Appendix B

Air Quality Assessment
ISE, Inc., May 2006

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March 20, 2006 (Revised)

Mr. Jeramey Harding
T&B Planning Consultants
8885 Rio San Diego Drive, Suite 227
San Diego, CA 92108

RE: AIR QUALITY CONFORMITY ASSESSMENT
CANDLELIGHT PHASE I RESIDENTIAL DEVELOPMENT – SAN DIEGO CA
ISE REPORT #04-013

Dear Mr. Harding:

At your request, Investigative Science and Engineering (ISE) have performed an air quality conformity assessment of the proposed Candlelight Phase I multifamily residential development project located in the City San Diego, California. The results of that survey, as well as predicted near term air quality levels at the project site, are presented in this letter report.

INTRODUCTION AND DEFINITIONS

Existing Site Characterization

The project site consists of approximately 27 acres located within the Otay Mesa Community Plan area of the City of San Diego. The project site is located south of Old Otay Mesa Road and the proposed SR-905. Caliente Avenue will bisect the proposed project site with onsite access provided from the same roadway. SR-905/Otay Mesa Road currently provides regional access to the project area via Interstate 805 (I-805); refer to Figure 1.

The project site currently consists of mostly undeveloped agricultural land with some existing dwellings on site (as shown in Figures 2a and –b). The proposed project site has a land use designation of RM-2-5 (Residential Medium) with a minimum lot size of 1,500 square-feet. Topographically, the project site consists of relatively flat terrains with elevations on the entire property ranging from approximately 465 to 525 feet above mean sea level (MSL). The project area topography can be seen in Figures 3a though -d on Page 4 of this report.

Project Description

The development plan calls for the construction of three separate Planning Areas (i.e., PA 3, 5 and 7). The development plan proposes 432 new multi-family attached residential homes within Planning Areas 3 and 5 and one street lot identified as Planning Area 7. Additionally the project plan would construct several recreational areas and provide some open space areas. The current site development plan is shown in Figure 4 on Page 5.

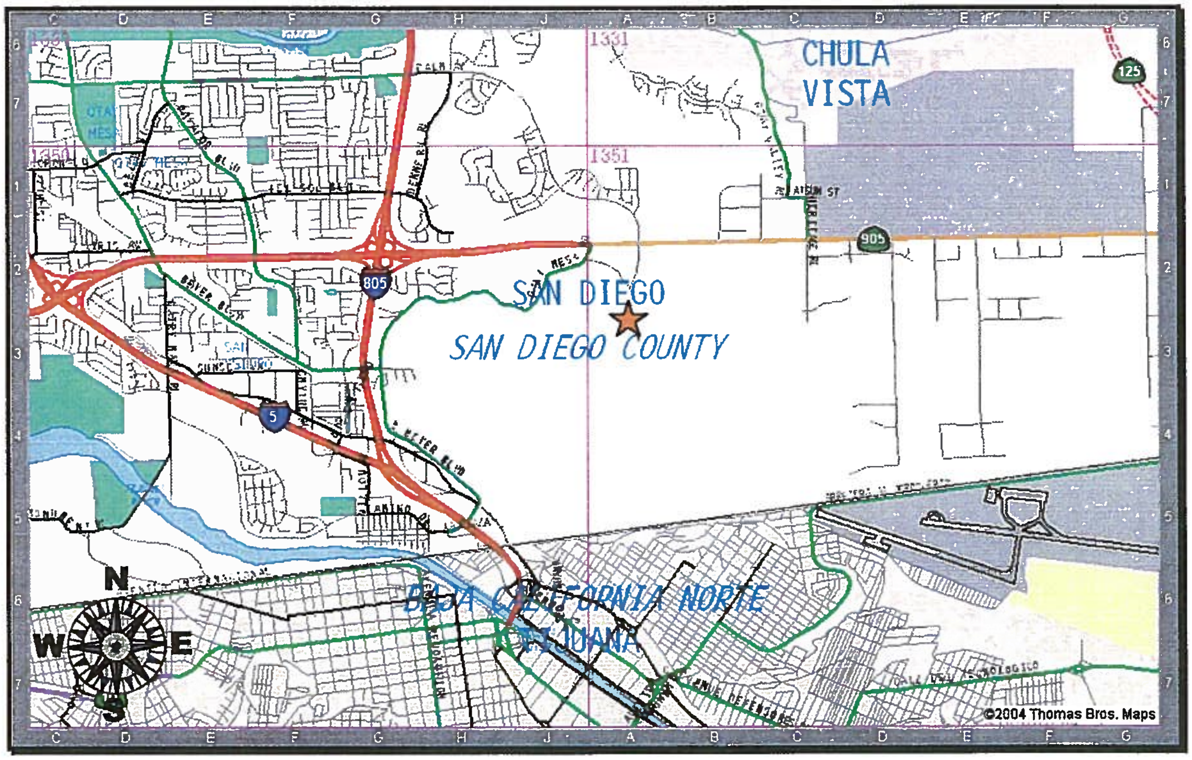


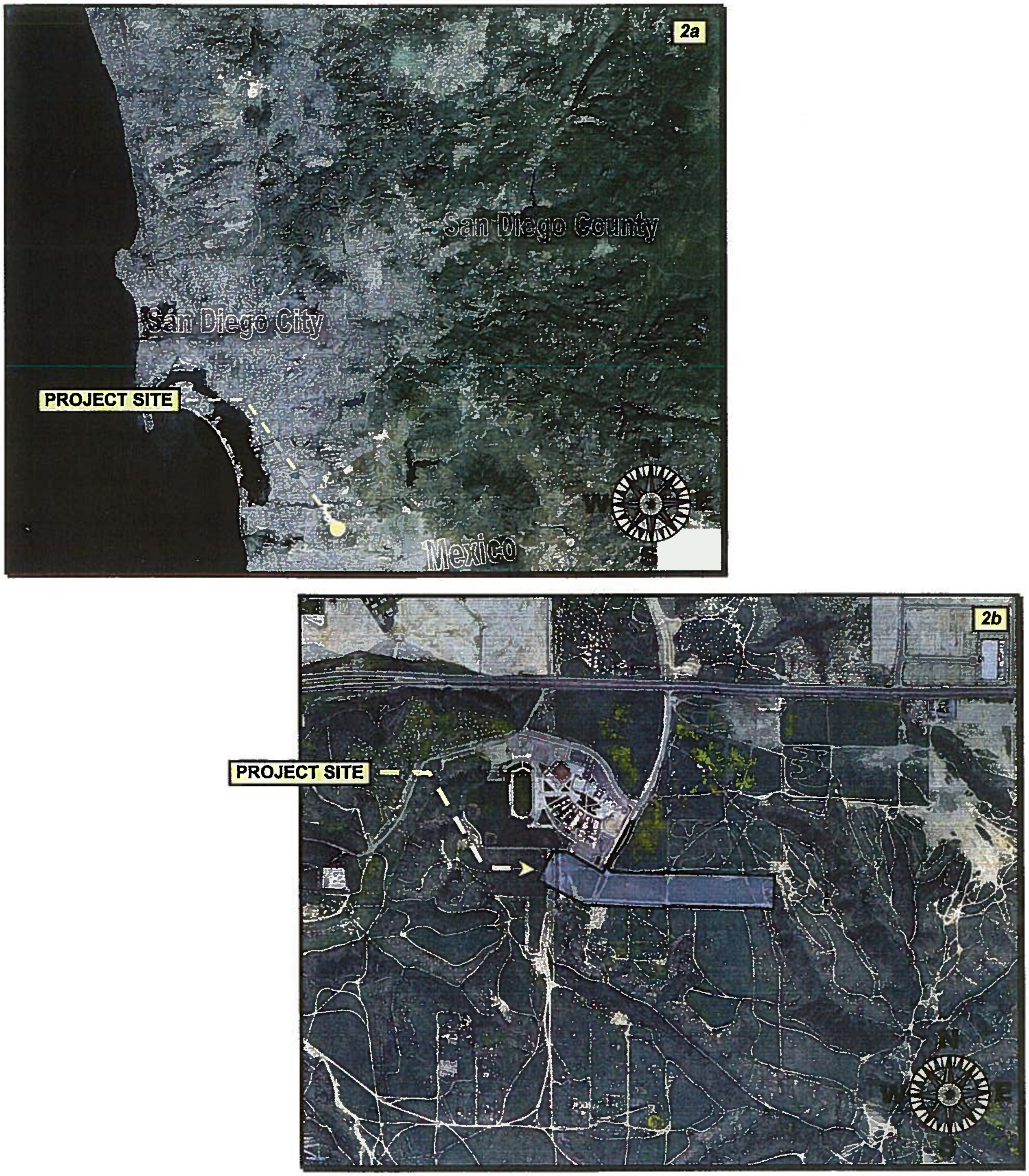
Figure 1: Project Vicinity Map (Thomas Guide Page 1351 Grid A2 and A3)

Air Quality Definitions

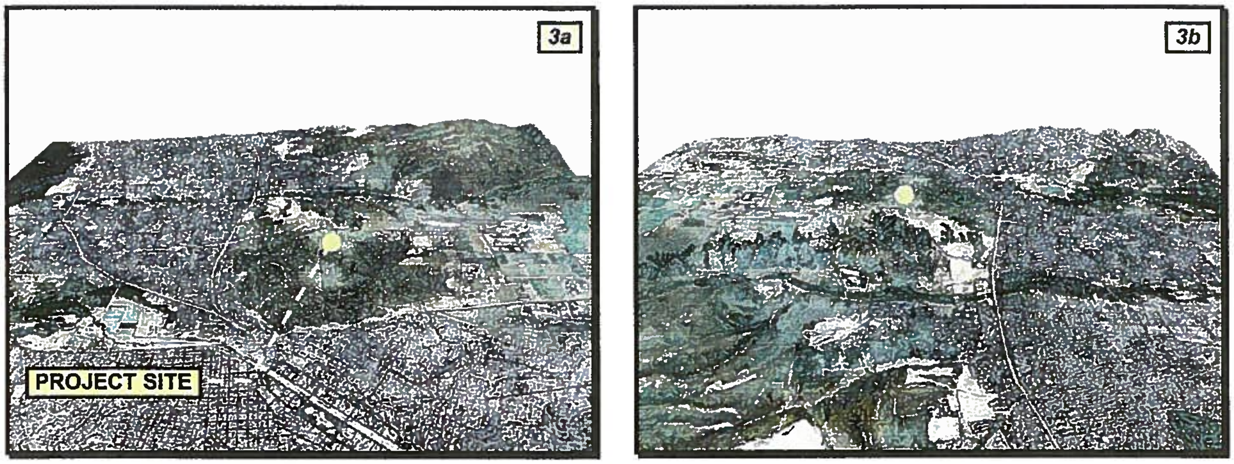
Air quality is defined by ambient air concentrations of specific pollutants determined by the Environmental Protection Agency (EPA) to be of concern with respect to the health and welfare of the public. The subject pollutants, which are monitored by the EPA, are Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), respirable 10-micron particulate matter (PM_{10}), sulfates, lead, Hydrogen Sulfide (H_2S), Volatile Organic Compounds (e.g., vinyl chloride, etc.), and visibility reducing particles.

Examples of sources and effects of these pollutants are identified below:

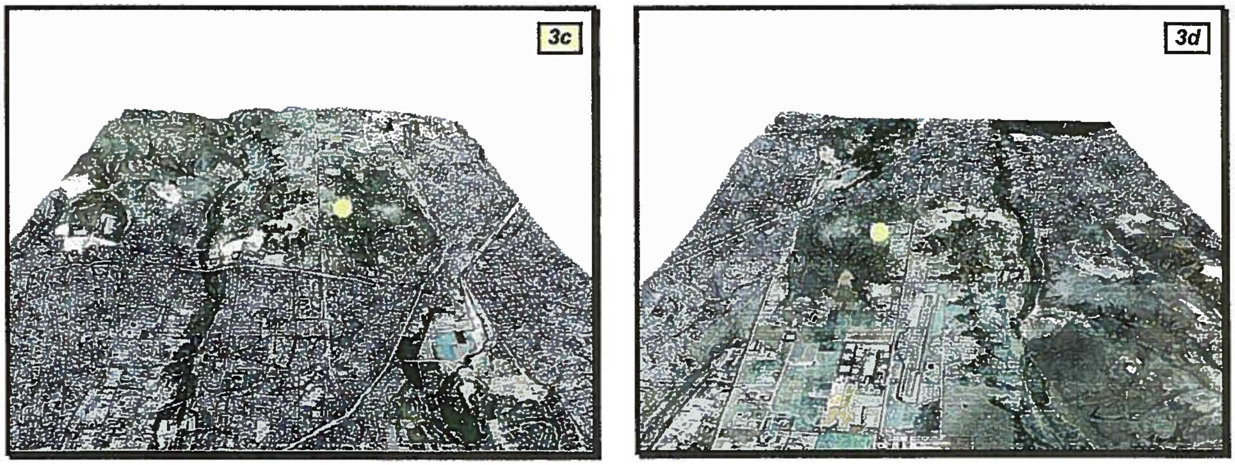
- <u>Carbon Monoxide (CO)</u>: Carbon monoxide is a colorless, odorless, tasteless and toxic gas resulting from the incomplete combustion of fossil fuels. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects. CO is a criteria air pollutant.



Figures 2a and -b: Project Satellite/Aerial Photographs – (© CNES 2003 / GlobeExplorer 4/03)



View Looking North **View Looking South**



View Looking East **View Looking West**

Figures 3a through -d: 3D Satellite CIR of Proposed Project Site – (© ISE / CNES – 2003)

- <u>Oxides of Sulfur (SO_x)</u>: Typically strong smelling, colorless gases that are formed by the combustion of fossil fuels. SO_2 and other sulfur oxides contribute to the problem of acid deposition. SO_2 is a criteria pollutant.

- <u>Nitrogen Oxides (Oxides of Nitrogen, or NO_x)</u>: Nitrogen oxides (NO_x) consist of nitric oxide (NO), nitrogen dioxide (NO_2) and nitrous oxide (N_2O) and are formed when nitrogen (N_2) combines with oxygen (O_2). Their lifespan in the atmosphere ranges from one to seven days for nitric oxide and nitrogen dioxide, to 170 years for nitrous oxide. Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition. NO_2 is a criteria air pollutant, and may result in numerous adverse health effects; it absorbs blue light, resulting in a brownish-red cast to the atmosphere and reduced visibility.

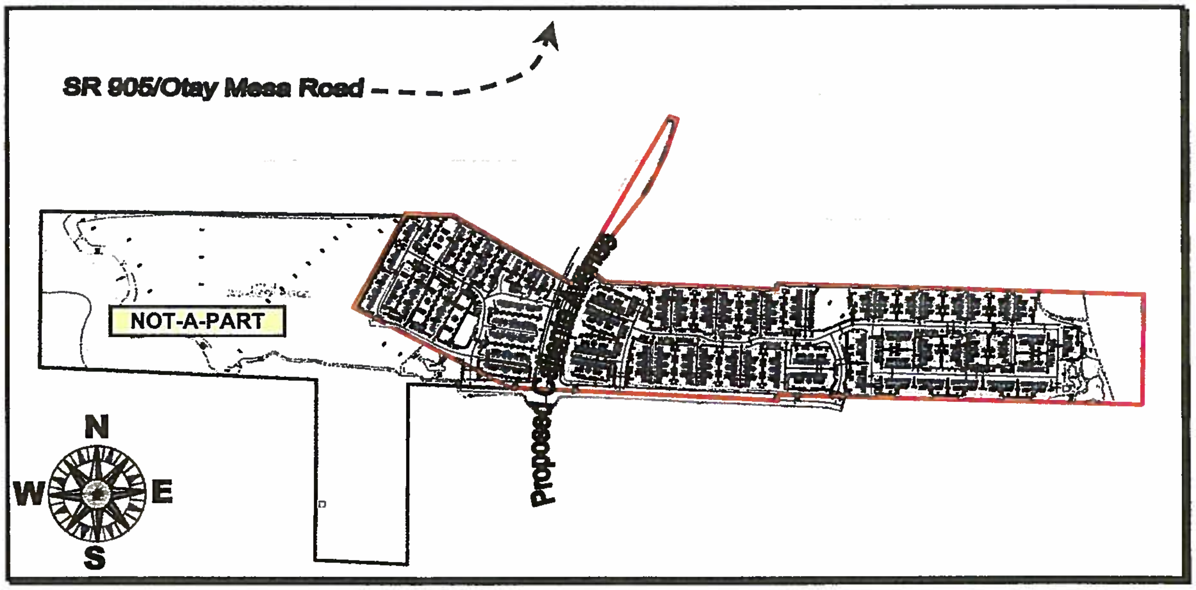


Figure 4: Proposed Candlelight Phase I Conceptual Site Plan (Hunsaker & Assoc., 1/05)

- Ozone (O_3): A strong smelling, pale blue, reactive toxic chemical gas consisting of three oxygen atoms. It is a product of the photochemical process involving the sun's energy. Ozone exists in the upper atmosphere ozone layer as well as at the earth's surface. Ozone at the earth's surface causes numerous adverse health effects and is a criteria air pollutant. It is a major component of smog.

