec), rate-of-spread (feet/minute) and flame lengths (feet) with a reasonable degree of certainty for use in fire protection planning purposes. Of these three fire behavior projections, Flame Length is the most critical in determining structure protection.



↑ **Figure 1: Description of Flame Length (expressed in Feet)**

2.3.1 Sources of Structure Ignition. There are three key ignition sources of concern to a structure located in a wildland/urban environment. These ignition sources are:

- radiation
- convection and
- firebrands

Radiation - Wildland fires can cause ignition by radiating heat to a structure. Radiation exposure depends on the intensity and the duration of the flaming fire front. Radiation decreases as the distance between the flaming front and the structure increases. This distance is commonly referred to as *"defensible space"* or *"survivable space*". Single-pane windows can break due to radiant heat and provide an opening for firebrands to enter a structure. Fireline intensity is key to radiation heat transfer.

Convection - Ignition of a structure by convective heat transfer requires the flame to come in direct contact with a structure. Calculation of flame lengths is critical in determining the proper distance between flammable vegetation and the structure. Whenever the flame length is equal to or less than the separation of combustible vegetation from a structure, there is a high probability of structure ignition. Contact with the fire's convection column also may cause ignition but the temperature of the column is generally not hot enough to ignite a structure.

Firebrands - Firebrands are pieces of burning materials that detach from a fire due to the strong convection drafts in the burning zone. Firebrands can be carried a long distance (one mile or more) by fire drafts and strong winds. Severe wildland/urban interface fires can produce heavy firebrand showers. The chance of these firebrands igniting a structure will depend on the size of the firebrand, how long it burns after contact, and the type of building materials, design, and construction of the structure. Firebrands landing on combustible roofing and decks are common sources for structure ignition. Firebrands can also enter a structure through unscreened vents, decks and chimneys, non-metal skylights and other overhangs.

The ***FIREWISE*** **2000** evaluation team used the computer based BEHAVE Fire Behavior Prediction Model to make the following seven (7) fire behavior assessments for the Bella Lago Development.

2.3.2 Wildland Fire Behavior Calculations for the off-site hazardous vegetative fuels.

Wildland fire behavior calculations have been projected for the hazardous vegetative fuels on the undeveloped sites adjacent to and bordering the proposed Bella Lago development. These projections were based on the typical prevailing southwest wind and two variations of a “Worst Case” (extreme) wind conditions that could be expected within City of Chula Vista rural areas. Our “worst case” fire weather conditions exceed the actual fire weather conditions of the San Diego County October 2003 fire siege.

Live and dead fuel moisture conditions associated with these type of wind conditions are as follows:

Scenario #1: South, Southwest and West Wind Condition Fuel Moisture Assumptions: Fuel Moisture conditions usually found under a *typical prevailing (normal summer) afternoon wind pattern.*

* 1-Hour Fine Fuel Moisture of……..4%
* 10-Hour Fuel Moisture of……6%
* 100-Hour Fuel Moisture of …….8%
* Live Herbaceous Fuel Moisture of.....50%
* Live Woody Fuel Moisture of…..... 60%

Scenario #2: North, Northeast and East Wind Condition Fuel Moisture Assumptions: (Santa Ana Wind Conditions). *An annual event often occuring three or four times a year.* ***These Scenario #2 dead and live fuel moisture conditions actually exceed the measurements recorded during the October 2003 fire storm.***

* 1-Hour Fine Fuel Moisture of…….2%
* 10-Hour Fuel Moisture of……....3%
* 100-Hour Fuel Moisture of…….5%
* Live Herbaceous Fuel Moisture of.....30%
* Live Woody Fuel Moisture of……....50%

Scenario #3: South, Southwest and West Wind Condition Fuel Moisture Assumptions: Late fire season strong non-typical (30-MPH) southwest wind pattern. *A rare event causing the following fuel moisture conditions, occuring only one or two times in a ten year frequency cycle.*

* 1-Hour Fine Fuel Moisture of ……...2%
* 10-Hour Fuel Moisture of……..3%
* 100-Hour Fuel Moisture of ……...5%
* Live Herbaceous Fuel Moisture of.....30%
* Live Woody Fuel Moisture of…….....60%

Tables 2.3.2-1 through 2.3.2-7 display the expected Rate of Fire Spread (expressed in feet per minute), Fireline Intensity (expressed in British Thermal Units per foot per second) and Flame Length (expressed in feet) for seven separate BEHAVE–Fire Behavior Prediction and Fuel Modeling System computer calculations of Bella Lago wildland fuels.

Table 2.3.2-1 (Scenario #1 Fuel Moisture Factors) **Expected fire behavior for a Fuel Model 1-Western grassland fire burning under a prevailing summer southwest wind pattern.**	
Rate of Spread	**174 feet/minute**
Fireline Intensity	**278 BTU's/foot/second**
Flame Length	**6.0 feet in length**
Additional Fire Behavior Calculation Input: • **15 percent uphill slope** • **15 mph 20-foot wind speed (6 mph mid-flame wind speed)** • **0^o direction of wind vector to uphill slope**	

Table 2.3.2-2 (Scenario #1 Fuel Moisture Factors) **Expected fire behavior for a combined Fuel Model [FM 1-Western grassland (65%) & FM-2-scattered sage with grass (35 %)] fire burning under a prevailing summer southwest wind.**	
Rate of Spread	**74 feet/minute**
Fireline Intensity	**645 BTU's/foot/second**
Flame Length	**8.8 feet in length**
Additional Fire Behavior Calculation Input: • **15 percent uphill slope** • **15 mph 20-foot wind speed (6 mph mid-flame wind speed)** • **0^o direction of wind vector to uphill slope**	

Table 2.3.2-3 (Scenario #2 Fuel Moisture Factors) **Expected Fire Behavior for a late season Santa Ana wind driven fire burning in a Fuel Model 1-Western grassland.**	
Rate of Spread	**733 feet/minute**
Fireline Intensity	**645 BTU's/foot/second**
Flame Length	**12.7 feet in length**
Additional Fire Behavior Calculation Input: • **15 downhill slope** • **60 mph 20-foot wind speed (24 mph mid-flame wind speed)** • **180^o direction of wind vector to uphill slope**	

Table 2.3.2-4 (Scenario #2 Fuel Moisture Factors) **Expected fire behavior for a late season Santa Ana wind driven fire burning in a Combined Fuel Model [FM 1-Western grassland (65%) & FM 2-scattered sage with grass (35%).**	
Rate of Spread	**888 feet/minute**
Fireline Intensity	**11,898 BTU's/foot/second**
Flame Length	**33.7 feet in length**
Additional Fire Behavior Calculation Input: • **15 percent downhill slope** • **60 mph 20-foot wind speed (24 mph mid-flame wind speed)** • **180° direction of wind vector to uphill slope**	

Table 2.3.2-5 (Scenario #3 Fuel Moisture Factors) **Expected fire behavior for a *"Non-typical"* strong southwest and west wind driven fire occurring within a Fuel Model 1 - Western grasslands.** ***A rare event occurring only one or two times in a ten year frequency cycle.***	
Rate of Spread	**733 feet/minute**
Fireline Intensity	**1,415 BTU's/foot/second**
Flame Length	**12.7 feet in length**
Additional Fire Behavior Calculation Input: • **15 percent uphill slope** • **30 mph 20-foot wind speed (12 mph mid-flame wind speed)** • **0° direction of wind vector to uphill slope**	

Table 2.3.2-6 (Scenario #3 Fuel Moisture Factors) **Expected fire behavior for a *"Non-typical"* strong southwest and west wind driven fire occurring within a Combined Fuel Model [FM 1 - Western grasslands (65%) & FM 2- scattered sage with grass. *A rare event occurring only one or two times in a ten year frequency cycle.***	
Rate of Spread	**593 feet/minute**
Fireline Intensity	**3,411 BTU's/foot/second**
Flame Length	**19.0 feet in length**
Additional Fire Behavior Calculation Input: • **15 percent uphill slope** • **30 mph 20-foot wind speed (12 mph mid-flame wind speed)** • **0° direction of wind vector to uphill slope**	

Table 2.3.2-7 Low Fuel Volume Buffer Area Irrigated Firewise Landscaping No vegetation over 18-inches Tall			
	Typical Summer Prevaling Wind (15 mph)	**Santa Ana Wind (60 mph)**	**Non-typical Strong Summer Wind (30 mph)**
Rate of Spread	**31 ft/min**	**51 ft/min 1/**	**51 ft/min**
Fireline Instensity	**47 Btu/ft/sec**	**76 Btu/ft/sec 1/**	**76 Btu/ft/sec**
Flame Length	**2.6 feet**	**3.3 feet 1/**	**3.3 feet**

Comments: *Only low fuel volume fire resistant ground covers, shrubs less than 18-inches tall and no trees are allowed in this buffer area strip.*

Fire Behavior Projections were based upon the following:

- Live fuel moistures of 150% due to required irrigation.
- 1-hour fine fuel moisture of 6%
- 10-hour fuel moisture of 10%
- 45% slopes (manufactured slope)

1/ Maximum wind speed in BEHAVE calculations for a FM - 1 grass fuel model is 30 mph.

3.0 Assessing Structure Ignitions in the Wildland/Urban Interface (Intermix)

During periods of high fire intensity and strong, dry winds, convective firebrands have the capability of being transported over great distances. The likelihood of a structure loss from airborne embers is not a concern for the proposed Bella Lago Development, as all homes will be constructed with non-combustible roofing and non-combustible building materials where designated, as per County of San Diego Wildland/Urban Interface Fire Code Standards. Therefore, due to the fact that only non-combustible building materials will be used in the construction of designated perimeter lot structures, only the radiantand convective heat issues need to be addressed in this FPP. *This statement is made with the understanding that the eventual homeowner will be responsible for maintaining the property, keeping the roof and rain gutters free of leaves, needles and other combustible debris and all firewood and other combustible materials are properly stored 30-feet away from the structure so that burning embers falling on or near the structure have no suitable host.*

"*Firewise"* landscaping is the act of converting native vegetation from a highly flammable and high intensity state to a much more fire resistant and lower fire intensity condition.

Comparing the expected wildland fire behavior projections of the untreated native fuels (as depicted in Tables 2.3.2-1 through 2.3.2-6) against the proposed fire resistant irrigated landscape vegetation within the 50-foot wide low fuel volume buffer area (as depicted in Table 2.3.2-7) demonstrates substantial reductions in the expected flame length and fireline intensity.

Other than requiring structures to be constructed of non-combustible roofing and building materials, the placement of a 50-foot wide low fuel volume buffer along the Bella Lago Project perimeter and interlinking this buffer area with the other side and backyard *"firewise"* landscaping has proven to be an effective treatment for minimizing structure losses due to wildfire radiant heat. Fire intensity in grass and/or short shrub non-native fuels (refer to Table 2.3.2-4) have expected flame lengths of **33.7 feet.** In contrast, flame lengths in tall, dense chaparral may approach **100-feet or more** in length and may require fuel treatment 100 feet or more away from a structure. However, no Fuel Model 4- Tall, dense Chaparral appears within the Bella Lago Project Site. This referral to a Fuel Model 4 is made only as a point of reference due to the fact that these longer flame lengths are what most reviewers of this plan see in the news coverage of wildland fires. Each fuel model has different flame lengths under the same fire weather conditions.

However due to the fact that only grass and short brush fuels are in the surrounding area, the new San Diego County Fire Code proposed 100-feet of fuel treatment will not be necessary. Again, refer to Tables 2.3.2-1 through 2.3.2-6 for projected flame lengths in the representative vegetative fuels. Therefore, the individual Zone 1 irrigated yard landscaping, plus the 50-foot of fuel treatment (Buffer Zone) away from a structure is all that will be required.

A USDA-Forest Service research study entitled the *"Structure Ignition Assessment Model (SIAM)"* by Jack D. Cohen, Intermountain Fire Science Laboratory, Missoula, Montana has helped to validate to the fire services how much distance is required to keep structures from igniting due to wildland fire radiant heat.

Mr. Cohen's research studies of all major western states fires in the past 10 years or more suggests that no residential structures have been lost to radiant heat when homes are built of non-combustible building materials and have 100 feet of fuel treatment regardless of the type of vegetative fuels and fire weather condition. Homes are lost to due firebrands entering the home via unscreened openings, window breakage, combustible decking, wooden fences, and other combustible materials. In lighter fuels such as grass and short grass, fuel treatment can be reduced to 50-feet or less and still protect a structure when built of non-combustible materials.

The SIAM Ignition Study research and the personal experience of the ***FIREWISE* 2000** evaluation team established the rationale for the fuel modification recommendations found in Section 5.0: Fuel Modification Descriptions, Recommended Treatments and Landscaping & Fuel Modification Exhibit Map.

4.0 Fire Department Response Times

The Bella Lago Project will be within a 7-minute initial response time (travel and get-away) for the closest City of Chula Vista Engine Station #6 located at 605 Mt. Miguel Road. The response engine will be a municipal Type I. Chula Vista Fire Department Station #8 located at 975 Lane Avenue would be the next quickest engine to respond. Station #8's response will also be a Type 1 engine. The closest Type 3 (brush) engine is at Station #4, located at 850 Paseo Rnchero.

San Diego Rural Fire Department, as well as other fire departments, can be requested, under a Mutual Aid agreement, to respond and they are approximately 15-20 minutes away from the project site. However given the reality that when a wildfire occurs on southern California wildlands, there are

usually multiple fires occuring and fire fighting resources can be quickly drawn down and unavailable for extensive periods of time as additional new fires occur.

Although City of Chula Vista fire station #6 is generally within the 7-minute response time, there is absolutely no assurance that this engine company or the engines at Station #4 or #8 will be in their station on the day a wildfire threatens the Bella Lago homes. On high/extreme fire danger days there often may be multiple starts and engine companies are more often already deployed on other incidents. This is why ***FIREWISE* 2000** planned developments use yard "*defensible space*", key fuel treatment strategies (buffer zone and irrigated & landscaped manufactured slopes) and "enhanced" fire protection features to enable the residences to survive a wildfire on their own and without the loss of any structures or lives. Our goal is for the 139 homes within the Bella Lago development to be able to survive a wildland fire on their own, with no loss of structures or lives and without the need of fire fighting personnel who may already be stretched to the maximum and not available for direct suppression assignment.

5.0 Required Fuel Modification Treatments and Fuel Treatment Location Map

5.1 Required Treatments and Actions

5.1.1 Individual Lot Side and Back Yard Landscaping. (*Shown as Uncolored on the Fuel Treatment Location Map).* Each individual lot owner will be required to maintain that portion of their side and back yard that lies between the perimeter Low Fuel Volume Buffer Area and their residence in a typical *"firewise"* yard landscaping and irrigated condition. (i.e. lawn, ornamental shrubs and occassional well spaced fire resistant trees). Shrubs and trees will be selected from the approved plant list in APPENDIX "A" and will be annually maintained free of dead material. Trees will be placed and maintained so that their crown cover at maturity will be more than 10-feet from any structure. All tree crowns will be separated by 20 feet and each tree will be limbed to maintain a separation of 6 feet between the ground and the lower limbs.

5.1.2 Low Fuel Volume Buffer Zone. (*Shown as Light Purple on the Fuel Treatment Location Map*). This low fuel volume buffer zone starts at the M.S.C.P. Open Space line and/or the project perimeter boundary and moves inward towards the developed area for 50 feet. The intent is to provide a 50-foot wide buffer strip consisting of low fire intensity irrigated vegetation separating the the highly flammable open space vegetation and the residential yard landscaping around the lot structures. Irrigated lawns, irrigated fire resistant ground covers or shrubs less than 18-inches tall are to be planted within this low fuel volume buffer zone. Well spaced, single specimen trees are allowed within this zone provided they are limbed up 3 times the height of the ground fuels and the trees are annually maintained free of any dead or dying vegetation. Structures built of combustible building materials are not allowed within this 50-foot wide buffer strip. Patio covers, decks, gazeboes and other yard structures built of non-comusible building materials are allowed. The Bella Lago HOA will be responsible for long-term maintenance of this Zone.

5.1.3 Manufactured Slopes (Bella Lago HOA Maintained). (*Shown as Green on the Fuel Treatment Location Map*). Landscaping and maintenance will be to the criteria discussed in Section 5.1.1. Areas will be permanently irrigated and replanted with "*firewise*" landscaping, consisting of well spaced and maintained fire resistant plants and trees. If a manufactured slope is considered as part of the low fuel volume buffer area, it will be replanted and maintained to the criteria discussed in Section 5.1.2. Long

term maintenance will be by the Bella Lago HOA. Irrigation can only be removed or turned off at the direction of the Fire Marshal.

5.1.4 Construction of a Administrative Easement/ Fire Access Road. *(Shown as Light Brown on the Fuel Treatment Location Map).* There will be an 18-foot wide administrative/fire access road constructed within the *"firewise"* landscaped 40-foot wide easement along the eastern property boundary from lot 142 south to Lot 36 and west to Lot 29. This access route should be constructed and surfaced with paving to support a 75,000 lb. gvw (H-20 loaded) fire engine. The access road will connect to and interlink with six different cul-de-sacs on the property. Access from the primary street cul-de-sac will be a curb return or a rolled curb. Besides providing fire access to most of the eastern perimeter, this road, plus the landscaping, will create a fuelbreak which will mitigate any threat from a Santa Ana wind driven wildland fire. Also it can serve as an alternate evacuation route in case a portion of the main access road is cut-off by a wildfire. Road and barrier design will be used to prevent every day use by residents. Long term maintenance of this fire access road will be by the Bella Lago HOA.

5.1.5 Standard Fire Protection Features For Certain Perimeter Lots. All 139 residential structures will be built with a Class A roof covering. Attic or foundation ventilation louvers or ventilation openings in vertical walls shall not exceed 144 square inches per opening and shall be covered with ¼-inch mesh corrosion-resistant metal screening or other approved material that offers equivalent protection. Attic ventilation shall also comply with the requirements of the Uniform Building Code (U.B.C.). Ventilation louvers and openings may be incorporated as part of access assemblies.

Any chimney, flue or stovepipe shall have an approved spark arrester. An approved spark arrester defined as a device constructed of nonflammable materials, 12 gauge minimum thickness, or other material found satisfactory by the City of Chula Vista Fire Department, and having 1/2 inch perforations for arresting burning carbon or sparks and installed to be visible for the purposes of inspection and maintenance.

All residences shall have automatic sprinkler systems installed and maintained in accordance with National Fire Protection Association (NFPA) Standard 13D (current edition).

5.1 6 "Enhanced Fire Protection Features. In addition to the above described standard fire protection features, "enhanced" fire protection features will be applied to perimter lots 30, 42, 43, 65, 84, 94, 104 & 129 in the upper northern development and lots 1-10, 13 & 25-27 within the southern development. The purpose of the "enhanced" fire protection features is to minimize the potential ignition of any structure surfaces that are less than 100-feet and face highly flammable vegetation from any potential contact from radiant and convective heat and/or firebrands entering structures through openings.

The following items are required on all lots designated as "Enhanced" Fire Protection Features:

1) Requiring Class A roof assembly, including a Class A roof covering, on all proposed residential structures. A Class A roof assembly is described as all those components of the roof assembly shall meet the Class A requirement. [I.e. non-combustible roof covering, 1x solid sheathing at overhangs (starter board), a 5/16ths inch thick (minimum) non-combustible material placed between the 2x solid blocking and the 2x facia board].

2) Placement of fire resistive (1-hour rated) building materials on all residential exterior wall surfaces. No attic ventilation openings or ventilation louvers shall be permitted in soffits, in eave overhangs, between rafters at eaves, or in other overhanging areas.

3) All eaves of roof overhangs shall be enclosed with non-combustible materials.

4) All projections (exterior balconies, carports, decks, patio covers, unenclosed roofs and floors, and similar architectual appendages and projections shall be of non-combustible construction, one-hour fire resistive construction on the underside, or heavy timber construction. When such appendages and projections are attached to exterior fire-resistive walls, they shall be constructed to maintain the fire-resistive integrity of the wall.

5) All glass or other transparent, translucent or opaque glazing materials, including skylights, shall be constructed of tempered glass or multi-layered glazed panels. No skylights will be allowed on the roof assembly facing hazardous vegetation.

6) No wooden or combustible sideyard fences will be allowed within 5 feet of an exterior residential wall surface.

5.1.7 Roadside Fuel Treatment Within the SDG&E Easement. *(Depicted in Blue on the Fuel Treatment Location Map).* The entrance road, that is located within the SDG&E easement south of lots 42/28 and north of 12/13, will require a 30-foot wide fuel treatment strip on each side of the roadway as it passes through the easement area. Proposed treatment is to annually mow or weed-whip all grasses and other vegetation within these two strips to a 4-inch stubble height.

5.1.8 Water Rention Basin. *(Depicted in Yellow on the FuelTreatment Location Map).*
Vegetation of the natural slopes within these water rention basins will be maintained to a 6-inch stubble height by mowing or weed-whipping. The Bello Lago HOA shall be responsible of maintenance of these water retention basins.

5.2 Recommendations for inclusion in the Bella Lago Homeowner Association CC&R's:

1) The lot/home owner is personally responsible for all fuel treatment measures within his or her lot.

2) The Bella Lago HOA Board shall have the responsibility and authority for enforcing fuel treatment measures on all lots and restrictions on building of combustible structures on all restricted lots. The Chula Vista Fire Department will hold the Bella Lago HOA accountable for enforcement of all wildland fire protection issues discussed in this plan.

3) All Manufactured Slopes located outside a lot boundary and within the Low Fuel Volume Buffer Strip fuel treatment will be annually maintained according to the criteria established in this FPP by the Bella Lago HOA.

4) The Bella Lago HOA Board is responsible to the City of Chula Vista Fire Marshall for the annual completion of all fuel modification treatments prior to May 15th.

5) All property owners are members of the Bella Lago HOA and will financially support the annual maintenance of all required Fuel Modification Areas surrounding the Bella Lago development.

6) The HOA Board must have authority for enforcing the ban on **NO TRASH DUMPING OR DISPOSAL OF YARD TRIMMINGS IN THE DESIGNATED OPEN SPACE OR IN THE FUEL TREATMENT ZONES.**

7) All individual lot landscaping plans, including additional structures, must be approved by the Bella Lago HOA Board to see if they are in compliance to the Fire Protection Plan criteria. Guidance and inspection will be provided by the Chula Vista Fire Department and City Landscape Architecture Division.