- PM_{10} (Particulate Matter less than 10 microns): A major air pollutant consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and aerosols. The size of the particles (10 microns or smaller, about 0.0004 inches or less) allows them to easily enter the lungs where they may be deposited, resulting in adverse health effects. PM_{10} also causes visibility reduction and is a criteria air pollutant.

- $PM_{2.5}$ (Particulate Matter less than 2.5 microns): A similar air pollutant consisting of tiny solid or liquid particles which are 2.5 microns or smaller (which is often referred to as fine particles). These particles are formed in the atmosphere from primary gaseous emissions, which include sulfates formed from SO2 release from power plants and industrial facilities, and nitrates, which are formed from NOx release from power plants, automobiles and, other types of combustion sources. The chemical composition of fine particles highly depends on location, time of year, and weather conditions.

- Volatile Organic Compounds (VOC): Volatile organic compounds are hydrocarbon compounds (any compound containing various combinations of hydrogen and carbon atoms) that exist in the ambient air. VOC's contribute to the formation of smog through atmospheric photochemical reactions and/or may be toxic. Compounds of carbon (also known as organic compounds) have different levels of reactivity; that is, they do not react at the same speed or do not form ozone to the same extent when exposed to photochemical processes. VOC's often have an odor, and some examples include gasoline, alcohol, and the solvents used in paints. Exceptions to the VOC designation include: carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate.

- Reactive Organic Gasses (ROG): Closely related to VOC, Reactive Organic Gasses (ROG) are also precursors in forming ozone and consist of compounds containing methane, ethane, propane, butane, and longer chain hydrocarbons, which are typically the result of some type of combustion or decomposition process. Smog is formed when ROG and nitrogen oxides react in the presence of sunlight. For the purposes of assessment VOC and ROG are often used interchangeably since the net effect is the creation of smog.

The EPA (under the Federal Clean Air Act of 1970, and amended in 1977) established ambient air quality standards for these pollutants. This standard is called the National Ambient Air Quality Standards (NAAQS). The California Air Resources Board (CARB) subsequently established the more stringent California Ambient Air Quality Standards (CAAQS). Both sets of standards are shown in Figure 5 below. Areas in California where ambient air concentrations of pollutants are higher than the state standard are considered to be in "non-attainment" status for that pollutant.

THRESHOLDS OF SIGNIFICANCE

San Diego County Air Quality Screening Standards

The County of San Diego Department of Planning and Land Use (DPLU) have established a set of screening standards for the determination of significance of air quality impacts within the County. These standards focus on the following potential impact areas:

1) Would the proposed project conflict or obstruct the implementation of the San Diego Regional Air Quality Strategy (RAQS) or applicable portions of the State Implementation Plan (SIP)?
2) Would the Proposed Project result in emissions that would violate any air quality standard or contribute substantially to an existing or projected air quality violation?
3) Since San Diego County is presently in non-attainment for the Federal and/or State Ambient Air Quality Standards for Ozone (O_3) and Particulate Matter Less then 10 Microns(PM_{10}), would the proposed project result in a cumulatively considerable net increase of PM_{10} or exceed quantitative thresholds for O_3 precursor, oxides of nitrogen (NO_x) and Volatile Organic Compounds (VOCs)?
4) Would the proposed project expose sensitive receptors (schools, hospitals, resident care facilities, or day-care centers) to substantial pollutant concentrations?
5) Would the proposed project create objectionable odors affecting a substantial number of people?

These screening standards will be applied throughout this air quality conformity assessment for the basis of determination of both regional as well as localized air quality impacts due to the proposed project.

Pollutant	Averaging Time	California Standards [1]		Federal Standards [2]		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)	1 Hour	0.09 ppm (180 μg/m^3)	Ultraviolet Photometry	0.12 ppm (235 μg/m^3)[8]	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	—		0.08 ppm (157 μg/m^3)[8]		
Respirable Particulate Matter (PM10)	24 Hour	50 μg/m^3	Gravimetric or Beta Attenuation	150 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 μg/m^3		50 μg/m^3		
Fine Particulate Matter (PM2.5)	24 Hour	No Separate State Standard		65 μg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 μg/m^3	Gravimetric or Beta Attenuation	15 μg/m^3		
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	9 ppm (10 mg/m^3)	None	Non-Dispersive Infrared Photometry (NDIR)
	1 Hour	20 ppm (23 mg/m^3)		35 ppm (40 mg/m^3)		
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	—
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	—	Gas Phase Chemiluminescence	0.053 ppm (100 μg/m^3)	Same as Primary Standard	Gas Phase Chemiluminescence
	1 Hour	0.25 ppm (470 μg/m^3)		—		
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	—	Ultraviolet Fluorescence	0.030 ppm (80 μg/m^3)	—	Spectrophotometry (Pararosaniline Method)
	24 Hour	0.04 ppm (105 μg/m^3)		0.14 ppm (365 μg/m^3)	—	
	3 Hour	—		—	0.5 ppm (1300 μg/m^3)	
	1 Hour	0.25 ppm (655 μg/m^3)		—	—	—
Lead[9]	30 Day Average	1.5 μg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		1.5 μg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
Visibility Reducing Particles	8 Hour	Extinction coefficient of 0.23 per kilometer — visibility of ten miles or more (0.07 — 30 miles or more for Lake Tahoe) due to particles when relative humidity is less than 70 percent. Method: Beta Attenuation and Transmittance through Filter Tape.		**No Federal Standards**		
Sulfates	24 Hour	25 μg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 μg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride [9]	24 Hour	0.01 ppm (26 μg/m^3)	Gas Chromatography			

Figure 5: Ambient Air Quality Standards Matrix (after CARB/EPA, updated 7/9/03)

San Diego County Criteria Pollutant Standards

Pursuant to California Health & Safety Code, Division 26, Part 3, Chapter 1, Section §40002, jurisdiction for regulation of air emissions from non-mobile sources within San Diego County has been delegated to the San Diego County Air Pollution Control District (APCD). As part of its air quality permitting process, the APCD has established thresholds for the preparation of Air Quality Impact Assessments (AQIA). APCD Rule 20.2, which outlines these screening level criteria, states that any project that results in an emission increase equal to or greater than any of these levels, must:

> *"… demonstrate through an AQIA . . . that the project will not (A) cause a violation of a State or national ambient air quality standard anywhere that does not already exceed such standard, nor (B) cause additional violations of a national ambient air quality standard anywhere the standard is already being exceeded, nor (C) cause additional violations of a State ambient air quality standard anywhere the standard is already being exceeded, nor (D) prevent or interfere with the attainment or maintenance of any State or national ambient air quality standard."*

For Projects whose stationary-source emissions are below these criteria, no AQIA is typically required, and project level emissions are presumed to be less than significant. In the absence of adopted thresholds of significance, the County of San Diego Department of Planning and Land Use (DPLU) accepts the use of these "screening criteria" as "Thresholds of Significance" by projects for the purposes of CEQA. These standards are compatible with those utilized elsewhere in the State (such as South Coast Air Quality Management District standards, etc.) as part of CEQA guidance documents. The screening-level criteria are listed in the below:

For CEQA purposes, these screening criteria are used as numeric methods to demonstrate that a project's total emissions (e.g. stationary and fugitive emissions, as well as emissions from mobile sources) would not result in a significant impact to air quality. Since APCD does not have AQIA thresholds for emissions of volatile organic compounds (VOCs), the use of the screening level for reactive organic compounds (ROC) from the CEQA Air Quality Handbook for the South Coast Air Basin (SCAB), which has stricter standards for emissions of ROCs/VOCs than San Diego's, is appropriate.

However, the eastern portions of the county (east of the Tecate Divide) have atmospheric conditions that are characteristic of the Southeast Desert Air Basin (SEDAB). SEDAB is not classified as an extreme non-attainment area for ozone and therefore has a less restrictive screening-level. Projects located in the eastern portions of the County can use the SEDAB screening-level threshold for VOCs. No differentiation is made between construction and operation emission thresholds.

In the event that project emissions may approach or exceed these screening level criteria, modeling would be required to demonstrate that the project's ground-level concentrations, including appropriate background levels, are below the Federal and State Ambient Air Quality Standards. The applicable standards are shown below in Table 1

TABLE 1: Thresholds of Significance for Air Quality Impacts

Pollutant	Thresholds of Significance (Pounds per Day)(3)	Clean Air Act *less than significant* Levels (Tons per Year)
Carbon Monoxide (CO)	550	100
Oxides of Sulfur (SO_x)	250	100
Volatile Organic Compounds (VOC's) Reactive Organic Gasses (ROG's)	55(1) / 75(2)	50
Oxides of Nitrogen (NO_x)	250	50
Particulate Matter (PM_{10})	100	100

Source: SDAPCD Rule 1501, 20.2(d)(2), 1995; EPA 40CFR93, 1993

(1) Threshold for VOCs based on the threshold of significance for reactive organic gases from Chapter 6 of the CEQA Air Quality Handbook of the South Coast Air Quality Management District.

(2) Threshold for VOCs in the eastern portion of the County based on the threshold of significance for reactive organic gases from Chapter 6 of the CEQA Air Quality Handbook of the Southeast Desert Air Basin.

(3) Thresholds are applicable for either construction or operational phases of a project action.

The existing ambient conditions are compared for the with- and without project cases. If emissions exceed the allowable thresholds, additional analysis is conducted to determine whether the emissions would exceed an ambient air quality standard (i.e., the CAAQS values shown in Figure 5 above). Determination of significance considers both localized impacts (such as CO hotspots) and cumulative impacts. In the event that any criteria pollutant exceeds the threshold levels, the proposed action's impact on air quality are considered significant and mitigation measures would be required.

In addition, under the General Conformity Rule, the EPA has developed a set of *de minimis* thresholds for all proposed federal actions in a non-attainment area for evaluating the significance of air quality impacts. It should be noted that the State (i.e., SDAPCD) standards are equal or more stringent than, the Federal Clean Air standards (a fact that can be verified through multiplication of the SDAPCD standards by 365 and dividing by 2,000). Development of the proposed project would therefore fall under the stricter SDAPCD guidelines.

Diesel Toxics Risk Factors

There are inherent uncertainties in risk assessment with regard to the identification of compounds as causing cancer or other health effects in humans, the cancer potencies and Reference Exposure Levels (RELs) of compounds, and the exposure that individuals receive. It is common practice to use conservative (health protective) assumptions with respect to uncertain parameters. The uncertainties and conservative assumptions must be considered when evaluating the results of risk assessments.

Since the potential health effects of contaminants are commonly identified based on animal studies, there is uncertainty in the application of these findings to humans. In addition, for many compounds it is uncertain whether the health effects observed at higher exposure levels in the laboratory or in occupational settings will occur at lower environmental exposure levels. In order to ensure that potential health impacts are not underestimated, it is commonly assumed that effects seen in animals or at high exposure levels could potentially occur in humans following low-level environmental exposure.

Estimates of potencies and RELs are derived from experimental animal studies or from epidemiological studies of exposed workers or other populations (*Source: CalEPA, USEPA, SCAQMD, SDAPCD, 2001*). Uncertainty arises from the application of potency or REL values derived from this data to the general human population. There is debate as to the appropriate levels of risk assigned to diesel particulates since the USEPA has not yet declared diesel particulates as a toxic air contaminant. The SDAPCD typically applies levels a risk level of one in a million as the *de minimis* risk level (*Source: San Diego County DPLU, 4/01*), although this type of reporting is only applicable to large populations (such as entire air basins) where the sample group is large and the exposure time is long (which is not the case for project-level construction projects).

For purposes of analysis under this report, and to be consistent with the approaches used for other toxic pollutants, a functional comparison of the risk probability per individual person exposed to construction contaminants will be examined. This approach has the advantage of not needing to quantify the population of the statistical group adjacent to the construction as well as allowing the per-person risk to be expressed as a final percentage. Of course, for a large enough population sample (i.e., a million people) the results are the same as CARB's predictions.

ANALYSIS METHODOLOGY

The analysis criteria for air quality impacts are based upon the approach recommended by the *South Coast Air Quality Management District's (SCAQMD) CEQA Handbook.* The handbook establishes aggregate emission calculations for determining the potential significance of a proposed action. In the event that the emissions exceed the established thresholds, air dispersion modeling may be conducted to assess whether the proposed action results in an exceedance of an air quality standard. This methodology has been adopted by SDAPCD.

Ambient Air Quality Data Collection

The California Air Resources Board (CARB) monitors ambient air quality at approximately 250 air-monitoring stations across the state. Air quality monitoring stations usually measure pollutant concentrations 10 meters (approximately 30-feet) above ground level; therefore, air quality is often referred to in terms of ground-level concentrations. Ambient air pollutant concentrations in the San Diego Air Basin are measured at 10 air-quality-monitoring stations operated by the SDAPCD (refer to Figure 6 below).

The nearest air quality monitoring stations with respect to the project site are located within the City of San Diego (Pasco International Station – ARB Station ID 80139) approximately 4.5 miles from the project site, and within the City of Chula Vista (East J Street Station – ARB Station ID 80114) approximately 5.2 miles from the project site. The San Diego station currently records CO, SO_2, NO_2, O_3, PM_{10}, Outdoor Temperature, Wind Direction, and Horizontal Wind Speed, while the Chula Vista station measures a slightly larger dataset consisting of CO, SO_2, NO_2, O_3, PM_{10}, $PM_{2.5}$, Toxics-Organics, Toxics-Metals, Toxics-Aldehydes, Cr^{6+} (Chromium), Outdoor Temperature, Wind Direction, and Horizontal Wind Speed.

Due to the type of equipment employed at each station, not every station is capable of recording the entire set of criteria pollutants identified in Table 1. Periodic audits are conducted of each station in accordance with the U.S. Environmental Protection Agency's 40 CFR, Part 58, Appendix A protocol with all equipment traceable to National Institute of Standards and Technology (NIST) standards. The typical accuracy of the equipment is ±15% for gasses (such as CO, NO_x, etc.) and ±10% for PM_{10}.