5.4 Proposed Fuel Treatment Modification Location Map

The following page is a pocket folder containing the Bella Lago Development FUEL TREATMENT LOCATION MAP, which depicts the location of all proposed fuel modification treatment locations. In addition to the Fuel Treatment Location Map all fuel management zones shall be permanently marked on the ground for the purpose of guiding annual fuel management maintenance operations.

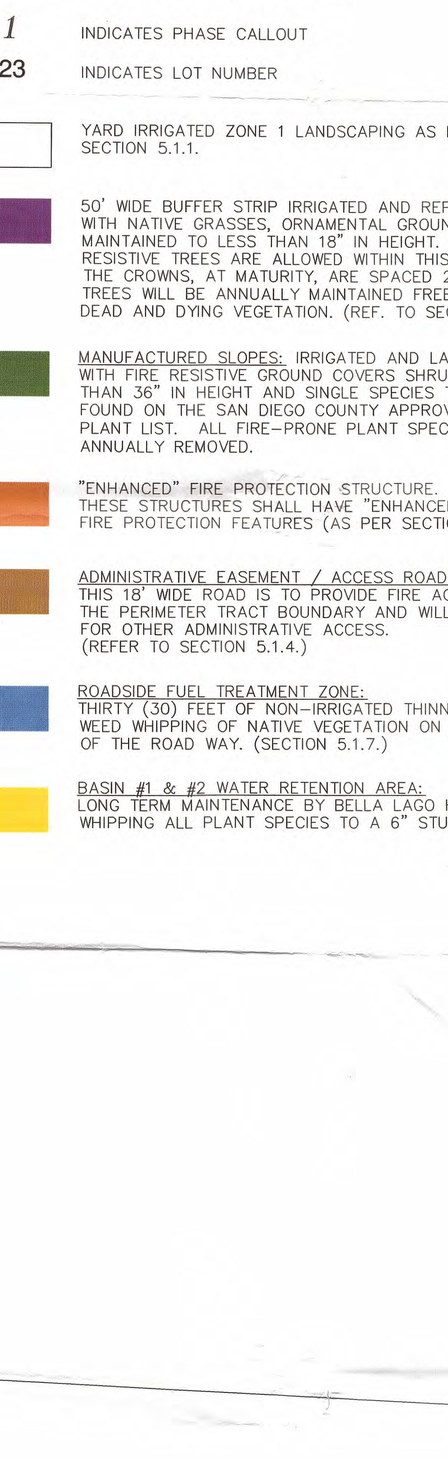
FUEL TREATMENT LOCATION MAP for:

BELLA LAGO

CITY OF CHULA VISTA TRACT 03-03

LEGEND:

- INDICATES PHASING DELINEATION
- *1* INDICATES PHASE CALLOUT
- 23 INDICATES LOT NUMBER
- YARD IRRIGATED ZONE 1 LANDSCAPING AS PER SECTION 5.1.1.
- 50' WIDE BUFFER STRIP IRRIGATED AND REPLANTED WITH NATIVE GRASSES, ORNAMENTAL GROUND COVERS. MAINTAINED TO LESS THAN 18" IN HEIGHT. SINGLE SPECIMEN FIRE RESISTIVE TREES ARE ALLOWED WITHIN THIS ZONE PROVIDED THE CROWNS, AT MATURITY, ARE SPACED 20' APART. TREES WILL BE ANNUALLY MAINTAINED FREE OF ALL DEAD AND DYING VEGETATION. (REF. TO SECTION 5.1.2)
- MANUFACTURED SLOPES: IRRIGATED AND LANDSCAPED WITH FIRE RESISTIVE GROUND COVERS SHRUBS LESS THAN 36" IN HEIGHT AND SINGLE SPECIES TREES FOUND ON THE SAN DIEGO COUNTY APPROVED PLANT LIST. ALL FIRE-PRONE PLANT SPECIES ANNUALLY REMOVED.
- "ENHANCED" FIRE PROTECTION STRUCTURE. THESE STRUCTURES SHALL HAVE "ENHANCED" FIRE PROTECTION FEATURES (AS PER SECTION 5.1.6)
- ADMINISTRATIVE EASEMENT / ACCESS ROAD: THIS 18' WIDE ROAD IS TO PROVIDE FIRE ACCESS TO THE PERIMETER TRACT BOUNDARY AND WILL BE USED FOR OTHER ADMINISTRATIVE ACCESS. (REFER TO SECTION 5.1.4.)
- ROADSIDE FUEL TREATMENT ZONE: THIRTY (30) FEET OF NON-IRRIGATED THINNING AND/OR WEED WHIPPING OF NATIVE VEGETATION ON EACH SIDE OF THE ROAD WAY. (SECTION 5.1.7.)
- BASIN #1 & #2 WATER RETENTION AREA: LONG TERM MAINTENANCE BY BELLA LAGO HOA BY WEED WHIPPING ALL PLANT SPECIES TO A 6" STUBBLE HEIGHT.



VICINITY MAP
N.T.S.



SCALE: 1"=100'

0 100 200 300 400

SCALE: 1" = 100'

Certified By

Richard E. Montague

Richard E. Montague
California Licensed Forester #905

1-27-06 (Date)

FIREWISE 2000, Inc.
330 W. Felicita Ave., Suite D-1
Escondido, CA 92025-6530
Telephone: 760-745-3947
Fax: 760-745-0851

PREPARED BY:
MAY GROUP
PLANNING • ENGINEERING • SURVEYING
8555 Aero Drive Suite 305 • San Diego, CA 92123
858/505-0435, FAX 858/505-0441

PREPARED FOR:
K. HOVNANIAN HOMES
420 STEVENS AVE.
SUITE 170
SOLANA BEACH, CA 92075
Phone: (858) 847-9660

X:\OPR\BLE\EXHIBITS\FUEL TREATMENT LOC MAP.DWG
W.O. # 0140-01 DATE PREPARED: 12-20-2005
REVISED DATE: 01-23-2006

Appendix C

Bella Lago Subdivision
Infrastructure Responsibility Table

APPENDIX 'C'
BELLA LAGO SUBDIVISION INFRASTRUCTURE RESPONSIBILTY TABLE

INFRASTRUCTURE	MAINTENANCE RESPONSIBILITY
Streets	
Private Streets Total of 9,997 linear feet	Home Owners Association (HOA)
Street Lighting – Private Streets	HOA
Storm Drain System (private)	
w/in Private Streets	HOA
w/in Public Streets	HOA
Lot #147 detention basin and force main	HOA*
Sewer System	
Sewer Main	City
Pump Station	City**
Water System	Otay Water District
Landscaping	
Parkways	HOA
Perimeter Slopes	HOA
Interior Slopes	HOA or private homeowner
Right-of-way areas	HOA
Perimeter fence and walls	HOA
Private Gate and Entry	HOA
Open Space	
MSCP Open Space	Preserve Manager
Private Open Space	HOA

* Grant of easement and maintenance agreement required.
** Pursuant to City policy, applicant pays for maintenance of pump station.

Appendix D

Water Conservation Plan

FINAL
BELLA LAGO PRECISE PLAN
WATER CONSERVATION PLAN

October 25, 2002

Dexter Wilson Engineering, Inc.
Consulting Engineers
703 Palomar Airport Road
Suite 300
Carlsbad, CA 92009
(760) 438-4422

Job Number: 729-003

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ABBREVIATIONS

ac -	acre
ac-ft -	acre-foot
cfd -	community facilities district
cfs -	cubic feet per second
gpd -	gallons per day
gpf -	gallons per flush
gpm -	gallons per minute
HOA -	homeowner's association
mgd -	million gallons per day

USEFUL CONVERSIONS

1 acre-foot	=	325,829 gallons
1 mgd	=	1,000,000 gallons/day
1 cfs	=	448.8 gpm
1 cubic foot	=	7.48 gallons
1 mgd	=	694.4 gpm

EXECUTIVE SUMMARY

The City of Chula Vista's Growth Management Ordinance requires that all development projects with 50 dwelling units or greater prepare a Water Conservation Plan. This plan presents a review of presently available technologies and practices which result in water conservation in primarily residential development. This report presents water conservation measures that will be incorporated into the planning and design of Bella Lago.

The Bella Lago development proposes 140 single family residential units on 179 acres. The project is located in the eastern portion of the City of Chula Vista, adjacent to the Rolling Hills Ranch project. Figure 1 provides a location map for the project.

The Otay Water District is the local water agency that will supply potable water to Bella Lago. The total estimated average potable water use for Bella Lago is 134,624 gpd. Since the project is upstream of Lower Otay Reservoir, a potable water reservoir, recycled water cannot be used on the project.

The State and local government have mandated a number of water conservation measures. The focus of this study is on the implementation of non-mandated water conservation measures. The Bella Lago project has established a water conservation target of 3.0 percent reduction of single family home water usage. To meet this target, the developer will install hot water pipe insulation, pressure reducing valves,water efficient dishwashers, and hot water on-demand units in all residential units. At buildout of the Bella Lago project, implementation of the above measures would result in an estimated water savings of 3,934 gallons per day. Additionally, single family homeowners will receive a landscaping guide as an education on the methods and importance of water conservation.