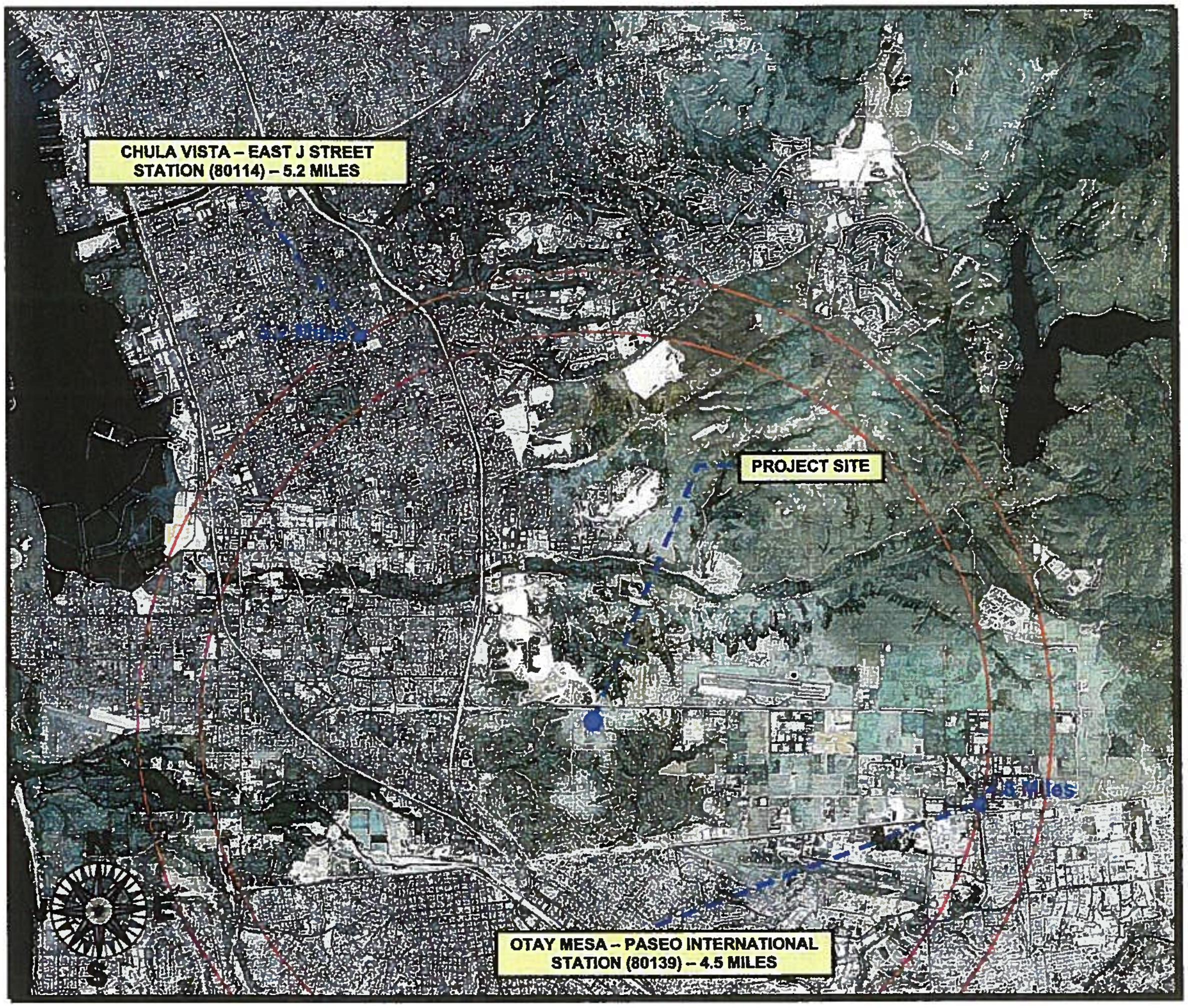


Figure 6: Ambient Air Quality Monitoring Station Location Map (ISE 5/04)

Construction Air Quality Modeling

Construction vehicle pollutant emission generators would consist primarily of haul truck activities such as earthwork haulage, concrete delivery and other suppliers, graders and pavers, contractor vehicles, and ancillary operating equipment such as diesel-electric generators and lifts. The analysis methodology utilized in this report is based upon the SCAQMD CEQA Handbook guidelines for construction operations. Construction emissions were based upon the EPA AP-42 Report generation rates identified by SCAQMD for the various classes of diesel construction equipment. The generation rates are identified in Table 2 below.

TABLE 2: Construction Equipment Pollutant Generation Levels by Class

	Generation Rates (pounds per horsepower-hour)				
Equipment Class	**CO**	**NO_x**	**SO_x**	**PM_{10}**	**ROG**
Track Backhoe	0.0150	0.0220	0.0020	0.0010	0.0030
Dozer - D8 Cat	0.0150	0.0220	0.0020	0.0010	0.0030
Hydraulic Crane	0.0090	0.0230	0.0020	0.0015	0.0030
Loader	0.0150	0.0220	0.0020	0.0010	0.0030
Side Boom	0.0130	0.0310	0.0020	0.0015	0.0030
Water Truck	0.0060	0.0210	0.0020	0.0015	0.0020
Welding Rig	0.0110	0.0180	0.0020	0.0010	0.0020
Concrete Truck	0.0060	0.0210	0.0020	0.0015	0.0020
Concrete Pump	0.0110	0.0180	0.0020	0.0010	0.0020
Dump/Haul Trucks	0.0060	0.0210	0.0020	0.0015	0.0020
Paver	0.0070	0.0230	0.0020	0.0010	0.0010
Roller	0.0070	0.0200	0.0020	0.0010	0.0020
Scraper	0.0110	0.0190	0.0020	0.0015	0.0010

Source: U.S. EPA AP-42 "Compilation of Air Pollutant Emission Factors", 9/85. Ratings shown for full (100%) load factor.

Non Diesel-Fired Toxic Emission Modeling (PM_{10})

Fugitive dust generation from the proposed grading plan was analyzed using the methodology recommended in the SCAQMD CEQA Handbook guidelines for calculating 10-micron Particulate Matter (PM_{10}) due to earthwork. The analysis assumed low-wind speeds and active wet suppression control. Aggregate levels of PM_{10} based upon the best available surface grading estimates were calculated in pounds per day and compared to the applicable significance criteria shown in Table 1.

Diesel-Fired Toxic Emission Modeling (CO, NO_x, SO_x, PM_{10})

For the purposes of this analysis, construction vehicle pollutant emission generators would consist entirely of construction activities associated with rough-grading operations (which is the worst-case pollution emission scenario). The analysis methodology utilized in this report is based upon the SCAQMD CEQA Handbook guidelines for construction operations. Construction emissions were based upon the EPA AP-42 Report generation rates identified by SCAQMD for the various classes of diesel construction equipment.

A screening risk assessment of diesel-fired toxics from construction haul trucks was performed using the *SCREEN3* dispersion model developed by the EPA's Office of Air Quality Planning and Standards. The SCREEN3 model uses a Gaussian plume dispersion algorithm that incorporates source-related and meteorological factors to estimate pollutant concentration from continuous sources. It is assumed that the pollutant does not undergo any chemical reactions, and that no other removal processes, such as wet or dry deposition, act on the plume during its transport from the source. The methodology is based upon the *Industrial Source Complex (ISC3)* source dispersion approach as outlined in the *EPA-454/B-95-003b* technical document.

Using the aforementioned concentrations obtained from the screening model, the diesel toxic risk can be defined as below:

$$Risk = \frac{F_{wind} \times EMFAC \times URF_{70\,year\,\exp osure}}{Dilution}$$

where, *Risk* is the excess cancer risk (probability in one-million);

F_{wind} is the frequency of the wind blowing from the exhaust source to the receptor (the default value is 1.0);

EMFAC is the exhaust particulate emission factor (the level from the screening model);

$URF_{70\ year\ exposure}$ is the Air Resource Board unit risk probability factor (300 x 10^{-6}, or 300 in a million cancer risk per $\mu g/m^3$ of diesel combustion generated PM_{10} inhaled in a 70-year lifetime based upon *ARB 1999 Staff Report from the Scientific Review Panel (SRP) on Diesel Toxics*); and,

Dilution is the atmospheric dilution ratio during source-to-receptor transport (the default value of 1.0 assumes no dilution)

Given the above assumptions for wind frequency and atmospheric dilution ratio, and substituting the CARB recommended value for the unit risk probability factor gives the following expression:

$$Risk = \frac{1 \times EMFAC \times 300x10^{-6}}{1} = 300x10^{-6} \times EMFAC \quad \text{per person}$$

Thus, the percentage of risk of cancer to any given person being exposed to a concentration of pollution equal to EMFAC (in $\mu g/m^3$) over a continuous period of 70-years would be:

$$Risk(\%) = (300x10^{-6} \times EMFAC) \times 100 = 300x10^{-4} \times EMFAC \quad \text{per person}$$

Where, it can be directly stated that a risk percentage of, say, 25% would indicate a 25% probability of inhaled cancer risk for the given level of exposure (EMFAC) if consumed continuously for a period of 70-years. A 50% probability would correspond to a 50:50 chance of inhaled cancer risk if consumed continuously for a period of 70-years, and so on.

For the construction-related diesel-fired toxics analysis, an area-source consistent in dimensions with the proposed grading area will be assumed. A simplified elevated terrain model (which is consistent with the area surrounding the project site) with no building downwash corrections and a worst-case wind direction will be utilized.

Aggregate Vehicle Emission Air Quality Modeling

Motor vehicles emissions associated with the proposed project were calculated by multiplying the appropriate emission factor (in grams per mile) times the estimated trip length and the total number of vehicles. Appropriate conversion factors were then applied to provide aggregate emission units of pounds per day.

CARB estimates on-road motor vehicle emissions by using a series of models called the Motor Vehicle Emission Inventory (MVEI) Models. Four computer models, which form the MVEI are CALIMFAC, WEIGHT, EMFAC, and BURDEN.

The CALIMFAC model produces base emission rates for each model year when a vehicle is new and as it accumulates mileage and the emission controls deteriorate. The WEIGHT model calculates the relative weighting each model year should be given in the total inventory, and each model year's accumulated mileage. The EMFAC model uses these pieces of information, along with the correction factors and other data, to produce fleet composite emission factors. Finally, the BURDEN model combines the emission factors with county-specific activity data to produce to emission inventories.

For the proposed project, the *EMFAC 2002 Model v2.2* of the MVEI was run using input conditions specific to the SDAPCD region to predict vehicle emissions based upon worst-case (winter) year 2004 generation rates (which is the worst-case emission levels in lieu of a project traffic study). A mix ratio consistent with the Caltrans ITS Transportation Project-Level Carbon Monoxide Protocol was used which consisted of the following air standard Otto-Cycle engine vehicle distribution percentages: Light Duty Autos = 69.0, Light Duty Trucks = 19.4, Medium Duty Trucks = 6.4, Heavy Duty Trucks = 4.7, Buses = 0.0, Motorcycles = 0.5. The aggregate emission factors are provided as an attachment to this report.

Fixed Source Emissions Modeling

Due to the proposed multifamily use of the Candlelight Phase I development, no fixed operational sources are expected. The proposed units would not contain fireplace units.

FINDINGS

Existing Climate Conditions

The climate of San Diego County is characterized by warm, dry summers and mild, wet winters and is dominated by a semi-permanent high-pressure cell located over the Pacific Ocean. This high-pressure cell maintains clear skies over the air basin for much of the year (refer to Figure 7). It also drives the dominated onshore circulation and helps to create two types of temperature inversions, subsidence and radiation, that contribute to local air quality degradation.

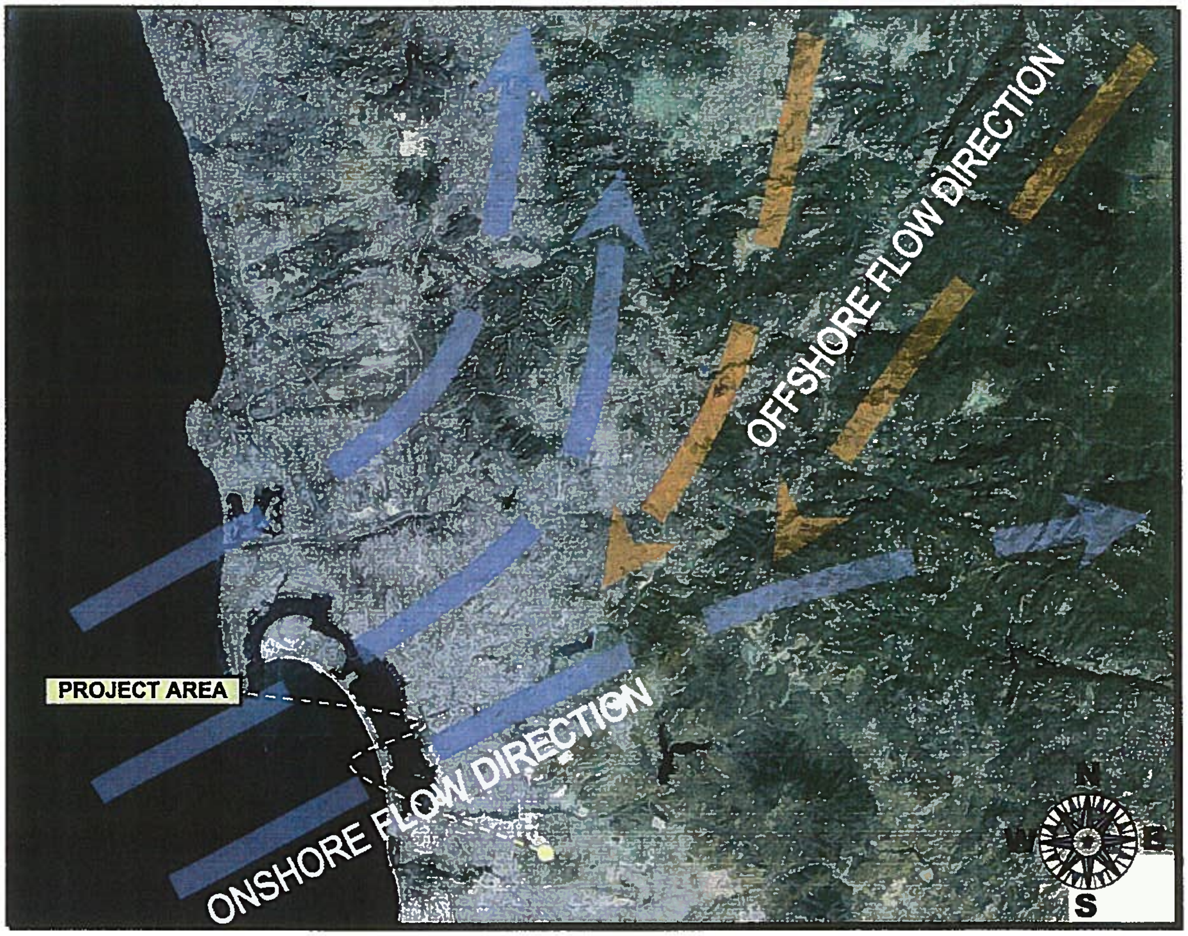


Figure 7: Project Air Basin Map (2003 CNES Satellite CIR Imagery)

Subsidence inversions occur during the warmer months, as descending air associated with the Pacific high-pressure cell comes into contact with cool marine air. The boundary between the two layers of air represents a temperature inversion that traps pollutants below it. Radiation inversion typically develops on winter nights, when air near the ground cools by radiation, and the air aloft remains warm. A shallow inversion layer that can trap pollutants is formed between the two layers.

Occasionally during the months of October through February, offshore flow becomes a dominant factor in the regional air quality. These periods, known as the *so-called* “Santa Ana Conditions”, are typically maximal during the month of December with wind speeds from the north to east approaching 35 knots and gusting to over 50 knots. This air movement is caused by clockwise pressure circulation over the Great Basin (i.e., the high plateau east of the Sierra Mountains and west of the Rocky Mountains including most of Nevada and Utah), which results in significant downward air motion towards the ocean.

Stronger Santa Ana winds can have gusts greater than 60 knots over widespread areas and gusts greater than 100 knots in canyon areas. Frequently, the strongest winds in the basin occur during the night and morning hours due to the absence of onshore sea breezes. The overall result is a noticeable degradation in local air quality.

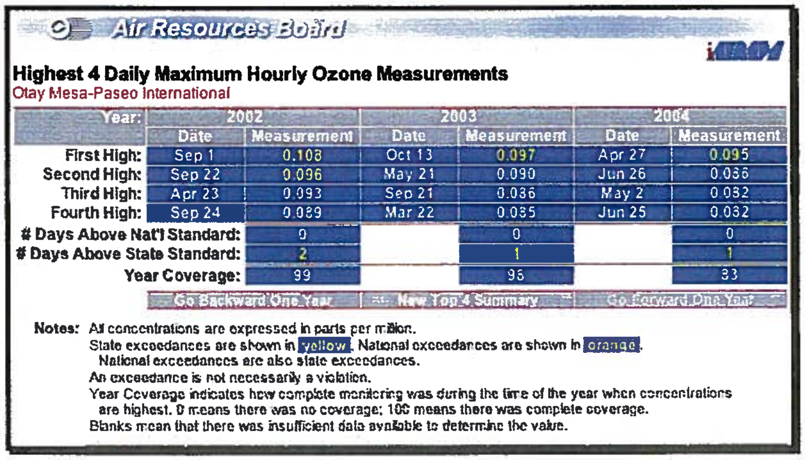
Finally, in the area of the proposed project site, the maximum and minimum average temperatures are 72° F and 57° F, respectively. Precipitation in the area averages 9.9 inches annually, 90 percent of which falls between November and April. The prevailing wind direction is from the west-northwest, with an annual mean speed of 6 to 10 miles per hour (NOAA 2004). Sunshine is usually plentiful in the proposed project area but night and morning cloudiness is common during the spring and summer. Fog can occur occasionally during the winter.