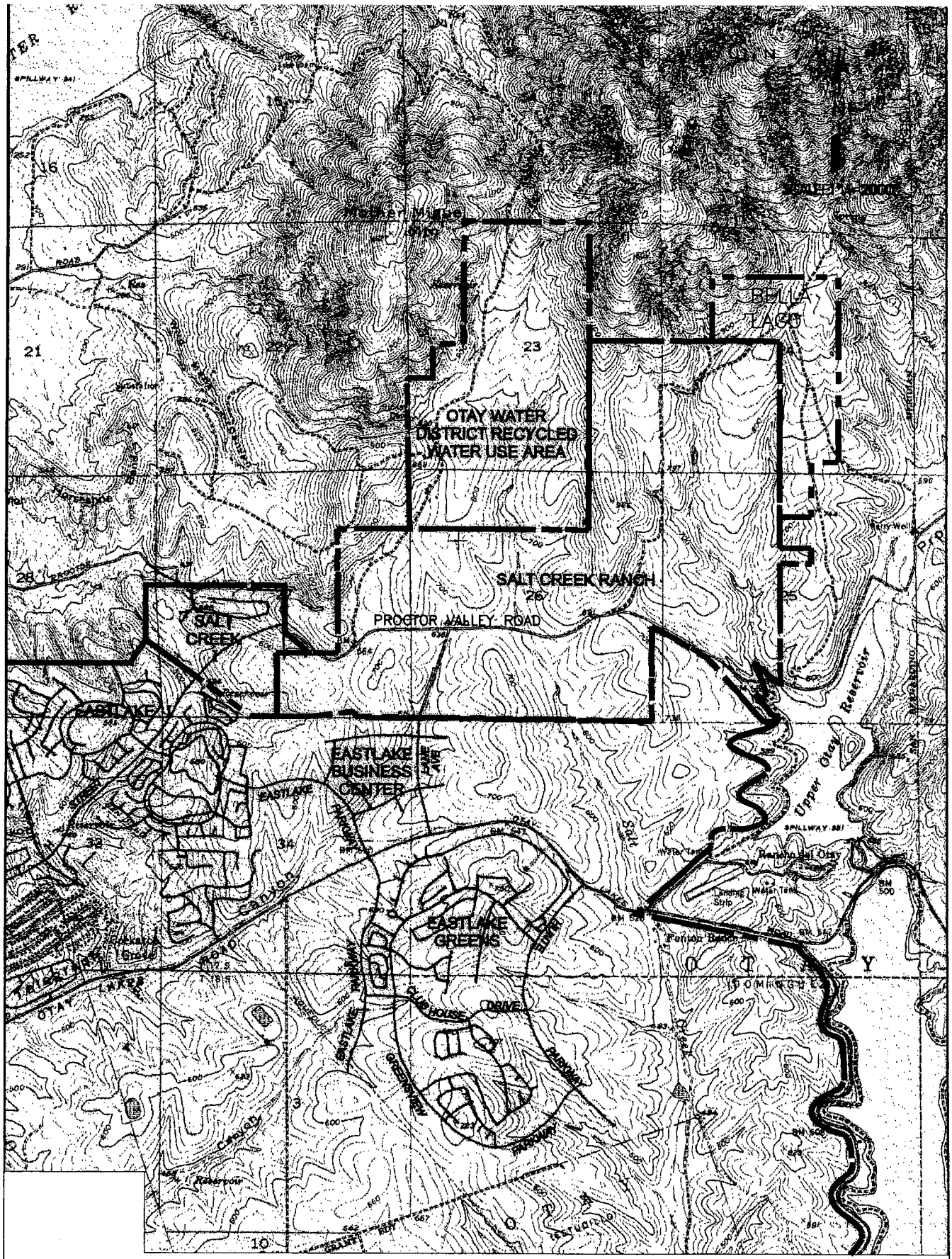


FIGURE 1

LOCATION MAP

INTRODUCTION

In recent years, the subject of water conservation has been given increased attention. The growing awareness of the need and value of water conservation has been sparked by local and regional water purveyors concerned about meeting the future water demands of their customers, particularly during drought conditions. Water conservation provides an alternative approach to the problem of finding new water sources to meet the water demand for a proposed community. The intent of water conservation is to manage water demand so that the customers receive adequate service but use less water.

Much has been done to educate consumers about limitations of water supply, the serious implications of a long-term drought, and the need for water conservation, but there is a practical limit to the percentage reduction of water use in established communities. This limit is a result of the types of plumbing fixtures installed in existing homes as well as the difficulty in altering consumers' established patterns of water use. Any water conservation effort, voluntary or mandatory, requires the cooperation of the public. Public information should be utilized to inform and convince the consumer that a change in personal water use habits is in everyone's best interest.

In recent years, the private development sector has become more attuned to the concerns of water availability and has recognized the value of addressing water conservation issues throughout planned development projects. By incorporating low water use plumbing fixtures, promoting drought tolerant landscaping, and providing educational materials to homeowners within the development project, private developments can do much to cultivate an interest in water conservation and establish new patterns of water use. These efforts can have significant impacts with regard to reducing the need for securing and importing larger quantities of water for use in San Diego County.

PURPOSE

The City of Chula Vista's Growth Management Ordinance requires that all major development projects (50 dwelling units or greater) prepare a Water Conservation Plan. The City Council has expressed a desire that other currently non-mandatory water conservation measures, including graywater use for larger lots and expanded recycled water systems be considered in future water conservation plans. Since Bella Lago is upstream of Lower Otay Reservoir, the graywater and recycled water systems cannot be used.

The City has undertaken an effort to develop and adopt guidelines for the preparation and implementation of required water conservation plans. This effort involved a pilot study that has been performed for three master planned projects (Otay Ranch Villages Six and Eleven, and Eastlake III), evaluating the relative effectiveness, costs, and issues associated with the implementation of additional water conservation measures beyond those currently mandated. Draft guidelines have been proposed to assist the City and developers in identifying the most beneficial conservation features to be implemented in a particular development. Final guidelines will be completed in the near future.

This plan presents a review of presently available technologies and practices which result in water conservation in primarily residential developments. The purpose of this report is to determine which of these technologies and practices are economically efficient and most cost effective to implement within the Bella Lago project.

This report presents water conservation measures which will be incorporated into the planning and design of Bella Lago and will provide a target for the anticipated water savings. This water conservation plan presents the long-term benefits with regard to water use reduction for the project.

Approximately half of the water used by residences in California is used outdoors. For this reason, options are presented that serve to reduce outdoor water use. The latest water conservation devices are presented along with an evaluation of their feasibility.

Although not covered in detail, there are several secondary benefits to conserving water that should be kept in mind when reviewing material in this report. These benefits include reduced sewage flows, reduced natural gas use, and reduced electricity use. Using less water in the shower, for example, reduces the amount of water input into the sewer system and reduces the amount of energy required to heat the water.

Project Description

Proposed development within Bella Lago includes 140 single family residential units on 179 acres. The irrigated open space portions of the project will be maintained by a homeowners association and have been taken into account in computing projected water demands for the project. Figure 2 provides the proposed development plan for Bella Lago.

WATER SUPPLY

The Otay Water District is the local water agency that will supply potable water to Bella Lago. The Otay Water District relies solely on the San Diego County Water Authority (SDCWA) for its potable water supply. The SDCWA is the largest of 27 member agencies of the Metropolitan Water District of Southern California (MWD), which is the primary importer of domestic water in Southern California.

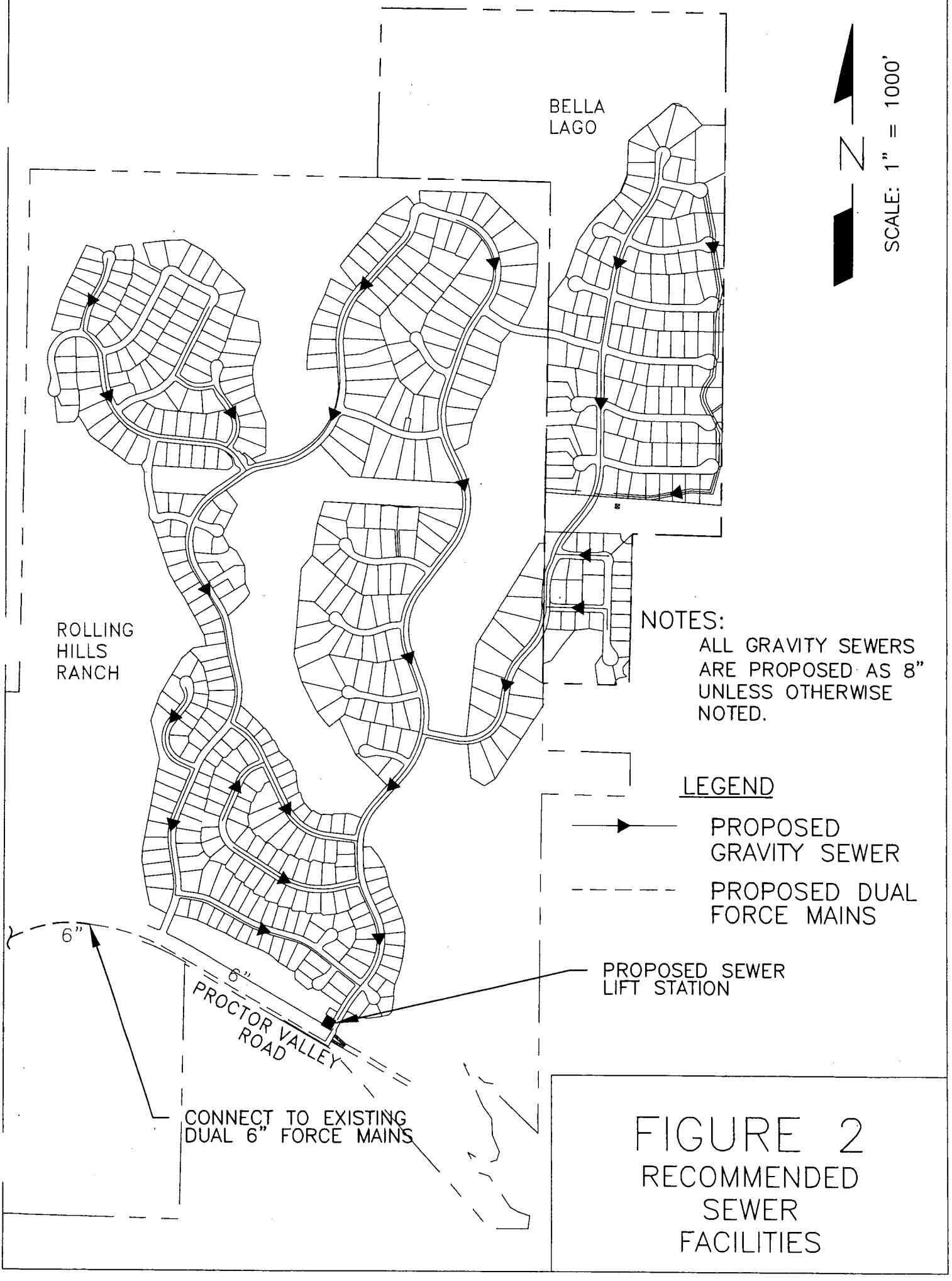


FIGURE 2
RECOMMENDED SEWER FACILITIES

PROJECTED WATER USE

Potable Water Demand

Water use is affected by, among other things, climate and the type of development. In California, recent trends towards the construction of more multi-unit housing, the general reduction in residential lot size, and a number of local agency water conservation programs in effect are all tending to reduce per capita water consumption. Total water use within the boundaries of the San Diego County Water Authority is approximately 209 gallons per capita per day and total use within the boundaries of the Otay Water District is estimated at 208 gallons per capita per day[1]. These values take into account commercial, agricultural, and industrial water uses as well as residential use.

Potable water demands were projected by taking the total acreage by land use and multiplying by water use factors. Table 1 provides the projected potable water demand for Bella Lago. The total estimated average potable water use is 135,464 gpd.

Table 1
Projected Potable Water Demands for Bella Lago

Land Use	Quantity	Unit Demand	Average Day Demands, gpd
Single-Family Residential (1-3 DU/AC)	140 units	856 gpd/unit[1]	119,840
Irrigated Slopes	7 ac	2,232 gpd/ac[2]	15,624
MSCP Natural Open Space	79 ac	0	0
Total			135,464

[1]Residential demand adopted from actual annual water consumption data provided by Otay Water District, 10/22/01.
[2]From OWD Water Resources Master Plan (1995).

MANDATED WATER CONSERVATION MEASURES

The State and many local Governments have mandated a number of water conservation measures. Table 2 summarizes the conservation measures that are mandated by the State of California.

TABLE 2
MANDATED WATER CONSERVATION DEVICES

Devices	Requirement
Showerheads	2.5 gpm
Lavatory Faucets	2.2 gpm
Sink Faucets	2.2 gpm
Metering Faucets in Public Restrooms	0.25-0.75 gal/cycle
Tub Spout Diverter	0.1 gpm
Residential Water Closets	1.6 gpf
Flushometer Valves	1.6 gpf
Commercial Water Closets	1.6 gpf
Urinals	1.0 gpf

Source: September 2001 report by Bahman Sheikh

NON-MANDATED WATER CONSERVATION MEASURES

Implementing water conservation measures before the construction of a new development project provides an opportunity to include measures that might not be feasible or cost effective to retrofit within a developed area. There are several measures described below that would be expensive to retrofit, but may be cost effective if included in the initial construction. As a part of the Water Conservation Pilot Study, the City and participating developers evaluated numerous potential water conservation measures for use within the projects. Based on the pilot study results, the Bella Lago

project selected four indoor and one outdoor measure for implementation in the project. The statistics represent results from surveys of manufacturers of the various water conservation devices. Indoor and outdoor measures are discussed separately. This report focuses on non-mandated water conservation measures.

Indoor Measures to be Implemented

Water Efficient Dishwasher. Efficient dishwashers, like clothes washers, are designed to reduce the amount of water used per load. Efficient dishwashers use about 6.0 to 7.0 gallons per load versus standard dishwashers that use about 8.0 to 9.0 gallons per load. This results in an estimated annual savings of 650 gallons per residential unit.

Water Pressure Reduction. Pressure reducing valves are used to lower water consumption through system leakage by reducing the pressure head to between 50 and 60 psi. Lower water pressure also reduces the flow rate from faucets in wash basins resulting in more efficient use of the water. This device is mainly useful in areas where water pressure is greater than 60 psi. The annual water savings resulting from the installation of pressure reducing valves is estimated to be 1,800 gallons per residential unit.

Hot Water Pipe Insulation. Insulation can be installed around the hot water piping at a household to minimize the amount of time that the homeowner waits for hot water at a sink or bathtub faucet. This measure can easily be implemented during initial construction, but would be infeasible as a retrofit to an existing home. This measure is expected to reduce annual water usage by approximately 2,400 gallons per unit.

Hot Water On-Demand Units. There are two types of hot water on-demand devices available on the market. One type, referred to as a "pump-back device," utilizes a combination of a valve and a pump. When activated, the cold water in the pipe between the fixture and the water heater storage tank is forced into the cold water pipe until the hot water arrives at the fixture. Then, the valve is automatically activated to allow hot water to flow out of the fixture for immediate use. The other type of on-demand unit, referred to as a "tank-less water heater," involves the installation of small water heaters located close to the point of use such as in bathrooms and the kitchen. This latter technology is proposed for use on the Bella Lago project because it is significantly more cost effective than the "pump back device". The estimated annual water savings from hot water on-demand units is 5,300 gallons per residential unit.

Outdoor Measures to be Implemented

Water Conservation Guide. Studies have shown that increased public awareness and information is very important to an effective water conservation plan[3]. A water conservation education program including information and a landscape watering guide will be distributed to the homeowners of the development project. The program will assist homeowners in the design and installation of water efficient landscaping and to educate the homeowners on the efficient irrigation of landscaping. The contents of the educational program and information guide shall be approved by the Director of Planning and Building. Besides efficient irrigation, the home water conservation guide will include information on general conservation techniques, such as listing commonly available drought resistant plants, and explain how to install efficient irrigation systems such as drip irrigation.

The developers involved in the water conservation pilot study have researched the amount of water used on homeowner landscaping and the amount of savings that could be achieved through proper watering techniques. Their findings indicate that a home in a low density residential area (1-3 DU/AC) uses an average of 400 gpd on landscaping. It is estimated that the average homeowner overwaters their lawn by 25 to 40 percent. By educating the homeowner and providing incentive for reduced water use, it is assumed that a 15 percent reduction (or 60 gpd) in outdoor water use can be achieved.

Optional Measures

Evapotranspiration Controllers. Evapotranspiration controllers are a relatively new technology that have primarily been used in larger landscaped areas such as parks and open space slopes. The technology is, however, applicable to single family residences. The system works by controlling irrigation schedules based on local evapotranspiration data. Radio signals from a central control facility would continually transmit the appropriate information to irrigation controllers at each customer's site and the controller would activate the irrigation system for the appropriate length of time. The annual water savings for a typical single family house is 20,000 gallons when compared to a conventional irrigation system.

Dual Flush Toilets. Rather than flushing at a rate of 1.6 gallons per cycle, dual flush toilets give the user the option to flush with 0.8 gallons depending on need. The relative newness of this technology presents the most significant challenge in the implementation of this device. The estimated annual water savings from this measure is 4,000 gallons per residential unit.

High Efficiency Washing Machines. Efficient clothes washers are designed to reduce the amount of water used per load. In a typical household, it is estimated that efficient front loading washers can result in an annual savings of 7,000 gallons per residential unit. Many times clothes washers are not supplied by the developer so it is often not their decision whether or not to install the more efficient machines.

WATER CONSERVATION TARGET

The Bella Lago project has set targets for the reduction of water use in single family residential units. The targeted reduction is 3.0 percent. Table 3 summarizes the total estimated water savings for Bella Lago based on this proposed reduction.

TABLE 3
WATER CONSERVATION TARGETS

Residential End Use Type	Proposed Units	Average Water Usage gpd/unit	Percentage Reduction	Targeted Water Use Reduction gpd/unit	Total Water Savings gpd
Low Density Single Family	140	856	3.0	25.7	3,598

IMPLEMENTATION MEASURES

For the Bella Lago project, Table 4 summarizes the water conservation measures that will be implemented for single family residential units. This table also provides the anticipated savings associated with the implementation of these measures.

Based on 140 single family units within the Bella Lago project at buildout, implementation of the measures in Table 4 would result in estimated water savings of 3,934 gallons per day for the project. In addition, the developers will prepare and distribute a landscape watering guide in an effort to reduce outdoor water usage by as much as 15 percent. This could result in an additional total water savings of 8,400 gpd for the project.

TABLE 4
BELLA LAGO
RESIDENTIAL WATER CONSERVATION MEASURES

Measure	Location	Yearly Water Savings gpd/unit	Daily Water Savings gpd/unit	Percentage of Total Usage	Total Water Savings gpd
Hot Water Pipe Insulation	Indoor	2,400	6.58	0.8	941
Pressure Reducing Valves	Indoor	1,800	4.93	0.6	705
Water Efficient Dishwashers	Indoor	650	1.78	0.2	255
Hot Water On-Demand Units	Indoor	5,300	14.52	1.7	2,033
Subtotal		10,150	27.81	3.3	3,934
Estimated Potential Additional Savings					
Landscape Guide	Outdoor	21,900	60.00	7.0	8,400

[1]Based on 856 gpd/unit average usage.

To additionally promote the Water Conservation Plan, the developer will offer other non-mandated conservation options to homebuyers. These options will be displayed in the model homes and may include evapotranspiration controllers, dual flush toilets, and high-efficiency washing machines.

In addition to establishing requirements and guidelines, the Master Developer will be responsible for the following:

- Provide educational materials to new homeowners.
- Install drought tolerant landscaping, approved by the City, in selected streetscapes and open areas.
- Require the inclusion of drought tolerant plant materials and efficient irrigation systems in the majority of builder installed landscaping.

IMPLEMENTATION PROGRAM

For the water conservation measures proposed to be incorporated into the Bella Lago project, Table 5 summarizes the implementation timing for each measure. The first four items in Table 5 are within the household and are the responsibility of the home builder to implement and the responsibility of the City Building Department to ensure that they are implemented. The landscaping guide is to be prepared by the developer and provided to the homeowner at the time of occupancy.

TABLE 5 BELLA LAGO IMPLEMENTATION PROGRAM		
Water Conservation Measure	Responsibility for Implementation	Timing
Hot Water Pipe Insulation	Developer	Initial Construction
Pressure Reducing Valves	Developer	Initial Construction
Water Efficient Dishwashers	Developer	Initial Construction
Hot Water On-Demand Units	Developer	Initial Construction
Landscape Guide	Developer	Initial Construction

REFERENCES

1. San Diego County Water Authority, 1996 Annual Report.

2. Bahman Sheikh, Water Use Efficiency, Strategies for Proposed Residential Developments, September 2001.

3. American Water Works Association Journal, Volume 79, No. 3, March 1987..

4. Engineering News Record (ENR) Journal, July 2000.

Appendix E

Air Quality Improvement Plan

INVESTIGATIVE SCIENCE AND ENGINEERING INC.

Corporate Office
16486 Bernardo Center Drive, #124
San Diego, CA 92128
Phone/Fax: (858) 451-3505 / (858) 451-0946
www.ise.us

December 2, 2002 (Revised)

Dr. Timothy Wilson
Bella Lago, LLC
13039 Brixton Place
San Diego, CA 92130

RE: AIR QUALITY IMPROVEMENT PLAN
BELLA LAGO RESIDENTIAL DEVELOPMENT – CHULA VISTA, CA
ISE REPORT #02-095

Dear Dr. Wilson:

At your request, Investigative Science and Engineering (ISE) was directed to develop a summary Air Quality Improvement Plan (AQIP) for the proposed Bella Lago residential development as required under the City of Chula Vista Municipal Code Section 19.09.050b. The results of that investigation are presented in this letter report.

Executive Summary

The developer of the proposed Bella Lago residential community will participate in the *Chula Vista GreenStar Program* by implementing either the *ComfortWise*^{SM}, *SDGE CA EnergyStar*^{SM}, or custom building program identified in the Community Energy Efficiency Program (CEEP). Further, the developer plans additional measures outlined within this report to enhance CO_2 uptake consistent with the City's Carbon Dioxide Reduction Plan.

Introduction and Purpose

The Chula Vista Municipal Code Section 19.09.050b encourages the development of an Air Quality Improvement Plan (AQIP) for all major development projects (defined as producing 50 or more dwelling units, or equivalent), so as to demonstrate that the best available control technology (BACT) is employed to reduce adverse air quality impacts. This policy is consistent with the policies currently in practice by the San Diego Air Pollution Control District (SDAPCD) and the California Air Resources Board (CARB).

The City has further outlined action measures to, *"... enhance opportunities to improve air quality and energy conservation..."* within their Carbon Dioxide (CO_2) Reduction Plan. The plan encourages, whenever possible, a diverse land use that minimizes urban sprawl and is orientated towards public transit, pedestrian, and bicycle use. Additionally, the Plan encourages energy efficient construction above CCR Title 24

Standards with solar thermal applications (if possible) and dense vegetation to increase CO_2 uptake.

Project Description

The proposed Bella Lago development plan would consist of approximately 140 high-end residential structures located on 180 acres within the northeast corner of the Rolling Hills Ranch specific plan area overlooking Otay Lakes.

Air Quality Action Measures

The City's AQIP pilot study report and CO_2 Reduction Plan identified a total of 12 Action Measures to be addressed in the AQIP. The ability to address all twelve measures in the Bella Lago AQIP is limited due to the project size, configuration, and required land dedication to the Multiple Species Conservation Plan (MSCP). However, energy efficient building construction and increased vegetation are effective measures that can be achieved within Bella Lago.

Community Energy Efficiency Program (CEEP) homes are designed and built with tight ducts, better windows, and improved construction so as to be at least 15% more energy efficient than the California Title 24 energy code. The program includes inspections of energy features and diagnostics of the HVAC system as the homes are being built. Other program elements can be added such as job-site recycling and air pollution credits to help solve local mandates. All CEEP homes exceed standard *EnergyStar*^{SM} requirements.