Existing Air Quality Levels

The project site is located in the southern portion of the San Diego Air Basin. The Basin is in attainment or unclassified for the federal one-hour ozone (O_3) standard and is designated in non-attainment for the federal eight-hour standard. Additionally, the basin is designated as being in federal attainment for NO_2, SO_2, lead, and CO and is currently unclassified for PM_{10}. The basin is also in attainment for all state-classified pollutants with the exception of O_3 and PM_{10}.

Tables 3a through -m provides a summary of the highest pollutant levels recorded at the closest identified monitoring stations for the last year available (2004) based upon the latest data excerpted from the CARB *ADAM* database system.

TABLE 3a: Otay Mesa Paseo International Station – Maximum Hourly Ozone Levels



Highest 4 Daily Maximum Hourly Ozone Measurements

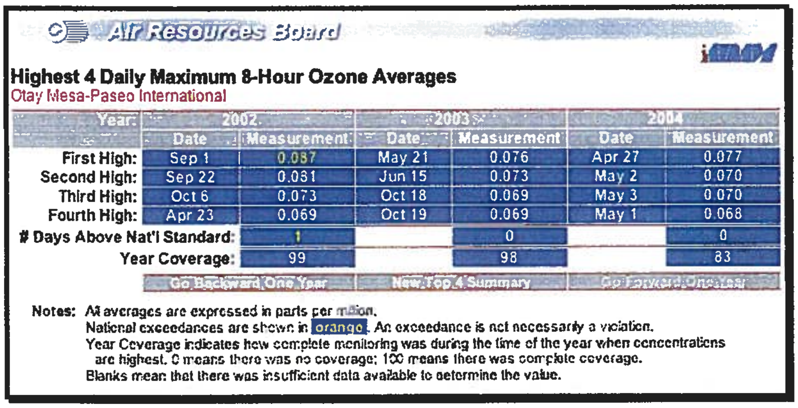
Otay Mesa-Paseo International

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Sep 1	0.108	Oct 13	0.097	Apr 27	0.095
Second High:	Sep 22	0.096	May 21	0.090	Jun 26	0.086
Third High:	Apr 23	0.093	Sep 21	0.086	May 2	0.082
Fourth High:	Sep 24	0.089	Mar 22	0.085	Jun 25	0.082
# Days Above Nat'l Standard:		0		0		0
# Days Above State Standard:		2		1		1
Year Coverage:		99		95		33

Notes: All concentrations are expressed in parts per million.
State exceedances are shown in yellow. National exceedances are shown in orange.
National exceedances are also state exceedances.
An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3b: Otay Mesa Paseo International Station – Maximum 8-Hour Ozone Levels



Highest 4 Daily Maximum 8-Hour Ozone Averages

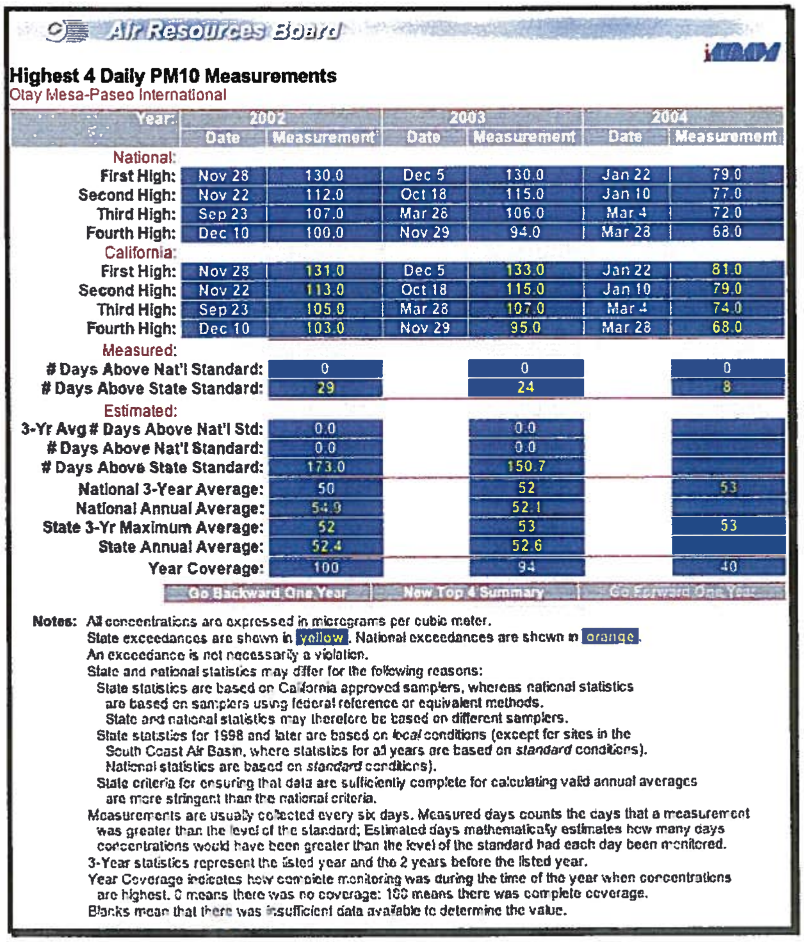
Otay Mesa-Paseo International

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Sep 1	0.087	May 21	0.076	Apr 27	0.077
Second High:	Sep 22	0.081	Jun 15	0.073	May 2	0.070
Third High:	Oct 6	0.073	Oct 18	0.069	May 3	0.070
Fourth High:	Apr 23	0.069	Oct 19	0.069	May 1	0.068
# Days Above Nat'l Standard:		1		0		0
Year Coverage:		99		98		83

Notes: All averages are expressed in parts per million.
National exceedances are shown in orange. An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3c: Otay Mesa Paseo International Station – Maximum Daily PM_{10} Levels



Highest 4 Daily PM10 Measurements

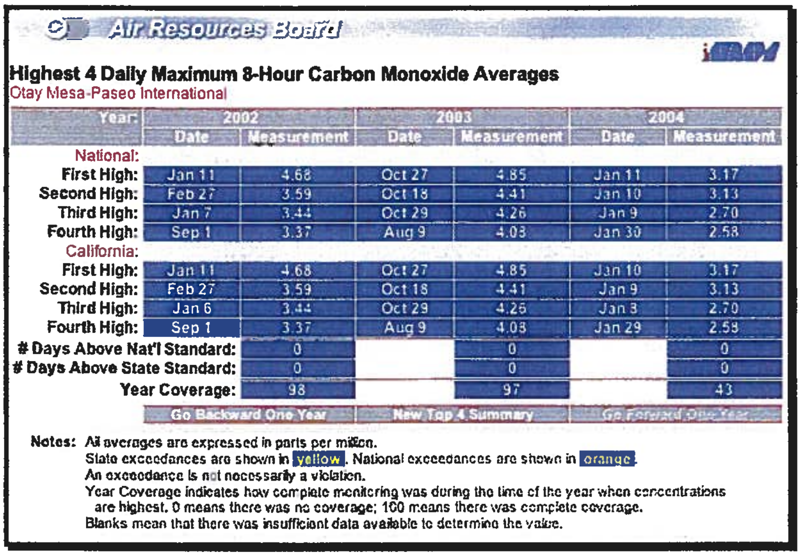
Otay Mesa-Paseo International

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
National:						
First High:	Nov 28	130.0	Dec 5	130.0	Jan 22	79.0
Second High:	Nov 22	112.0	Oct 18	115.0	Jan 10	77.0
Third High:	Sep 23	107.0	Mar 28	106.0	Mar 4	72.0
Fourth High:	Dec 10	100.0	Nov 29	94.0	Mar 28	68.0
California:						
First High:	Nov 28	131.0	Dec 5	133.0	Jan 22	81.0
Second High:	Nov 22	113.0	Oct 18	115.0	Jan 10	79.0
Third High:	Sep 23	105.0	Mar 28	107.0	Mar 4	74.0
Fourth High:	Dec 10	103.0	Nov 29	95.0	Mar 28	68.0
Measured:						
# Days Above Nat'l Standard:		0		0		0
# Days Above State Standard:		29		24		8
Estimated:						
3-Yr Avg # Days Above Nat'l Std:		0.0		0.0		
# Days Above Nat'l Standard:		0.0		0.0		
# Days Above State Standard:		173.0		150.7		
National 3-Year Average:		50		52		53
National Annual Average:		54.9		52.1		
State 3-Yr Maximum Average:		52		53		53
State Annual Average:		52.4		52.6		
Year Coverage:		100		94		40

Notes: All concentrations are expressed in micrograms per cubic meter.
State exceedances are shown in yellow. National exceedances are shown in orange.
An exceedance is not necessarily a violation.
State and national statistics may differ for the following reasons:
State statistics are based on California approved samplers, whereas national statistics are based on samplers using federal reference or equivalent methods.
State and national statistics may therefore be based on different samplers.
State statistics for 1998 and later are based on *local* conditions (except for sites in the South Coast Air Basin, where statistics for all years are based on *standard* conditions).
National statistics are based on *standard* conditions).
State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.
Measurements are usually collected every six days. Measured days counts the days that a measurement was greater than the level of the standard; Estimated days mathematically estimates how many days concentrations would have been greater than the level of the standard had each day been monitored.
3-Year statistics represent the listed year and the 2 years before the listed year.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3d: Otay Mesa Paseo International Station – Maximum 8-Hour CO Levels



Highest 4 Daily Maximum 8-Hour Carbon Monoxide Averages

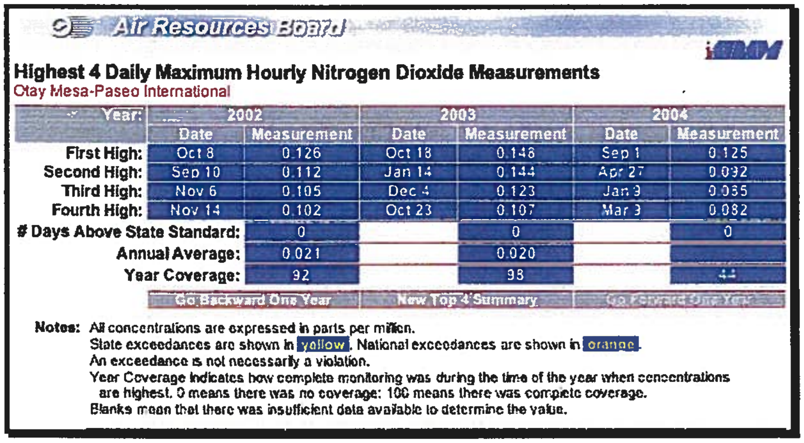
Otay Mesa-Paseo International

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
National:						
First High:	Jan 11	4.68	Oct 27	4.85	Jan 11	3.17
Second High:	Feb 27	3.59	Oct 18	4.41	Jan 10	3.13
Third High:	Jan 7	3.44	Oct 29	4.26	Jan 9	2.70
Fourth High:	Sep 1	3.37	Aug 9	4.03	Jan 30	2.58
California:						
First High:	Jan 11	4.68	Oct 27	4.85	Jan 10	3.17
Second High:	Feb 27	3.59	Oct 18	4.41	Jan 9	3.13
Third High:	Jan 6	3.44	Oct 29	4.26	Jan 8	2.70
Fourth High:	Sep 1	3.37	Aug 9	4.03	Jan 29	2.58
# Days Above Nat'l Standard:		0		0		0
# Days Above State Standard:		0		0		0
Year Coverage:		98		97		43

Notes: All averages are expressed in parts per million.
State exceedances are shown in yellow. National exceedances are shown in orange.
An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3e: Otay Mesa Paseo International Station – Maximum Daily NO_2 Levels



Highest 4 Daily Maximum Hourly Nitrogen Dioxide Measurements

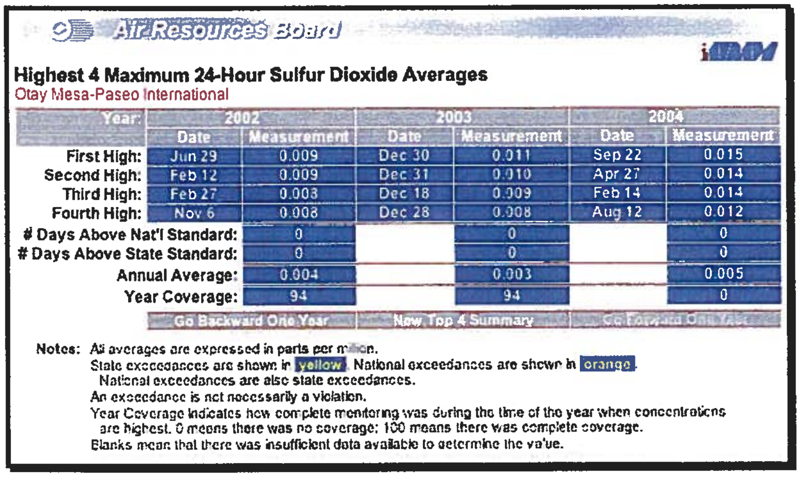
Otay Mesa-Paseo International

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Oct 8	0.126	Oct 18	0.148	Sep 1	0.125
Second High:	Sep 10	0.112	Jan 14	0.144	Apr 27	0.092
Third High:	Nov 6	0.105	Dec 4	0.123	Jan 3	0.085
Fourth High:	Nov 14	0.102	Oct 23	0.107	Mar 3	0.082
# Days Above State Standard:		0		0		0
Annual Average:		0.021		0.020		
Year Coverage:		92		98		44

Notes: All concentrations are expressed in parts per million.
State exceedances are shown in yellow. National exceedances are shown in orange.
An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3f: Otay Mesa Paseo International Station – Maximum 24-Hour SO_2 Levels



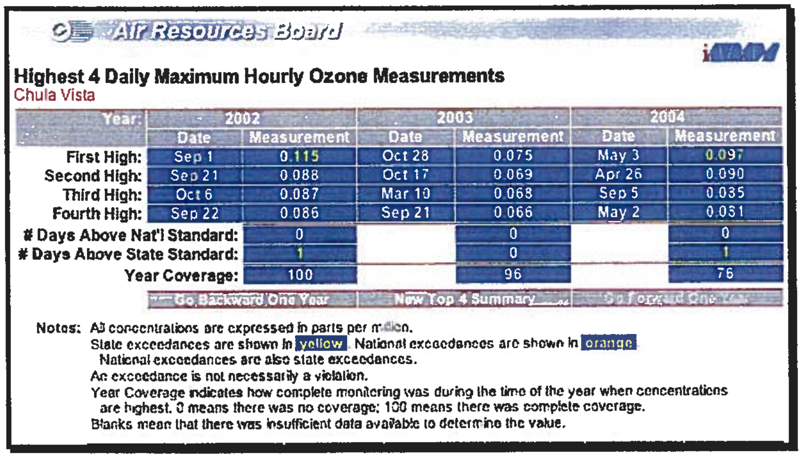
Highest 4 Maximum 24-Hour Sulfur Dioxide Averages
Otay Mesa-Paseo International

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Jun 29	0.009	Dec 30	0.011	Sep 22	0.015
Second High:	Feb 12	0.009	Dec 31	0.010	Apr 27	0.014
Third High:	Feb 27	0.003	Dec 18	0.009	Feb 14	0.014
Fourth High:	Nov 6	0.008	Dec 28	0.008	Aug 12	0.012
# Days Above Nat'l Standard:		0		0		0
# Days Above State Standard:		0		0		0
Annual Average:		0.004		0.003		0.005
Year Coverage:		94		94		0

Notes: All averages are expressed in parts per million.
State exceedances are shown in yellow. National exceedances are shown in orange.
National exceedances are also state exceedances.
An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3g: Chula Vista E. J Street Station – Maximum Hourly Ozone Levels