Builders agree to meet the energy requirements of the program in one of two ways: either the homes are *ComfortWise*^{SM} or *SDGE CA EnergyStar*^{SM} homes, or the homes meet the following five requirements of the CEEP. Namely,

1) The HVAC system must be designed to the Air Conditioning Contractors of America requirements (ACCA Manual J, D, and S). An engineer registered in the State of California must stamp the HVAC design.
2) The CHEERS computer analysis program must demonstrate that the home scores an 86 or greater, which is equivalent to an ENERGY STAR® Home.
3) The California Energy Commission's "Tight Duct" criteria must be met.
4) Contractor must use CEEP scopes of work (obtainable at www.thebii.org), and notify installing subcontractors (insulation, windows, and HVAC) that the scopes of work will be used as the basis for all quality inspections.
5) CHEERS-compliant inspection and diagnostic evaluations will be made. They include insulation, caulking, windows, water heating, furnace and AC system. A certified CHEERS rater performs duct blaster and blower door tests.

In fact, the US Environmental Protection Agency (EPA) has calculated the following reduction factors to ascertain the regional air quality improvements attainable using construction methods contained in programs consistent with CEEP requirements. These reductions, which are shown below, are attainable through use of the CEEP on a per-kilowatt-hour-basis.

CO_2 Reduction Pounds	SO_2 Reduction Pounds	NO_x Reduction Pounds
0.478	0.0034	0.0037

All values given in pounds per kilowatt-hour saved.

In other words, any project using a CEEP building program would, for every kilowatt-hour saved, reduce CO_2 emissions by 0.478 pounds, SO_2 emissions by 0.0034 pounds, and NO_x emissions by 0.0037 pounds. These savings have the direct effect of improving regional air quality within the San Diego air basin.

Project Implementation

The developer will implement the *ComfortWise*^{SM}, *SDGE CA EnergyStar*^{SM}, or custom CEEP building program on all units within the Bella Lago residential development. Consistent with the City's Carbon Dioxide Reduction Plan, the following measures are proposed for the Bella Lago development in order to further reduce CO_2 emissions within the development.

1) The project would have a paved, 12-foot-wide bicycle and walking pathway traversing the entire eastern edge of the project. This path would in turn link up to the entire project cul-de-sacs again encouraging bicycling and walking.

2) The project contains three depressed detention basins, which will be planted with grass and landscaped in a neighborhood park-like fashion.

3) The entire project site would have an Italian Village theme with lushly landscaped areas and hundreds of trees. In fact, this level of dense landscaping is the focal point of the projects Italian village theme. It is the intent of the project landscape design to go above-and-beyond the minimum City requirements.

4) All homes will be wired for telecommuting encouraging home office use. This would lower the aggregate number of daily car trips to remote offices or other locations.

5) The project contains a 50-foot-wide fuel management zone surrounding the entire development that will be planted with grass and ornamental shrubs not exceeding 18 inches in height. The zone creates about ten acres of open space in addition to the current 90 acres of dedicated open space.

6) The pad to lot ratio is large, meaning there will be increased open space on each lot compared to actual building area.

These measures are consistent with the best available control methods for CO_2 currently available. Implementation of these measures should provide some relief to localized CO_2 levels as defined under the City's reduction plan. Additionally, the project shall comply with all applicable air quality mitigation measures outlined in the project Environmental Impact Report.

Should you have any questions regarding the above conclusions, please do not hesitate to contact me at (858) 451-3505.

Sincerely,

Rick Tavares

Rick Tavares, Ph.D.
Project Principal
Investigative Science and Engineering, Inc.

Cc: Jeremy Louden, ISE

Appendix C

Bella Lago Subdivision
Infrastructure Responsibility Table

APPENDIX 'C'
BELLA LAGO SUBDIVISION INFRASTRUCTURE RESPONSIBILTY TABLE

INFRASTRUCTURE	MAINTENANCE RESPONSIBILITY
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Private Streets Total of 9,997 linear feet	Home Owners Association (HOA)
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Perimeter fence and walls	HOA
Private Gate and Entry	HOA
Open Space	
MSCP Open Space	Preserve Manager
Private Open Space	HOA

* Grant of easement and maintenance agreement required.
** Pursuant to City policy, applicant pays for maintenance of pump station.

Appendix D

Water Conservation Plan

FINAL
BELLA LAGO PRECISE PLAN
WATER CONSERVATION PLAN

October 25, 2002

Dexter Wilson Engineering, Inc.
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Suite 300
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(760) 438-4422

Job Number: 729-003

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ABBREVIATIONS

ac -	acre
ac-ft -	acre-foot
cfd -	community facilities district
cfs -	cubic feet per second
gpd -	gallons per day
gpf -	gallons per flush
gpm -	gallons per minute
HOA -	homeowner's association
mgd -	million gallons per day

USEFUL CONVERSIONS

1 acre-foot	=	325,829 gallons
1 mgd	=	1,000,000 gallons/day
1 cfs	=	448.8 gpm
1 cubic foot	=	7.48 gallons
1 mgd	=	694.4 gpm

EXECUTIVE SUMMARY

The City of Chula Vista's Growth Management Ordinance requires that all development projects with 50 dwelling units or greater prepare a Water Conservation Plan. This plan presents a review of presently available technologies and practices which result in water conservation in primarily residential development. This report presents water conservation measures that will be incorporated into the planning and design of Bella Lago.

The Bella Lago development proposes 140 single family residential units on 179 acres. The project is located in the eastern portion of the City of Chula Vista, adjacent to the Rolling Hills Ranch project. Figure 1 provides a location map for the project.

The Otay Water District is the local water agency that will supply potable water to Bella Lago. The total estimated average potable water use for Bella Lago is 134,624 gpd. Since the project is upstream of Lower Otay Reservoir, a potable water reservoir, recycled water cannot be used on the project.

The State and local government have mandated a number of water conservation measures. The focus of this study is on the implementation of non-mandated water conservation measures. The Bella Lago project has established a water conservation target of 3.0 percent reduction of single family home water usage. To meet this target, the developer will install hot water pipe insulation, pressure reducing valves,water efficient dishwashers, and hot water on-demand units in all residential units. At buildout of the Bella Lago project, implementation of the above measures would result in an estimated water savings of 3,934 gallons per day. Additionally, single family homeowners will receive a landscaping guide as an education on the methods and importance of water conservation.

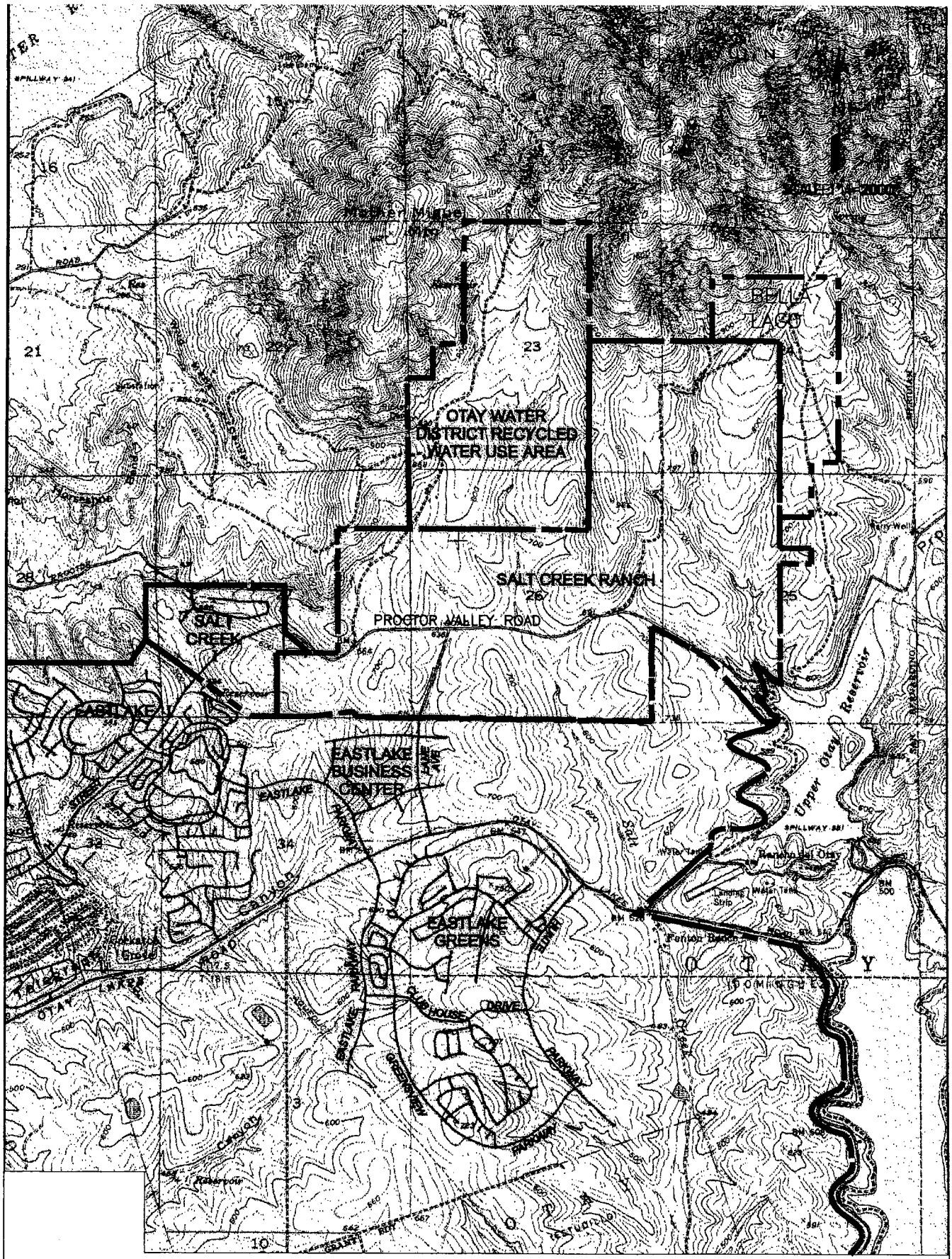


FIGURE 1

LOCATION MAP

INTRODUCTION

In recent years, the subject of water conservation has been given increased attention. The growing awareness of the need and value of water conservation has been sparked by local and regional water purveyors concerned about meeting the future water demands of their customers, particularly during drought conditions. Water conservation provides an alternative approach to the problem of finding new water sources to meet the water demand for a proposed community. The intent of water conservation is to manage water demand so that the customers receive adequate service but use less water.

Much has been done to educate consumers about limitations of water supply, the serious implications of a long-term drought, and the need for water conservation, but there is a practical limit to the percentage reduction of water use in established communities. This limit is a result of the types of plumbing fixtures installed in existing homes as well as the difficulty in altering consumers' established patterns of water use. Any water conservation effort, voluntary or mandatory, requires the cooperation of the public. Public information should be utilized to inform and convince the consumer that a change in personal water use habits is in everyone's best interest.

In recent years, the private development sector has become more attuned to the concerns of water availability and has recognized the value of addressing water conservation issues throughout planned development projects. By incorporating low water use plumbing fixtures, promoting drought tolerant landscaping, and providing educational materials to homeowners within the development project, private developments can do much to cultivate an interest in water conservation and establish new patterns of water use. These efforts can have significant impacts with regard to reducing the need for securing and importing larger quantities of water for use in San Diego County.