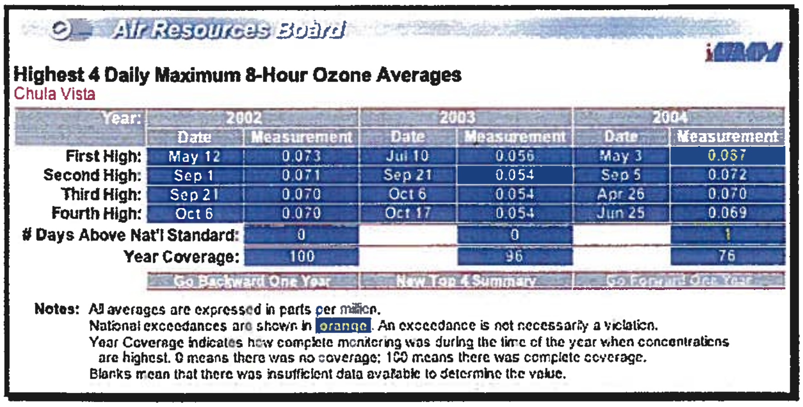
Highest 4 Daily Maximum Hourly Ozone Measurements
Chula Vista

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Sep 1	0.115	Oct 28	0.075	May 3	0.097
Second High:	Sep 21	0.088	Oct 17	0.069	Apr 26	0.090
Third High:	Oct 6	0.087	Mar 10	0.068	Sep 5	0.035
Fourth High:	Sep 22	0.086	Sep 21	0.066	May 2	0.031
# Days Above Nat'l Standard:		0		0		0
# Days Above State Standard:		1		0		1
Year Coverage:		100		96		76

Notes: All concentrations are expressed in parts per million.
State exceedances are shown in yellow. National exceedances are shown in orange.
National exceedances are also state exceedances.
An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3h: Chula Vista E. J Street Station – Maximum 8-Hour Ozone Levels



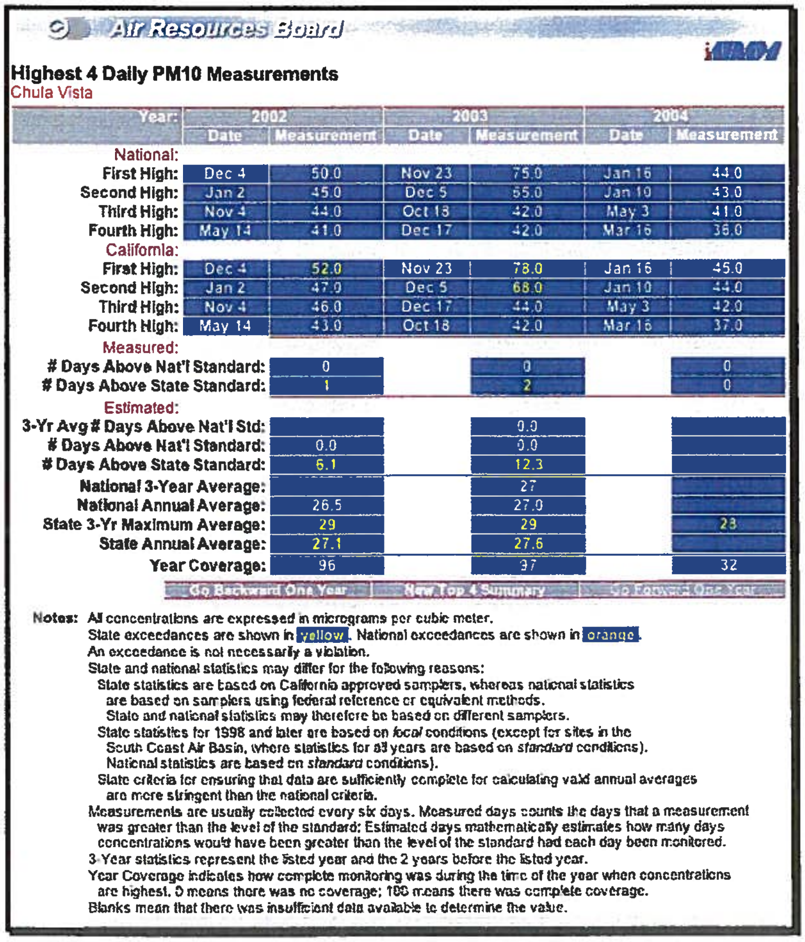
Highest 4 Daily Maximum 8-Hour Ozone Averages
Chula Vista

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	May 12	0.073	Jul 10	0.056	May 3	0.087
Second High:	Sep 1	0.071	Sep 21	0.054	Sep 5	0.072
Third High:	Sep 21	0.070	Oct 6	0.054	Apr 26	0.070
Fourth High:	Oct 6	0.070	Oct 17	0.054	Jun 25	0.069
# Days Above Nat'l Standard:		0		0		1
Year Coverage:		100		96		76

Notes: All averages are expressed in parts per million.
National exceedances are shown in orange. An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3i: Chula Vista E. J Street Station – Maximum Daily PM_{10} Levels



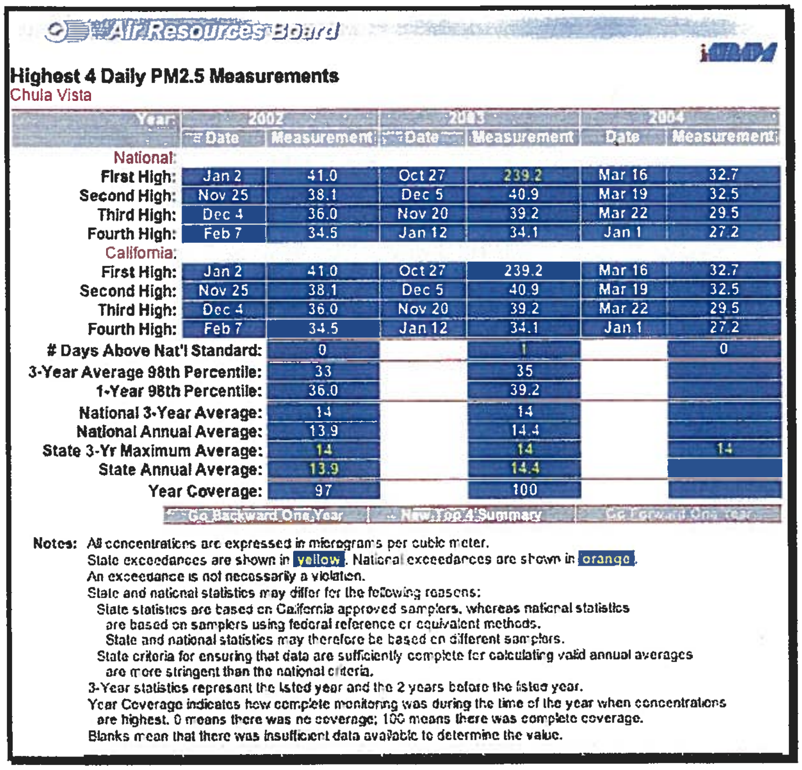
Highest 4 Daily PM10 Measurements
Chula Vista

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
National:						
First High:	Dec 4	50.0	Nov 23	75.0	Jan 16	44.0
Second High:	Jan 2	45.0	Dec 5	55.0	Jan 10	43.0
Third High:	Nov 4	44.0	Oct 18	42.0	May 3	41.0
Fourth High:	May 14	41.0	Dec 17	42.0	Mar 16	36.0
California:						
First High:	Dec 4	52.0	Nov 23	78.0	Jan 16	45.0
Second High:	Jan 2	47.0	Dec 5	68.0	Jan 10	44.0
Third High:	Nov 4	46.0	Dec 17	44.0	May 3	42.0
Fourth High:	May 14	43.0	Oct 18	42.0	Mar 16	37.0
Measured:						
# Days Above Nat'l Standard:		0		0		0
# Days Above State Standard:		1		2		0
Estimated:						
3-Yr Avg # Days Above Nat'l Std:				0.0		
# Days Above Nat'l Standard:		0.0		0.0		
# Days Above State Standard:		6.1		12.3		
National 3-Year Average:				27		
National Annual Average:		26.5		27.0		
State 3-Yr Maximum Average:		29		29		28
State Annual Average:		27.1		27.6		
Year Coverage:		96		37		32

Notes: All concentrations are expressed in micrograms per cubic meter.
State exceedances are shown in yellow. National exceedances are shown in orange.
An exceedance is not necessarily a violation.
State and national statistics may differ for the following reasons:
State statistics are based on California approved samplers, whereas national statistics are based on samplers using federal reference or equivalent methods.
State and national statistics may therefore be based on different samplers.
State statistics for 1998 and later are based on *local* conditions (except for sites in the South Coast Air Basin, where statistics for all years are based on *standard* conditions).
National statistics are based on *standard* conditions).
State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.
Measurements are usually collected every six days. Measured days counts the days that a measurement was greater than the level of the standard; Estimated days mathematically estimates how many days concentrations would have been greater than the level of the standard had each day been monitored.
3-Year statistics represent the listed year and the 2 years before the listed year.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3j: Chula Vista E. J Street Station – Maximum Daily $PM_{2.5}$ Levels



Highest 4 Daily PM2.5 Measurements

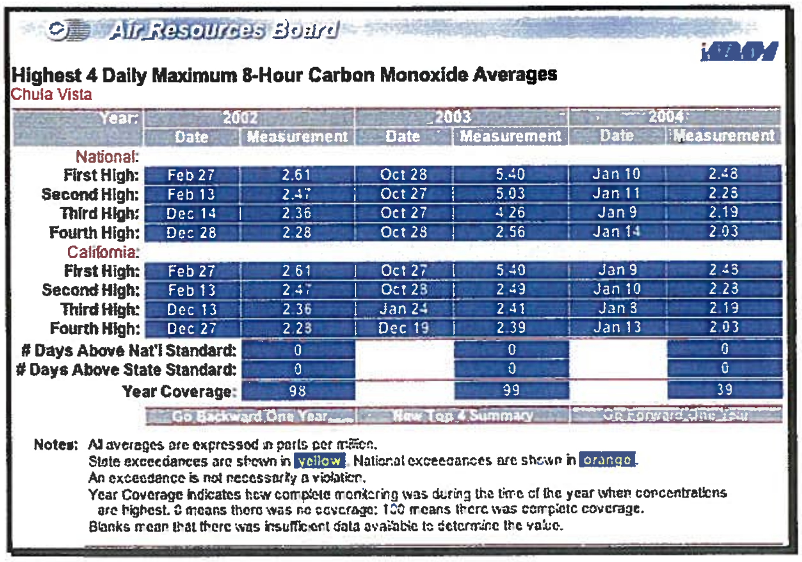
Chula Vista

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
National:						
First High:	Jan 2	41.0	Oct 27	239.2	Mar 16	32.7
Second High:	Nov 25	38.1	Dec 5	40.9	Mar 19	32.5
Third High:	Dec 4	36.0	Nov 20	39.2	Mar 22	29.5
Fourth High:	Feb 7	34.5	Jan 12	34.1	Jan 1	27.2
California:						
First High:	Jan 2	41.0	Oct 27	239.2	Mar 16	32.7
Second High:	Nov 25	38.1	Dec 5	40.9	Mar 19	32.5
Third High:	Dec 4	36.0	Nov 20	39.2	Mar 22	29.5
Fourth High:	Feb 7	34.5	Jan 12	34.1	Jan 1	27.2
# Days Above Nat'l Standard:		0		1		0
3-Year Average 98th Percentile:		33		35		
1-Year 98th Percentile:		36.0		39.2		
National 3-Year Average:		14		14		
National Annual Average:		13.9		14.4		
State 3-Yr Maximum Average:		14		14		14
State Annual Average:		13.9		14.4		
Year Coverage:		97		100		

Notes: All concentrations are expressed in micrograms per cubic meter.
State exceedances are shown in yellow. National exceedances are shown in orange.
An exceedance is not necessarily a violation.
State and national statistics may differ for the following reasons:
State statistics are based on California approved samplers, whereas national statistics are based on samplers using federal reference or equivalent methods.
State and national statistics may therefore be based on different samplers.
State criteria for ensuring that data are sufficiently complete for calculating valid annual averages are more stringent than the national criteria.
3-Year statistics represent the listed year and the 2 years before the listed year.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3k: Chula Vista E. J Street Station – Maximum 8-Hour CO Levels



Highest 4 Daily Maximum 8-Hour Carbon Monoxide Averages

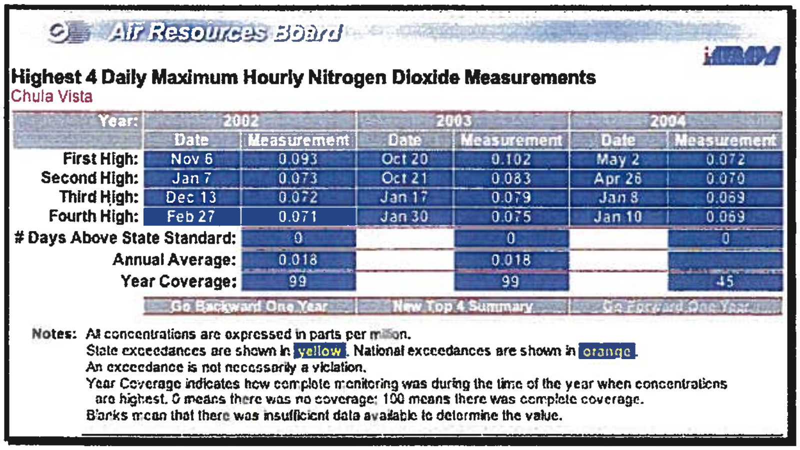
Chula Vista

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
National:						
First High:	Feb 27	2.61	Oct 28	5.40	Jan 10	2.48
Second High:	Feb 13	2.47	Oct 27	5.03	Jan 11	2.26
Third High:	Dec 14	2.36	Oct 27	4.26	Jan 9	2.19
Fourth High:	Dec 28	2.28	Oct 28	2.56	Jan 14	2.03
California:						
First High:	Feb 27	2.61	Oct 27	5.40	Jan 9	2.43
Second High:	Feb 13	2.47	Oct 28	2.49	Jan 10	2.23
Third High:	Dec 13	2.36	Jan 24	2.41	Jan 3	2.19
Fourth High:	Dec 27	2.23	Dec 19	2.39	Jan 13	2.03
# Days Above Nat'l Standard:		0		0		0
# Days Above State Standard:		0		0		0
Year Coverage:		98		99		39

Notes: All averages are expressed in parts per million.
State exceedances are shown in yellow. National exceedances are shown in orange.
An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3l: Chula Vista E. J Street Station – Maximum Daily NO_2 Levels



Highest 4 Daily Maximum Hourly Nitrogen Dioxide Measurements

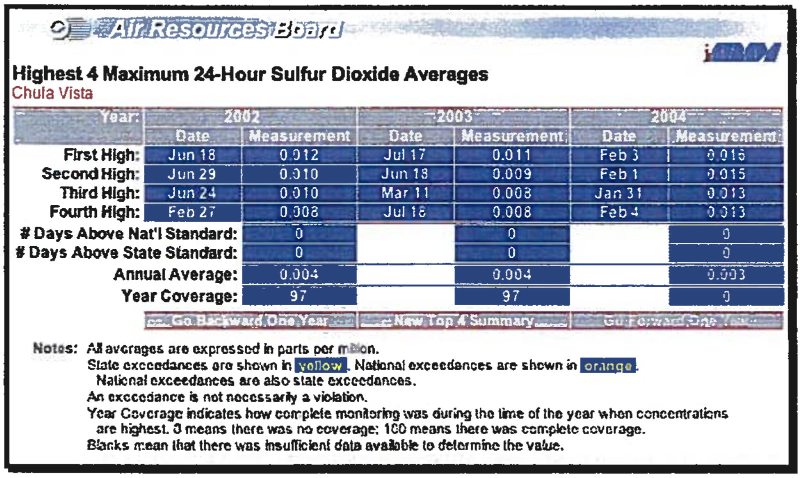
Chula Vista

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Nov 6	0.093	Oct 20	0.102	May 2	0.072
Second High:	Jan 7	0.073	Oct 21	0.083	Apr 26	0.070
Third High:	Dec 13	0.072	Jan 17	0.079	Jan 8	0.069
Fourth High:	Feb 27	0.071	Jan 30	0.075	Jan 10	0.069
# Days Above State Standard:		0		0		0
Annual Average:		0.018		0.018		
Year Coverage:		99		99		45

Notes: All concentrations are expressed in parts per million.
State exceedances are shown in yellow. National exceedances are shown in orange.
An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

TABLE 3m: Chula Vista E. J Street Station – Maximum 24-Hour SO_2 Levels



Highest 4 Maximum 24-Hour Sulfur Dioxide Averages

Chula Vista

Year:	2002		2003		2004	
	Date	Measurement	Date	Measurement	Date	Measurement
First High:	Jun 18	0.012	Jul 17	0.011	Feb 3	0.016
Second High:	Jun 29	0.010	Jun 18	0.009	Feb 1	0.015
Third High:	Jun 24	0.010	Mar 11	0.008	Jan 31	0.013
Fourth High:	Feb 27	0.008	Jul 18	0.008	Feb 4	0.013
# Days Above Nat'l Standard:		0		0		0
# Days Above State Standard:		0		0		0
Annual Average:		0.004		0.004		0.003
Year Coverage:		97		97		0

Notes: All averages are expressed in parts per million.
State exceedances are shown in yellow. National exceedances are shown in orange.
National exceedances are also state exceedances.
An exceedance is not necessarily a violation.
Year Coverage indicates how complete monitoring was during the time of the year when concentrations are highest. 0 means there was no coverage; 100 means there was complete coverage.
Blanks mean that there was insufficient data available to determine the value.