PURPOSE

The City of Chula Vista's Growth Management Ordinance requires that all major development projects (50 dwelling units or greater) prepare a Water Conservation Plan. The City Council has expressed a desire that other currently non-mandatory water conservation measures, including graywater use for larger lots and expanded recycled water systems be considered in future water conservation plans. Since Bella Lago is upstream of Lower Otay Reservoir, the graywater and recycled water systems cannot be used.

The City has undertaken an effort to develop and adopt guidelines for the preparation and implementation of required water conservation plans. This effort involved a pilot study that has been performed for three master planned projects (Otay Ranch Villages Six and Eleven, and Eastlake III), evaluating the relative effectiveness, costs, and issues associated with the implementation of additional water conservation measures beyond those currently mandated. Draft guidelines have been proposed to assist the City and developers in identifying the most beneficial conservation features to be implemented in a particular development. Final guidelines will be completed in the near future.

This plan presents a review of presently available technologies and practices which result in water conservation in primarily residential developments. The purpose of this report is to determine which of these technologies and practices are economically efficient and most cost effective to implement within the Bella Lago project.

This report presents water conservation measures which will be incorporated into the planning and design of Bella Lago and will provide a target for the anticipated water savings. This water conservation plan presents the long-term benefits with regard to water use reduction for the project.

Approximately half of the water used by residences in California is used outdoors. For this reason, options are presented that serve to reduce outdoor water use. The latest water conservation devices are presented along with an evaluation of their feasibility.

Although not covered in detail, there are several secondary benefits to conserving water that should be kept in mind when reviewing material in this report. These benefits include reduced sewage flows, reduced natural gas use, and reduced electricity use. Using less water in the shower, for example, reduces the amount of water input into the sewer system and reduces the amount of energy required to heat the water.

Project Description

Proposed development within Bella Lago includes 140 single family residential units on 179 acres. The irrigated open space portions of the project will be maintained by a homeowners association and have been taken into account in computing projected water demands for the project. Figure 2 provides the proposed development plan for Bella Lago.

WATER SUPPLY

The Otay Water District is the local water agency that will supply potable water to Bella Lago. The Otay Water District relies solely on the San Diego County Water Authority (SDCWA) for its potable water supply. The SDCWA is the largest of 27 member agencies of the Metropolitan Water District of Southern California (MWD), which is the primary importer of domestic water in Southern California.

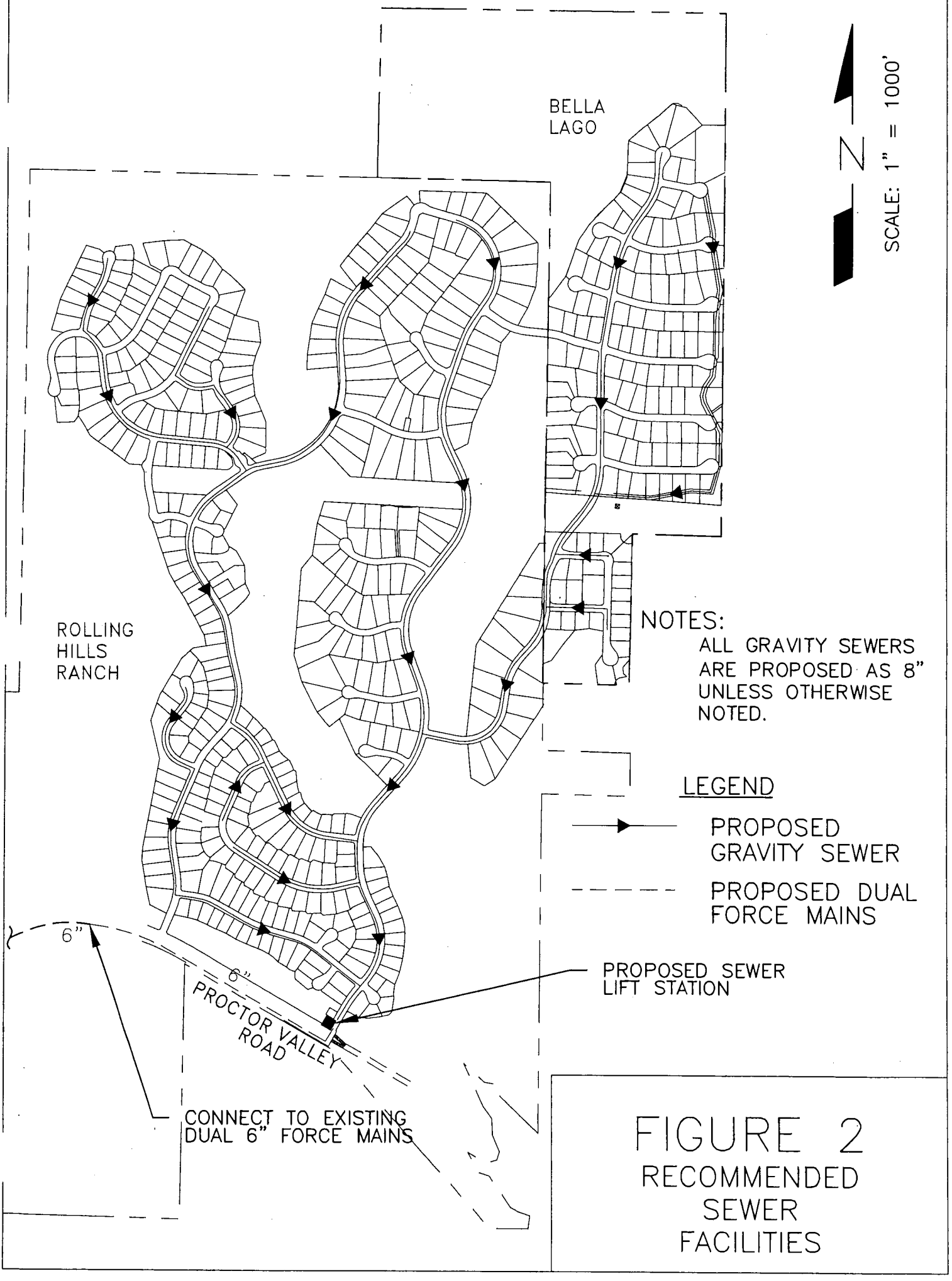


FIGURE 2
RECOMMENDED SEWER FACILITIES

PROJECTED WATER USE

Potable Water Demand

Water use is affected by, among other things, climate and the type of development. In California, recent trends towards the construction of more multi-unit housing, the general reduction in residential lot size, and a number of local agency water conservation programs in effect are all tending to reduce per capita water consumption. Total water use within the boundaries of the San Diego County Water Authority is approximately 209 gallons per capita per day and total use within the boundaries of the Otay Water District is estimated at 208 gallons per capita per day[1]. These values take into account commercial, agricultural, and industrial water uses as well as residential use.

Potable water demands were projected by taking the total acreage by land use and multiplying by water use factors. Table 1 provides the projected potable water demand for Bella Lago. The total estimated average potable water use is 135,464 gpd.

Table 1
Projected Potable Water Demands for Bella Lago

Land Use	Quantity	Unit Demand	Average Day Demands, gpd
Single-Family Residential (1-3 DU/AC)	140 units	856 gpd/unit[1]	119,840
Irrigated Slopes	7 ac	2,232 gpd/ac[2]	15,624
MSCP Natural Open Space	79 ac	0	0
Total			135,464

[1]Residential demand adopted from actual annual water consumption data provided by Otay Water District, 10/22/01.
[2]From OWD Water Resources Master Plan (1995).

MANDATED WATER CONSERVATION MEASURES

The State and many local Governments have mandated a number of water conservation measures. Table 2 summarizes the conservation measures that are mandated by the State of California.

TABLE 2
MANDATED WATER CONSERVATION DEVICES

Devices	Requirement
Showerheads	2.5 gpm
Lavatory Faucets	2.2 gpm
Sink Faucets	2.2 gpm
Metering Faucets in Public Restrooms	0.25-0.75 gal/cycle
Tub Spout Diverter	0.1 gpm
Residential Water Closets	1.6 gpf
Flushometer Valves	1.6 gpf
Commercial Water Closets	1.6 gpf
Urinals	1.0 gpf

Source: September 2001 report by Bahman Sheikh

NON-MANDATED WATER CONSERVATION MEASURES

Implementing water conservation measures before the construction of a new development project provides an opportunity to include measures that might not be feasible or cost effective to retrofit within a developed area. There are several measures described below that would be expensive to retrofit, but may be cost effective if included in the initial construction. As a part of the Water Conservation Pilot Study, the City and participating developers evaluated numerous potential water conservation measures for use within the projects. Based on the pilot study results, the Bella Lago

project selected four indoor and one outdoor measure for implementation in the project. The statistics represent results from surveys of manufacturers of the various water conservation devices. Indoor and outdoor measures are discussed separately. This report focuses on non-mandated water conservation measures.

Indoor Measures to be Implemented

Water Efficient Dishwasher. Efficient dishwashers, like clothes washers, are designed to reduce the amount of water used per load. Efficient dishwashers use about 6.0 to 7.0 gallons per load versus standard dishwashers that use about 8.0 to 9.0 gallons per load. This results in an estimated annual savings of 650 gallons per residential unit.

Water Pressure Reduction. Pressure reducing valves are used to lower water consumption through system leakage by reducing the pressure head to between 50 and 60 psi. Lower water pressure also reduces the flow rate from faucets in wash basins resulting in more efficient use of the water. This device is mainly useful in areas where water pressure is greater than 60 psi. The annual water savings resulting from the installation of pressure reducing valves is estimated to be 1,800 gallons per residential unit.

Hot Water Pipe Insulation. Insulation can be installed around the hot water piping at a household to minimize the amount of time that the homeowner waits for hot water at a sink or bathtub faucet. This measure can easily be implemented during initial construction, but would be infeasible as a retrofit to an existing home. This measure is expected to reduce annual water usage by approximately 2,400 gallons per unit.

Hot Water On-Demand Units. There are two types of hot water on-demand devices available on the market. One type, referred to as a "pump-back device," utilizes a combination of a valve and a pump. When activated, the cold water in the pipe between the fixture and the water heater storage tank is forced into the cold water pipe until the hot water arrives at the fixture. Then, the valve is automatically activated to allow hot water to flow out of the fixture for immediate use. The other type of on-demand unit, referred to as a "tank-less water heater," involves the installation of small water heaters located close to the point of use such as in bathrooms and the kitchen. This latter technology is proposed for use on the Bella Lago project because it is significantly more cost effective than the "pump back device". The estimated annual water savings from hot water on-demand units is 5,300 gallons per residential unit.

Outdoor Measures to be Implemented

Water Conservation Guide. Studies have shown that increased public awareness and information is very important to an effective water conservation plan[3]. A water conservation education program including information and a landscape watering guide will be distributed to the homeowners of the development project. The program will assist homeowners in the design and installation of water efficient landscaping and to educate the homeowners on the efficient irrigation of landscaping. The contents of the educational program and information guide shall be approved by the Director of Planning and Building. Besides efficient irrigation, the home water conservation guide will include information on general conservation techniques, such as listing commonly available drought resistant plants, and explain how to install efficient irrigation systems such as drip irrigation.

The developers involved in the water conservation pilot study have researched the amount of water used on homeowner landscaping and the amount of savings that could be achieved through proper watering techniques. Their findings indicate that a home in a low density residential area (1-3 DU/AC) uses an average of 400 gpd on landscaping. It is estimated that the average homeowner overwaters their lawn by 25 to 40 percent. By educating the homeowner and providing incentive for reduced water use, it is assumed that a 15 percent reduction (or 60 gpd) in outdoor water use can be achieved.

Optional Measures

Evapotranspiration Controllers. Evapotranspiration controllers are a relatively new technology that have primarily been used in larger landscaped areas such as parks and open space slopes. The technology is, however, applicable to single family residences. The system works by controlling irrigation schedules based on local evapotranspiration data. Radio signals from a central control facility would continually transmit the appropriate information to irrigation controllers at each customer's site and the controller would activate the irrigation system for the appropriate length of time. The annual water savings for a typical single family house is 20,000 gallons when compared to a conventional irrigation system.

Dual Flush Toilets. Rather than flushing at a rate of 1.6 gallons per cycle, dual flush toilets give the user the option to flush with 0.8 gallons depending on need. The relative newness of this technology presents the most significant challenge in the implementation of this device. The estimated annual water savings from this measure is 4,000 gallons per residential unit.

High Efficiency Washing Machines. Efficient clothes washers are designed to reduce the amount of water used per load. In a typical household, it is estimated that efficient front loading washers can result in an annual savings of 7,000 gallons per residential unit. Many times clothes washers are not supplied by the developer so it is often not their decision whether or not to install the more efficient machines.

WATER CONSERVATION TARGET

The Bella Lago project has set targets for the reduction of water use in single family residential units. The targeted reduction is 3.0 percent. Table 3 summarizes the total estimated water savings for Bella Lago based on this proposed reduction.

TABLE 3
WATER CONSERVATION TARGETS

Residential End Use Type	Proposed Units	Average Water Usage gpd/unit	Percentage Reduction	Targeted Water Use Reduction gpd/unit	Total Water Savings gpd
Low Density Single Family	140	856	3.0	25.7	3,598

IMPLEMENTATION MEASURES

For the Bella Lago project, Table 4 summarizes the water conservation measures that will be implemented for single family residential units. This table also provides the anticipated savings associated with the implementation of these measures.

Based on 140 single family units within the Bella Lago project at buildout, implementation of the measures in Table 4 would result in estimated water savings of 3,934 gallons per day for the project. In addition, the developers will prepare and distribute a landscape watering guide in an effort to reduce outdoor water usage by as much as 15 percent. This could result in an additional total water savings of 8,400 gpd for the project.

TABLE 4
BELLA LAGO
RESIDENTIAL WATER CONSERVATION MEASURES

Measure	Location	Yearly Water Savings gpd/unit	Daily Water Savings gpd/unit	Percentage of Total Usage	Total Water Savings gpd
Hot Water Pipe Insulation	Indoor	2,400	6.58	0.8	941
Pressure Reducing Valves	Indoor	1,800	4.93	0.6	705
Water Efficient Dishwashers	Indoor	650	1.78	0.2	255
Hot Water On-Demand Units	Indoor	5,300	14.52	1.7	2,033
Subtotal		10,150	27.81	3.3	3,934
Estimated Potential Additional Savings					
Landscape Guide	Outdoor	21,900	60.00	7.0	8,400

[1]Based on 856 gpd/unit average usage.

To additionally promote the Water Conservation Plan, the developer will offer other non-mandated conservation options to homebuyers. These options will be displayed in the model homes and may include evapotranspiration controllers, dual flush toilets, and high-efficiency washing machines.

In addition to establishing requirements and guidelines, the Master Developer will be responsible for the following:

- Provide educational materials to new homeowners.
- Install drought tolerant landscaping, approved by the City, in selected streetscapes and open areas.
- Require the inclusion of drought tolerant plant materials and efficient irrigation systems in the majority of builder installed landscaping.

IMPLEMENTATION PROGRAM

For the water conservation measures proposed to be incorporated into the Bella Lago project, Table 5 summarizes the implementation timing for each measure. The first four items in Table 5 are within the household and are the responsibility of the home builder to implement and the responsibility of the City Building Department to ensure that they are implemented. The landscaping guide is to be prepared by the developer and provided to the homeowner at the time of occupancy.

TABLE 5 BELLA LAGO IMPLEMENTATION PROGRAM		
Water Conservation Measure	Responsibility for Implementation	Timing
Hot Water Pipe Insulation	Developer	Initial Construction
Pressure Reducing Valves	Developer	Initial Construction
Water Efficient Dishwashers	Developer	Initial Construction
Hot Water On-Demand Units	Developer	Initial Construction
Landscape Guide	Developer	Initial Construction

REFERENCES

1. San Diego County Water Authority, 1996 Annual Report.

2. Bahman Sheikh, Water Use Efficiency, Strategies for Proposed Residential Developments, September 2001.

3. American Water Works Association Journal, Volume 79, No. 3, March 1987..

4. Engineering News Record (ENR) Journal, July 2000.

Appendix E

Air Quality Improvement Plan

INVESTIGATIVE SCIENCE AND ENGINEERING INC.

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December 2, 2002 (Revised)

Dr. Timothy Wilson
Bella Lago, LLC
13039 Brixton Place
San Diego, CA 92130

RE: AIR QUALITY IMPROVEMENT PLAN
BELLA LAGO RESIDENTIAL DEVELOPMENT – CHULA VISTA, CA
ISE REPORT #02-095

Dear Dr. Wilson:

At your request, Investigative Science and Engineering (ISE) was directed to develop a summary Air Quality Improvement Plan (AQIP) for the proposed Bella Lago residential development as required under the City of Chula Vista Municipal Code Section 19.09.050b. The results of that investigation are presented in this letter report.

Executive Summary

The developer of the proposed Bella Lago residential community will participate in the *Chula Vista GreenStar Program* by implementing either the *ComfortWise*^{SM}, *SDGE CA EnergyStar*^{SM}, or custom building program identified in the Community Energy Efficiency Program (CEEP). Further, the developer plans additional measures outlined within this report to enhance CO_2 uptake consistent with the City's Carbon Dioxide Reduction Plan.

Introduction and Purpose

The Chula Vista Municipal Code Section 19.09.050b encourages the development of an Air Quality Improvement Plan (AQIP) for all major development projects (defined as producing 50 or more dwelling units, or equivalent), so as to demonstrate that the best available control technology (BACT) is employed to reduce adverse air quality impacts. This policy is consistent with the policies currently in practice by the San Diego Air Pollution Control District (SDAPCD) and the California Air Resources Board (CARB).

The City has further outlined action measures to, *"... enhance opportunities to improve air quality and energy conservation..."* within their Carbon Dioxide (CO_2) Reduction Plan. The plan encourages, whenever possible, a diverse land use that minimizes urban sprawl and is orientated towards public transit, pedestrian, and bicycle use. Additionally, the Plan encourages energy efficient construction above CCR Title 24

Standards with solar thermal applications (if possible) and dense vegetation to increase CO_2 uptake.

Project Description

The proposed Bella Lago development plan would consist of approximately 140 high-end residential structures located on 180 acres within the northeast corner of the Rolling Hills Ranch specific plan area overlooking Otay Lakes.

Air Quality Action Measures

The City's AQIP pilot study report and CO_2 Reduction Plan identified a total of 12 Action Measures to be addressed in the AQIP. The ability to address all twelve measures in the Bella Lago AQIP is limited due to the project size, configuration, and required land dedication to the Multiple Species Conservation Plan (MSCP). However, energy efficient building construction and increased vegetation are effective measures that can be achieved within Bella Lago.

Community Energy Efficiency Program (CEEP) homes are designed and built with tight ducts, better windows, and improved construction so as to be at least 15% more energy efficient than the California Title 24 energy code. The program includes inspections of energy features and diagnostics of the HVAC system as the homes are being built. Other program elements can be added such as job-site recycling and air pollution credits to help solve local mandates. All CEEP homes exceed standard *EnergyStar*^{SM} requirements.

Builders agree to meet the energy requirements of the program in one of two ways: either the homes are *ComfortWise*^{SM} or *SDGE CA EnergyStar*^{SM} homes, or the homes meet the following five requirements of the CEEP. Namely,

1) The HVAC system must be designed to the Air Conditioning Contractors of America requirements (ACCA Manual J, D, and S). An engineer registered in the State of California must stamp the HVAC design.
2) The CHEERS computer analysis program must demonstrate that the home scores an 86 or greater, which is equivalent to an ENERGY STAR® Home.
3) The California Energy Commission's "Tight Duct" criteria must be met.
4) Contractor must use CEEP scopes of work (obtainable at www.thebii.org), and notify installing subcontractors (insulation, windows, and HVAC) that the scopes of work will be used as the basis for all quality inspections.
5) CHEERS-compliant inspection and diagnostic evaluations will be made. They include insulation, caulking, windows, water heating, furnace and AC system. A certified CHEERS rater performs duct blaster and blower door tests.

In fact, the US Environmental Protection Agency (EPA) has calculated the following reduction factors to ascertain the regional air quality improvements attainable using construction methods contained in programs consistent with CEEP requirements. These reductions, which are shown below, are attainable through use of the CEEP on a per-kilowatt-hour-basis.

CO_2 Reduction Pounds	SO_2 Reduction Pounds	NO_x Reduction Pounds
0.478	0.0034	0.0037

All values given in pounds per kilowatt-hour saved.

In other words, any project using a CEEP building program would, for every kilowatt-hour saved, reduce CO_2 emissions by 0.478 pounds, SO_2 emissions by 0.0034 pounds, and NO_x emissions by 0.0037 pounds. These savings have the direct effect of improving regional air quality within the San Diego air basin.

Project Implementation

The developer will implement the *ComfortWise*^{SM}, *SDGE CA EnergyStar*^{SM}, or custom CEEP building program on all units within the Bella Lago residential development. Consistent with the City's Carbon Dioxide Reduction Plan, the following measures are proposed for the Bella Lago development in order to further reduce CO_2 emissions within the development.

1) The project would have a paved, 12-foot-wide bicycle and walking pathway traversing the entire eastern edge of the project. This path would in turn link up to the entire project cul-de-sacs again encouraging bicycling and walking.

2) The project contains three depressed detention basins, which will be planted with grass and landscaped in a neighborhood park-like fashion.

3) The entire project site would have an Italian Village theme with lushly landscaped areas and hundreds of trees. In fact, this level of dense landscaping is the focal point of the projects Italian village theme. It is the intent of the project landscape design to go above-and-beyond the minimum City requirements.

4) All homes will be wired for telecommuting encouraging home office use. This would lower the aggregate number of daily car trips to remote offices or other locations.

5) The project contains a 50-foot-wide fuel management zone surrounding the entire development that will be planted with grass and ornamental shrubs not exceeding 18 inches in height. The zone creates about ten acres of open space in addition to the current 90 acres of dedicated open space.

6) The pad to lot ratio is large, meaning there will be increased open space on each lot compared to actual building area.

These measures are consistent with the best available control methods for CO_2 currently available. Implementation of these measures should provide some relief to localized CO_2 levels as defined under the City's reduction plan. Additionally, the project shall comply with all applicable air quality mitigation measures outlined in the project Environmental Impact Report.

Should you have any questions regarding the above conclusions, please do not hesitate to contact me at (858) 451-3505.

Sincerely,

Rick Tavares

Rick Tavares, Ph.D.
Project Principal
Investigative Science and Engineering, Inc.

Cc: Jeremy Louden, ISE