Source: California Air Resources Board (CARB) ADAM Ambient Air Quality Inventory – 1/05

Factors affecting ground level pollutant concentrations include the rate at which pollutants are emitted to the atmosphere, the height from which they are released, and topographic and meteorological features. Given these factors, the stations reported exceedances of the State standards for O_3 and PM_{10}. All other criteria pollutants were within both federal and state standards. Monitoring for lead was discontinued entirely in 1998.

Construction Air Quality Emission Levels

The estimated construction equipment exhaust emissions are provided below in Tables 4a though -c for the typical construction activities identified at the project site. The construction activities would roughly be divided into the following phases:

- Rough Grading (i.e., clearing, grubbing, and general pad and road alignment formation). This typically consists of three distinct phases: mobilization, scraper hauls/finishing, and additional site finishing work.
- Underground Utility Construction (i.e., general trench-work, pipe laying with associated base material and cover, and ancillary earthwork required to facilitate placement of sewer lift stations, manholes, etc.). This is typically performed as a single phase.
- Paving Activities (which would include the movement of any remaining material as well as necessary curb and gutter work, road base material placement and blacktop). This is typically performed as a single phase.

Based upon these values, no significant air quality impacts are expected since levels would not rise above SDAPCD thresholds. No significant VOC emissions are expected. No remedial mitigation measures would be required.

TABLE 4a: Predicted Construction Emissions – Rough Grading Operations

					Aggregate Emissions in Pounds / Day				
Equipment Type	**Qty. Used**	**HP**	**Daily Load Factor (%)**	**Duty Cycle (Hrs. / day)**	**CO**	**NOx**	**SOx**	**PM_{10}**	**ROG**
Dozer - D8 Cat	2	400	50	8	48.000	70.400	6.400	3.200	9.600
Loader	2	150	45	8	16.200	23.760	2.160	1.080	3.240
Water Truck	3	200	50	8	14.4	50.4	4.8	3.6	4.8
Scraper	2	300	35	8	18.48	31.92	3.36	2.52	1.68
				Total (Σ):	**97.1**	**176.5**	**16.7**	**10.4**	**19.3**
				Significance Threshold (SDAPCD)	**550.00**	**250.00**	**250.00**	**100.00**	**55.00**

TABLE 4b: Predicted Construction Emissions – Underground Utility Construction

					Aggregate Emissions in Pounds / Day				
Equipment Type	**Qty. Used**	**HP**	**Daily Load Factor (%)**	**Duty Cycle (Hrs. / day)**	**CO**	**NOx**	**SOx**	**PM_{10}**	**ROG**
Track Backhoe	3	150	50	8	27.000	39.600	3.600	1.800	5.400
Loader	2	150	45	8	16.200	23.760	2.160	1.080	3.240
Concrete Truck	6	250	25	0.5	1.125	3.938	0.375	0.281	0.375
Dump/Haul Trucks	5	300	45	0.5	2.025	7.088	0.675	0.506	0.675
				Total (Σ):	46.4	74.4	6.8	3.7	9.7
				Significance Threshold (SDAPCD)	**550.00**	**250.00**	**250.00**	**100.00**	**55.00**

TABLE 4c: Predicted Construction Emissions – Surface Paving Activities

					Aggregate Emissions in Pounds / Day				
Equipment Type	**Qty. Used**	**HP**	**Daily Load Factor (%)**	**Duty Cycle (Hrs. / day)**	**CO**	**NOx**	**SOx**	**PM_{10}**	**ROG**
Dump/Haul Trucks	25	300	45	0.5	10.125	35.438	3.375	2.531	3.375
Paver	1	150	35	8	2.940	9.660	0.840	0.420	0.420
Roller	2	150	35	8	5.880	16.800	1.680	0.840	1.680
				Total (Σ):	18.9	61.9	5.9	3.8	5.5
				Significance Threshold (SDAPCD)	**550.00**	**250.00**	**250.00**	**100.00**	**55.00**

Non Diesel-Fired Toxic Emission Levels (PM_{10})

The Candlelight Phase I development site would have a total excavation quantity (including remedial grading) of 724,000 cubic-yards of material (i.e., sand, dirt, and rock) moved over the course of the proposed grading. Thus, for alluvium-type material, the project would have an approximate working weight of,

$$Total\ Weight = 724{,}000\ cubic\text{–}yards\ x\ \frac{1.3\ tons}{cubic\text{–}yard} = 941{,}200\ tons$$

According to the Project Engineer, out of the total quantity identified above, only roughly 60-percent of the working weight would be capable of generating PM_{10} (since the remaining quantity is assumed to be composed of rocky/clayey material not capable of being reducible to particles small enough to be of concern). Thus, for the purposes of analysis, the working weight of earthwork material capable of generating some amount of PM_{10} would be 0.6 x 941,200 tons or 564,720 tons.

The proposed earthwork operations at the Candlelight Phase I project site would occur over a total of approximately 120 working days. Thus, the average earthwork movement per day would be 564,720 tons / 180 working days or slightly over 3,137 tons/day.

Following the analysis procedure identified in the *SCAQMD CEQA Handbook* for PM_{10} emissions from fugitive dust gives the following semi-empirical relationship for aggregate respirable dust generation,

$$PM_{10} = 0.00112 \times \left[\frac{\left(\frac{WS}{5}\right)^{1.3}}{\left(\frac{SMC}{2}\right)^{1.4}} \right] \times ET$$

where, PM_{10} = Fugitive dust emissions in pounds,
WS = Ambient wind speed,
SMC = Soil Moisture Content,
ET = Earthwork Tonnage moved per day,

It should be noted that surface wetting will be utilized during all phases of earthwork operations (*Source: T&B Planning, 5/04, 12/04, 1/05*), thus the SMC value would be 0.5. Following the analysis guidelines identified in the *SCAQMD CEQA Handbook and* substituting the above values and a maximum credible wind speed scenario of 12 MPH (WS = 12) gives the following result,

$$PM_{10} = 0.00112 \times \left[\frac{(12/5)^{1.3}}{(0.5/2)^{1.4}} \right] \times 3137.3 = 0.02434 \times 3137.3 = 76.36$$

or, a level of slightly over 76 pounds of PM_{10} generated per day. This level is below the 100 pounds per day threshold established by SDAPCD. Therefore, no significant impacts are expected.

Diesel-Fired Toxic Emission Levels (CO, NO_x, SO_x, PM_{10})

Onsite construction operations were found to generate worst-case daily pollutant levels of 97.1 pounds of CO, 176.5 pounds of NO_x, 16.7 pounds of SO_x, and 10.4 pounds of PM_{10}. These emissions are assumed to occur over any given 24-hour day (thereby providing an upper bound on expected emission concentrations) and direct comparison with CAAQS standards. Although all stable criteria pollutants are provided, it should be noted that for cancer-risk potential, only PM_{10} is the single contributing factor.

The proposed Candlelight Phase I development has a maximum working area of roughly 38.2 acres (calculated as a disturbed area of 24.6 acres out of a total 27.1

developable plus a 12.6-acre borrow area to west and a 1.0-acre offsite roadway pad to the south) or 1,663,992 square-feet (154,590 m^2) based upon data obtained from the project site plans. Based upon the onsite emission levels identified above, the aggregate emission rates for the various criteria pollutants in grams per second and grams per square-meter (m^2) per second (required as the input parameters for the *SCREEN3* model) are given below in Table 5. This methodology essentially applies all of the diesel emissions over this working area and provides a worst-case assessment of the impacts to sensitive receptors.

TABLE 5: Predicted Onsite Diesel-Fired Construction Emission Rates

Criteria Pollutant	Daily Site Emission Rates (grams/second)	Average Area Emission Rates (grams/m^2/second)
CO	97.1 (453.59) / 86400 = 0.5097	0.5097 / 154590 = 3.2971 x 10^{-6}
NO_x	176.5 (453.59) / 86400 = 0.9266	0.9266 / 154590 = 5.9939 x 10^{-6}
SO_x	16.7 (453.59) / 86400 = 0.0876	0.0876 / 154590 = 5.6666 x 10^{-7}
PM_{10}	10.4 (453.59) / 86400 = **0.0545**	0.0545 / 154590 = **3.5254 x 10^{-7}**

Total averaging time is 24 hours x 60 minutes/hour x 60 seconds/minute = 86,400 seconds per CAAQS standards.
One pound-mass = 453.592 grams

The expected diesel-fired construction emission concentrations from the *SCREEN3* modeling are shown below in Table 6. The output model results are provided as an attachment to this report. Based upon the model results, all criteria pollutants were below the recommended risk level with a PM_{10} risk probability of 0.2595% (or 25.9 one-hundredths of one-percent risk per 70-year exposure duration). No significant carcinogenic impact potential is expected due to proposed grading operations.

TABLE 6: SCREEN3 Predicted Diesel-Fired Emission Concentrations

Criteria Pollutant	Pollutant Concentration ($\mu g/m^3$)	Pollutant Concentration (ppm)	Pollutant Risk Probability (percent risk per person for 70-year exposure)	Significant?
CO	80.88	0.070	n/a	No
NO_x	147.00	0.078	n/a	No
SO_x	13.90	0.005	n/a	No
PM_{10}	**8.65**	- -	**0.2595%**	No

Diesel risk calculated using: $Risk(\%) = (300x10^{-6} \times EMFAC) \times 100 = 300x10^{-4} \times EMFAC$, based upon ARB 1999 Staff Report from the Scientific Review Panel (SRP) on Diesel Toxics inhaled in a 70-year lifetime.

<u>Conversion Factors (approximate):</u>

- *CO: 1 ppm = 1,150 $\mu g/m^3$ @ 25 deg-C STP*
- *NO_x: 1 ppm = 1,880 $\mu g/m^3$ @ 25 deg-C STP*
- *SO_x: 1 ppm = 2,620 $\mu g/m^3$ @ 25 deg-C STP*
- *PM_{10}: 1 ppm = 1 g/m^3 (solid)*

Values rounded to three significant decimal places.

Additionally, the analysis identified a worst-case PM_{10} level of 8.6 µg/m^3 occurring at a distance of 634 meters (2,080 feet) from the boundaries of the construction site. This pollutant concentration is far below the California Ambient Air Quality Standard (CAAQS) of 50 µg/m^3 established by the State for any given 24-hour exposure period. Additionally, any nearby (standing) receptor would experience levels far less than the identified maximum (concentration values ranging between 4.0 to 6.0 µg/m^3 were indicated).

Since the transport of this pollutant diminishes as a function of the aforementioned Gaussian curve (also called the normal or bell curve since it illustrates the distribution of a random population sample, refer to Figure 8), the project generated PM_{10} level is expected to <u>approach background concentrations</u> at distances approaching twice the maximum distance (or roughly three standard deviations from the maximum). This distance would be 634 x 2 meters or approximately 4,160 feet (0.78 miles) from the proposed construction area. No cumulative contribution of PM_{10} from construction at the site would be physically possible beyond this point.

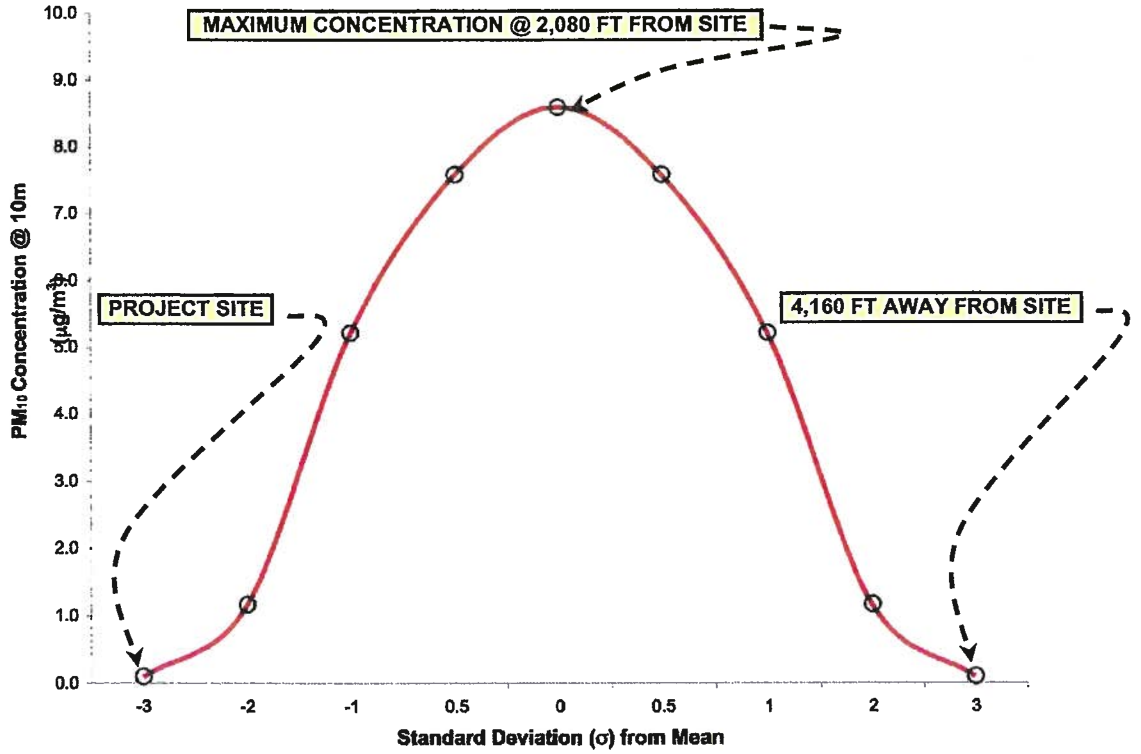


Figure 8: Predicted PM_{10} Dispersion Pattern / Concentration Levels (ISE, 1/05)

Vehicular Emission Levels

Motor vehicles are the primary source of emissions associated with the proposed project area. Typically, uses such as the proposed Candlelight Phase I residential development do not directly emit significant amount of air pollutants from onsite activities. Rather, vehicular trips to and from these land uses are the significant contributor.

The project is expected to have a total worst-case trip generation level of 3,190 ADT based upon the cumulative trip generation produced by the proposed 432 multifamily dwelling units (*Source: Candlelight Phase I Traffic Analysis, KOA, February 2006*). Currently the site is unused and has an effective starting ADT of zero (i.e., no appreciable emission offsets are attainable for this project).

The calculated emission levels are shown below in Table 7. A median speed of 45 MPH was used consistent with average values observed (i.e., combined freeway and surface street traffic activity). An average trip distance of 15 miles was assumed based upon the proposed service area of the new development and a mix ratio consistent with the Caltrans ITS Transportation Project-Level Carbon Monoxide Protocol was applied. A five-percent medium duty truck (MDT) vehicle mix was used based upon observed past mix rates identified by the project applicant and traffic engineer. Based upon the findings, no project related trip-generated pollutant exceedances are indicated. No remedial mitigation measures are required.

TABLE 7: Predicted Vehicle Trip Emissions – Candlelight Phase I Development

		Aggregate Trip Emissions in Pounds / Day				
Development Phase	**ADT**	**CO**	**NO$_x$**	**SO$_x$**	**PM$_{10}$**	**ROG**
EMFAC Year 2004 Emission Rates (in grams/mile @ 45 MPH)						
Light Duty Autos (LDA):		4.237	0.590	0.003	0.009	0.149
Light Duty Trucks (LDT):		5.333	0.871	0.004	0.013	0.170
Medium Duty Trucks (MDT):		4.39	1.406	0.008	0.016	0.175
Heavy Duty Trucks (HDT):		7.578	12.835	0.139	0.213	0.613
Buses (UBUS):		13.806	14.657	0.137	0.133	1.165
Motorcycles (MCY):		43.384	1.673	0.002	0.036	3.303
Proposed Project Action @ 3190 Net ADT						
Light Duty Autos (LDA):	2201	308.4	42.9	0.2	0.7	10.8
Light Duty Trucks (LDT):	619	109.1	17.8	0.1	0.3	3.5
Medium Duty Trucks (MDT):	204	29.6	9.5	0.1	0.1	1.2
Heavy Duty Trucks (HDT):	150	37.6	63.6	0.7	1.1	3.0
Buses (UBUS):	0	0.0	0.0	0.0	0.0	0.0
Motorcycles (MCY):	16	22.9	0.9	0.0	0.0	1.7
Total (Σ) =	**3190**	**507.6**	**134.8**	**1.0**	**2.1**	**20.3**
Significance Threshold (SDAPCD):		**550.0**	**250.0**	**250.0**	**100.0**	**55.0**

Assumes a 15-mile trip distance per vehicle. SDAPCD air basin. Wintertime conditions (50° F)

Odor Impact Potential to Proposed Site

The inhalation of volatile organic compounds (VOCs) causes smell sensations in humans. There are four primary ways in which these odors can affect human health:

- The VOCs can produce toxicological effects;
- The odorant compounds can cause irritations in the eye, nose, and throat;
- The VOCs can stimulate sensory nerves that can cause potentially harmful health effects; and,
- The exposure to perceived unpleasant odors can stimulate negative cognitive and emotional responses based on previous experiences with such odors.

Development of the proposed project site could generate trace amounts (less than 1 $\mu g/m^3$) of substances such as ammonia, carbon dioxide, hydrogen sulfide, methane, dust, organic dust, and endotoxins (i.e., bacteria are present in the dust). Additionally, proposed onsite uses could generate such substances as volatile organic acids, alcohols, aldehydes, amines, fixed gases, carbonyls, esters, sulfides, disulfides, mercaptans, and nitrogen heterocycles.

Finally, it should be noted that odor generation impacts due to the project are not expected to be significant since, a) the nearest existing sensitive receptor is located over 250 feet away from the project, and b) any odor generation would be intermittent and would terminate upon completion of the construction phase of the project. As a result, no significant air quality impacts are expected to surrounding residential receptors. No mitigation for odors is identified.

CONCLUSIONS / RECOMMENDATIONS

Aggregate Project Emissions

The aggregate construction and operational emission levels produced by the proposed Candlelight Phase I residential development project are shown below in Tables 8a and –b respectively. Based upon the analysis, no construction- or residual project-related air quality exceedances were identified for any of the identified criteria pollutants.

TABLE 8a: Aggregate Construction Emissions – Candlelight Phase I Development

	Aggregate Emissions in Pounds / Day				
OPERATIONAL SCENARIO	**CO**	**NO$_x$**	**SO$_x$**	**PM$_{10}$**	**ROG**
Construction Vehicle Emissions (Table 4a):	97.1	176.5	16.7	10.4	19.3
Surface Grading Dust Generation:				76.4	
Total (Σ):	**97.1**	**176.5**	**16.7**	**86.8**	**19.3**
Significance Threshold (SDAPCD):	**550.0**	**250.0**	**250.0**	**100.0**	**55.0**

TABLE 8b: Aggregate Operational Emissions – Candlelight Phase I Development

	Aggregate Emissions in Pounds / Day				
OPERATIONAL SCENARIO	**CO**	**NO$_x$**	**SO$_x$**	**PM$_{10}$**	**ROG**
Operational Vehicular Traffic Generation (Table 7):	507.6	134.8	1.0	2.1	20.3
Onsite Sources (n/a):	0.0	0.0	0.0	0.0	0.0
Total (Σ):	507.6	134.8	1.0	2.1	**20.3**
Significance Threshold (SDAPCD):	**550.0**	**250.0**	**250.0**	**100.0**	**55.0**

Additionally, no localized cumulative exceedances of CAAQS standards were indicated. No additional mitigation would be required as part of this project. No adverse air basin impacts were identified.

Consistency with Regional Air Quality Management Plans

Finally, the San Diego Regional Air Quality Strategy (RAQS) establishes what could be thought of as an "emissions budget" for the San Diego Air Basin. This budget takes into account existing conditions, planned growth based on General Plans for cities within the San Diego Association of Governments (SANDAG) region, and air quality control measures implemented by the SDAPCD.

The "emissions budget" accounts for current emissions associated with the proposed project as well as previously approved projects consistent with current General Plan policies. Therefore, to determine whether the proposed project is consistent with the RAQS requires a comparison of net emissions from the proposed development to the emissions associated with previously approved and accounted for plans (commonly known as the *Consistency Criterion* of the RAQS).

Since the proposed Candlelight Phase I residential development project is consistent with the proposed SANDAG projections for growth within this area, the project, by default, satisfies the *Consistency Criterion* of the RAQS and would also be consistent with State Implementation Plan (SIP) for the criteria pollutants under examination.

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: Ryan Taylor, ISE

Attachments: EMFAC 2002 Emission Factors– SDAPCD Air Basin (2004)
SCREEN3 Model Output for Criteria Pollutants

EMFAC 2002 Emission Factor Tabulations – Scenario Year 2004

```
Title    : San Diego APCD Avg 2004 Winter
Version  : Emfac2002 V2.2 Sept 23 2002
Run Date : 01/07/04 13:22:39
Scen Year: 2004 -- Model Years: 1965 to 2004
Season   : Winter
Area     : San Diego (SD)
*****************************************************************************************
     Year:2004 -- Model Years 1965 to 2004 Inclusive --  Winter
     Emfac2002 Emission Factors: V2.2 Sept 23 2002

     San Diego (SD)                    San Diego (SD)                 San Diego (SD)

                         Table   1:  Running Exhaust Emissions (grams/mile)

     Pollutant Name: Reactive Org Gases        Temperature:  50F  Relative Humidity:  40%

     Speed
      MPH       LDA      LDT      MDT      HDT      UBUS      MCY      ALL

        5      0.952    1.018    1.108    3.545    9.410    6.252    1.142
       10      0.633    0.688    0.747    2.513    6.276    4.908    0.774
       15      0.443    0.488    0.528    1.854    4.364    4.034    0.550
       20      0.326    0.363    0.390    1.419    3.161    3.471    0.410
       25      0.252    0.283    0.302    1.125    2.386    3.130    0.320
       30      0.205    0.232    0.245    0.922    1.876    2.957    0.263
       35      0.175    0.199    0.209    0.780    1.536    2.927    0.226
       40      0.157    0.180    0.187    0.681    1.311    3.038    0.203
       45      0.149    0.170    0.175    0.613    1.165    3.303    0.192
       50      0.148    0.170    0.171    0.568    1.078    3.763    0.191
       55      0.155    0.177    0.177    0.542    1.039    4.490    0.199
       60      0.171    0.195    0.191    0.533    1.044    5.607    0.218
       65      0.198    0.225    0.218    0.539    1.091    7.327    0.251


     Pollutant Name: Carbon Monoxide           Temperature:  50F  Relative Humidity:  40%

     Speed
      MPH       LDA      LDT      MDT      HDT      UBUS      MCY      ALL

        5      9.684   12.679   11.448   42.134   79.498   49.936   12.502
       10      8.164   10.520    9.177   28.256   52.563   40.999   10.086
       15      7.056    8.976    7.636   19.981   36.748   35.434    8.438
       20      6.223    7.840    6.554   14.897   27.165   32.235    7.273
       25      5.585    6.990    5.777   11.709   21.230   30.866    6.430
       30      5.092    6.351    5.213    9.702   17.541   31.110    5.814
       35      4.713    5.877    4.811    8.475   15.321   33.009    5.370
       40      4.430    5.541    4.541    7.805   14.146   36.877    5.068
       45      4.237    5.333    4.390    7.578   13.806   43.384    4.897
       50      4.134    5.254    4.362    7.760   14.243   53.755    4.860
       55      4.133    5.325    4.476    8.380   15.531   70.156    4.981
       60      4.263    5.587    4.775    9.548   17.902   96.445    5.313
       65      4.575    6.120    5.338   11.480   21.810  139.659    5.950
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Pollutant Name: Oxides of Nitrogen        Temperature:  50F  Relative Humidity:  40%

Speed
 MPH        LDA       LDT       MDT       HDT       UBUS       MCY       ALL

  5       1.039     1.574     2.387    19.889    26.531     1.221     2.213
 10       0.899     1.345     2.038    16.714    20.923     1.272     1.880
 15       0.796     1.180     1.791    14.560    17.390     1.324     1.647
 20       0.720     1.061     1.617    13.133    15.187     1.379     1.486
 25       0.666     0.976     1.499    12.255    13.891     1.435     1.377
 30       0.628     0.919     1.424    11.819    13.264     1.493     1.312
 35       0.604     0.884     1.385    11.770    13.188     1.552     1.282
 40       0.591     0.868     1.379    12.099    13.635     1.612     1.286
 45       0.590     0.871     1.406    12.835    14.657     1.673     1.323
 50       0.600     0.891     1.467    14.056    16.400     1.734     1.399
 55       0.621     0.932     1.569    15.901    19.145     1.797     1.520
 60       0.655     0.996     1.723    18.597    23.389     1.860     1.702
 65       0.706     1.089     1.946    22.508    30.003     1.923     1.968


Pollutant Name: Sulfur Dioxide            Temperature:  50F  Relative Humidity:  40%

Speed
 MPH        LDA       LDT       MDT       HDT       UBUS       MCY       ALL

  5       0.010     0.012     0.020     0.144     0.147     0.003     0.017
 10       0.007     0.009     0.015     0.142     0.143     0.003     0.015
 15       0.006     0.007     0.012     0.141     0.141     0.002     0.013
 20       0.005     0.006     0.011     0.140     0.139     0.002     0.012
 25       0.004     0.005     0.009     0.140     0.138     0.002     0.011
 30       0.004     0.005     0.009     0.140     0.138     0.002     0.011
 35       0.003     0.004     0.008     0.140     0.137     0.002     0.010
 40       0.003     0.004     0.008     0.139     0.137     0.002     0.010
 45       0.003     0.004     0.008     0.139     0.137     0.002     0.010
 50       0.003     0.004     0.008     0.139     0.137     0.002     0.010
 55       0.003     0.004     0.008     0.140     0.137     0.002     0.010
 60       0.004     0.005     0.009     0.140     0.138     0.003     0.011
 65       0.004     0.005     0.009     0.140     0.138     0.004     0.011


Pollutant Name: PM10                      Temperature:  50F  Relative Humidity:  40%

Speed
 MPH        LDA       LDT       MDT       HDT       UBUS       MCY       ALL

  5       0.057     0.084     0.095     0.805     0.667     0.066     0.102
 10       0.038     0.056     0.065     0.631     0.481     0.052     0.073
 15       0.026     0.039     0.047     0.505     0.360     0.043     0.054
 20       0.019     0.029     0.035     0.414     0.279     0.037     0.042
 25       0.015     0.023     0.027     0.347     0.224     0.034     0.034
 30       0.012     0.018     0.022     0.297     0.186     0.032     0.028
 35       0.010     0.016     0.019     0.260     0.161     0.032     0.024
 40       0.009     0.014     0.017     0.233     0.143     0.033     0.022
 45       0.009     0.013     0.016     0.213     0.133     0.036     0.020
 50       0.009     0.013     0.015     0.200     0.127     0.041     0.019
 55       0.009     0.013     0.016     0.191     0.126     0.048     0.019
 60       0.009     0.014     0.016     0.187     0.130     0.060     0.020
 65       0.011     0.016     0.018     0.187     0.138     0.078     0.021
```

SCREEN3 Model Output for Criteria Pollutants: CO, NO_x, SO_x, and PM_{10}

```
CANDLELIGHT PHASE I - CO

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)   HT (M)   (DEG)
 -------  ----------  ----  -----  -----  ------  ------  -------
    20.   32.09        3     1.0    1.0   320.0    3.00     45.
   100.   40.79        4     1.0    1.0   320.0    3.00     45.
   200.   53.97        4     1.0    1.0   320.0    3.00     45.
   300.   65.75        5     1.0    1.0 10000.0    3.00     45.
   400.   76.16        5     1.0    1.0 10000.0    3.00     45.
   500.   77.69        6     1.0    1.0 10000.0    3.00     45.
   600.   80.72        6     1.0    1.0 10000.0    3.00     45.
   700.   80.38        6     1.0    1.0 10000.0    3.00     45.
   800.   78.35        6     1.0    1.0 10000.0    3.00     45.
   900.   75.61        6     1.0    1.0 10000.0    3.00     45.
  1000.   72.69        6     1.0    1.0 10000.0    3.00     45.
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    20. M:
   634.   80.88        6     1.0    1.0 10000.0    3.00     45.

     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC     DIST TO    TERRAIN
  PROCEDURE         (UG/M**3)     MAX (M)     HT (M)
--------------     -----------    -------    -------
SIMPLE TERRAIN       80.88          634.          0.
```

```
CANDLELIGHT PHASE I - NOX

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)    (UG/M**3)   STAB  (M/S)  (M/S)    (M)    HT (M)  (DEG)
-------  ----------   ----  -----  -----  ------   ------  -------
    20.   58.33        3     1.0    1.0   320.0     3.00     45.
   100.   74.14        4     1.0    1.0   320.0     3.00     45.
   200.   98.11        4     1.0    1.0   320.0     3.00     45.
   300.   119.5        5     1.0    1.0 10000.0     3.00     45.
   400.   138.4        5     1.0    1.0 10000.0     3.00     45.
   500.   141.2        6     1.0    1.0 10000.0     3.00     45.
   600.   146.7        6     1.0    1.0 10000.0     3.00     45.
   700.   146.1        6     1.0    1.0 10000.0     3.00     45.
   800.   142.4        6     1.0    1.0 10000.0     3.00     45.
   900.   137.5        6     1.0    1.0 10000.0     3.00     45.
  1000.   132.1        6     1.0    1.0 10000.0     3.00     45.
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    20. M:
   634.   147.0        6     1.0    1.0 10000.0     3.00     45.

     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC     DIST TO    TERRAIN
  PROCEDURE         (UG/M**3)     MAX (M)     HT (M)
--------------     -----------    -------    -------
SIMPLE TERRAIN       147.0          634.         0.
```

```
CANDLELIGHT PHASE I - SOX

** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC               U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)   (UG/M**3)   STAB   (M/S)  (M/S)    (M)   HT (M)   (DEG)
-------  ----------  ----   -----  -----  ------  ------  -------
    20.   5.515       3      1.0    1.0   320.0    3.00     45.
   100.   7.010       4      1.0    1.0   320.0    3.00     45.
   200.   9.275       4      1.0    1.0   320.0    3.00     45.
   300.   11.30       5      1.0    1.0 10000.0    3.00     45.
   400.   13.09       5      1.0    1.0 10000.0    3.00     45.
   500.   13.35       6      1.0    1.0 10000.0    3.00     45.
   600.   13.87       6      1.0    1.0 10000.0    3.00     45.
   700.   13.81       6      1.0    1.0 10000.0    3.00     45.
   800.   13.47       6      1.0    1.0 10000.0    3.00     45.
   900.   13.00       6      1.0    1.0 10000.0    3.00     45.
  1000.   12.49       6      1.0    1.0 10000.0    3.00     45.
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    20. M:
   634.   13.90       6      1.0    1.0 10000.0    3.00     45.

     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC     DIST TO    TERRAIN
  PROCEDURE         (UG/M**3)     MAX (M)     HT (M)
--------------     -----------    -------    -------
SIMPLE TERRAIN       13.90          634.          0.
```

```
CANDLELIGHT PHASE I - PM10

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME  MAX DIR
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)   (M)    HT (M)   (DEG)
-------  ----------  ----  -----  -----  ------  ------  -------
    20.    3.431       3     1.0    1.0   320.0    3.00      45.
   100.    4.361       4     1.0    1.0   320.0    3.00      45.
   200.    5.770       4     1.0    1.0   320.0    3.00      45.
   300.    7.030       5     1.0    1.0 10000.0    3.00      45.
   400.    8.143       5     1.0    1.0 10000.0    3.00      45.
   500.    8.307       6     1.0    1.0 10000.0    3.00      45.
   600.    8.631       6     1.0    1.0 10000.0    3.00      45.
   700.    8.595       6     1.0    1.0 10000.0    3.00      45.
   800.    8.378       6     1.0    1.0 10000.0    3.00      45.
   900.    8.085       6     1.0    1.0 10000.0    3.00      45.
  1000.    7.772       6     1.0    1.0 10000.0    3.00      45.
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    20. M:
   634.    8.648       6     1.0    1.0 10000.0    3.00      45.

     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC    DIST TO   TERRAIN
  PROCEDURE         (UG/M**3)    MAX (M)    HT (M)
---------------    -----------   -------   -------
SIMPLE TERRAIN        8.648         634.        0.
```

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June 8, 2015

To Whom it May Concern:

The City of San Diego's Transportation Department during its review of the EIR, discovered that the traffic calculations for the Traffic Impact Analysis used "greater than 20 dwelling units per acre" as a basis its calculations; while the Tentative Map used 19.93 (rounded up to 20) dwelling units per acre.

In order for the traffic calculations in the Traffic Impact Analysis report to be accurate and match the EIR, the dwelling units per acre must be "greater than" 20.

Therefore, the Tentative Map was updated to reflect a decrease of .09 acres for the developable acres (Lot 1 was decreased by .09 acres and Lot 4 (MHPA) increased). This increased the dwelling units per acre to 20.008 and required the following changes to the Tentative Map:

Area affected	Previous Tentative Map acres/units	Updated Tentative Map acres/units
Lot 1 acres	7.81 acres	7.72 acres
Dwelling unit per acre	19.93 dwelling units per acre	20.008 dwelling units per acre
Developable acres	23.83 acres	23.74 acres
Lot 4 acres	15.76 acres	15.85 acres
Total open space acres	17.86 acres	17.95 acres
Total open space rounded	17.9 acres	18 acres
Total developable acres rounded	23.8 acres	23.7 acres

This update to the Tentative Map made the environmental impact LESS than previously stated. Therefore, it was determined that the reports for this EIR would not need to be re-written/updated to reflect this negligible change of .09 acres on the Tentative Map.

Also note, some reports state that 476 dwelling units would be built and others studied impacts of 475 units. Therefore, 475 dwelling units will be used to be consistent. Some reports may show 476 units. The lower dwelling unit number would cause LESS of an environmental impact.

The attached report may have acres/units which do not reflect the latest Tentative Map updates described above. However, please note the current impact is less that the report may state and therefore, not considered a significant change requiring a report re-write.

Sincerely,

Kathy C

Kathy Corvin
Schwerin & Assoc.
(619) 220 4969

Appendix C

Biological Technical Report
Alden Environmental, June 2013

Biological Technical Report for the Candlelight Project

June 27, 2013
Project No. 40329

Prepared for:

Candlelight Properties, LLC

Prepared by:

Alden Environmental, Inc.
3245 University Avenue, #1188
San Diego, CA 92104

ALDEN
ENVIRONMENTAL, INC

Candlelight Project
Biological Technical Report

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1.0 INTRODUCTION

This report describes existing biological conditions on the Candlelight project site and provides the U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (Corps), California Department of Fish and Wildlife (CDFW), City of San Diego (City), and project applicant with information necessary to assess impacts to biological resources under the California Environmental Quality Act (CEQA), City's Biology Guidelines (City 2002), federal and state Endangered Species Acts (ESAs), federal Clean Water Act, and California Fish and Game Code.

This document is an update to a report prepared previously for the project by Helix Environmental Planning (Helix 2007). Text from this earlier report has been reproduced in this report and updated as necessary to reflect current site conditions and project features.

1.1 PROJECT DESCRIPTION

The Candlelight project is located on a 44.9-acre parcel in the Otay Mesa area of San Diego. The project would subdivide the property into 3 multi-family residential lots and 2 open space/habitat preserve lots (Western and Eastern Preserves). The current zoning is RM2-5 with an allowable density of 29 dwelling units per acre. This would allow 647 dwellings on the 3 lots. However, due to the physical constraints of the property, the project proposes a maximum of 475 multifamily units.

Road access to the site will be provided by extending Caliente Avenue to the south as a 5-lane major and creating Public Street "A" running east and west below Caliente Avenue as a 2- lane collector. The project also proposes creating a temporary cul-de-sac to the west of Public Street "A" and another off-site cul-de-sac at the east end of Public Street "A." Internal circulation will be provided by private driveways throughout the project. Additionally, the City will install a pedestrian trail along an existing dirt road within the Eastern Preserve.

1.2 PROJECT LOCATION

The approximately 44.9-acre project site is located in the City's Otay Mesa community, 1.1 miles east of Interstate 805, and 1.4 miles north of the U.S./Mexico border (Figure 1). The project site occupies a portion of Section 31 within Township 18 South, Range 1 West of the U.S. Geological Survey 7.5-minute Imperial Beach quadrangle map (Figure 2). Approximately 2.5 acres of the project site occurs within the City's Multi-Habitat Planning Area (MHPA; Figures 3a and 3b); however, none of it is proposed to be impacted.

1.3 PHYSICAL DESCRIPTION AND LAND USE

The project site consists of a mesa top previously used for agriculture. The site is currently undeveloped and supports native and non-native habitats. On-site elevations range from approximately 430 feet to 545 feet above mean sea level. Soils on site consist of Olivenhain cobbly loam and Stockpen gravelly clay loam (Bowman 1973). Historic aerial photographs of the site dating back to 1928 were collected and analyzed to determine the previous land uses on site. The vast majority of the property has been actively farmed since at least 1955; as a result, Lots 1 through 3 have been repeatedly disced and tilled. Earthen berms have been constructed along the site property boundaries in all directions to restrict access and illegal dumping. Based on the historic aerial photograph analysis, it appears that the berms were constructed between 1995 and 1997. Construction of the berms resulted in lower areas or depressions near their bases. Clay soils present in those depressions are somewhat impervious, and standing water is present following winter and spring rains for periods of weeks.

San Ysidro High School bounds the project site northwest of Caliente Avenue, while undeveloped land bounds the project site northeast of Caliente Avenue. In addition, undeveloped land bounds the project site on the south, east, and west. The site is accessed on the northern border via Caliente Avenue.

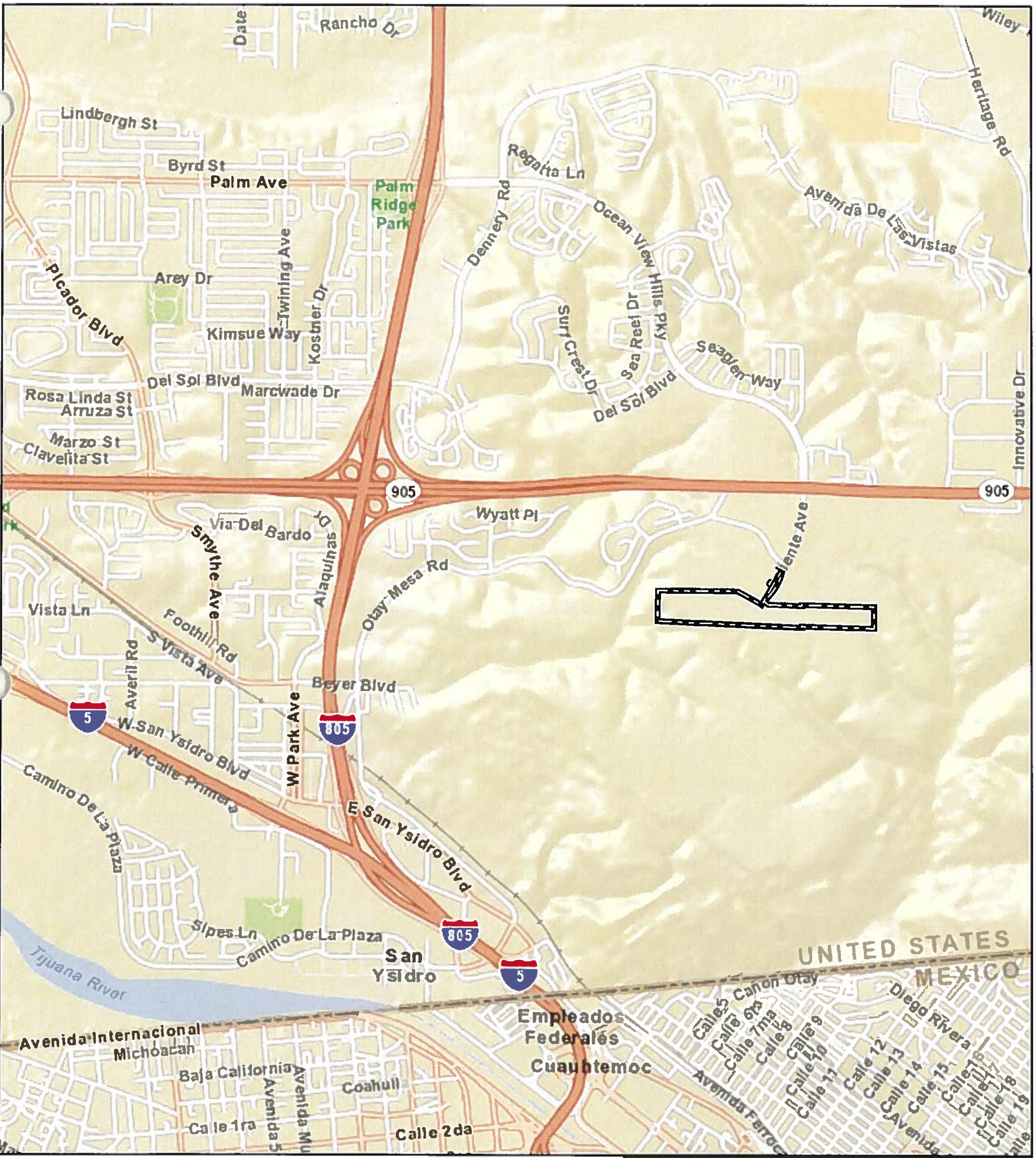
2.0 METHODS

2.1 LITERATURE REVIEW

Prior to conducting updated field investigations, Alden Environmental, Inc. (Alden) performed a review of existing literature, including the previously prepared Biological Technical Report for the site (Helix 2007a) and environmental documentation prepared for the adjacent Southview project. A search of CDFW's California Natural Diversity Database (CDFG 2011 and 2012) and the California Native Plant Society ([CNPS] 2010) online database for information regarding sensitive species known to occur within the project vicinity. Additional sources include information compiled as part of the Multiple Species Conservation Program (MSCP; City 1997a and b), State Route 905 Biological Technical Report (Helix 2004a), and Sweetwater Union High School Biological Constraints Report (Helix 1999).

2.2 BIOLOGICAL SURVEYS

Helix conducted a full range of biological field surveys in 2004 and 2005. Additional update surveys were conducted by Alden in 2012 to provide more current information for the project analysis. In all, 7 types of field surveys were conducted within the project limits (Table 1): vegetation mapping, rare plant surveys, a jurisdictional delineation, burrowing owl (BUOW; *Athene cunicularia*) surveys, and USFWS protocol-level presence/absence surveys for fairy shrimp (San Diego [*Branchinecta sandiegonensis*] and Riverside [*Streptocephalus woottoni*]), Quino checkerspot butterfly (QCB; *Euphydryas editha quino*), and coastal California gnatcatcher (CAGN; *Polioptila californica californica*). During the surveys, incidental plant and animal observations were noted. During the rare plant surveys, special attention was given to MSCP narrow endemic species potentially occurring on site. More detailed information about the surveys can be found in the protocol survey annual reports (Alden 2012a and 2012b; Helix 2004b, 2004c, 2004e, 2005a, and 2005b).



Legend

▭ Project Boundary

N
W E
S

2,400 1,200 0 2,400
Feet

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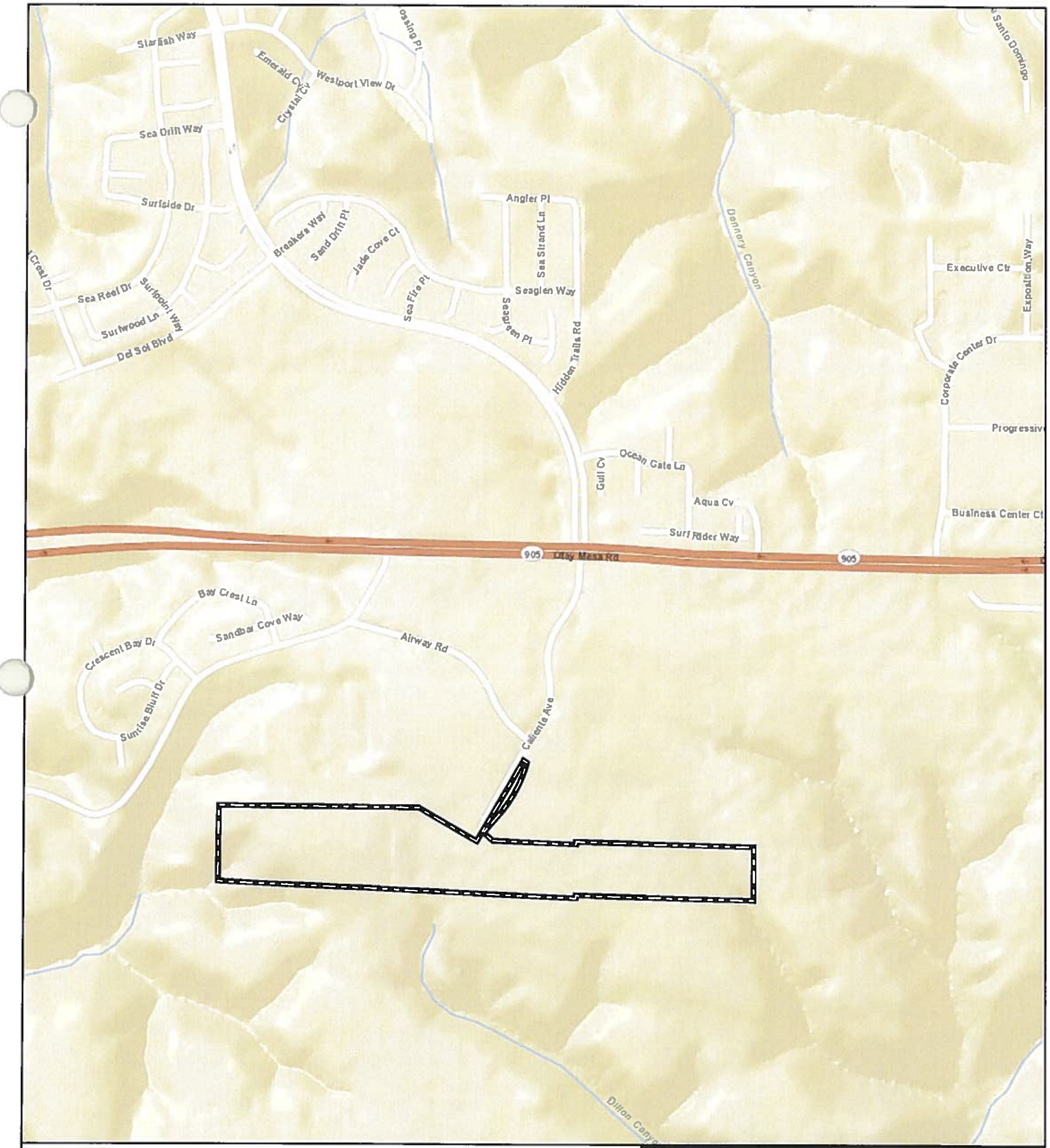
Figure 1

Regional Vicinity

CANDLELIGHT
BIOLOGICAL TECHNICAL REPORT



Legend

▭ Project Boundary

N
W E
S

960 480 0 960
Feet

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Figure 2

Project Location

CANDLELIGHT
BIOLOGICAL TECHNICAL REPORT

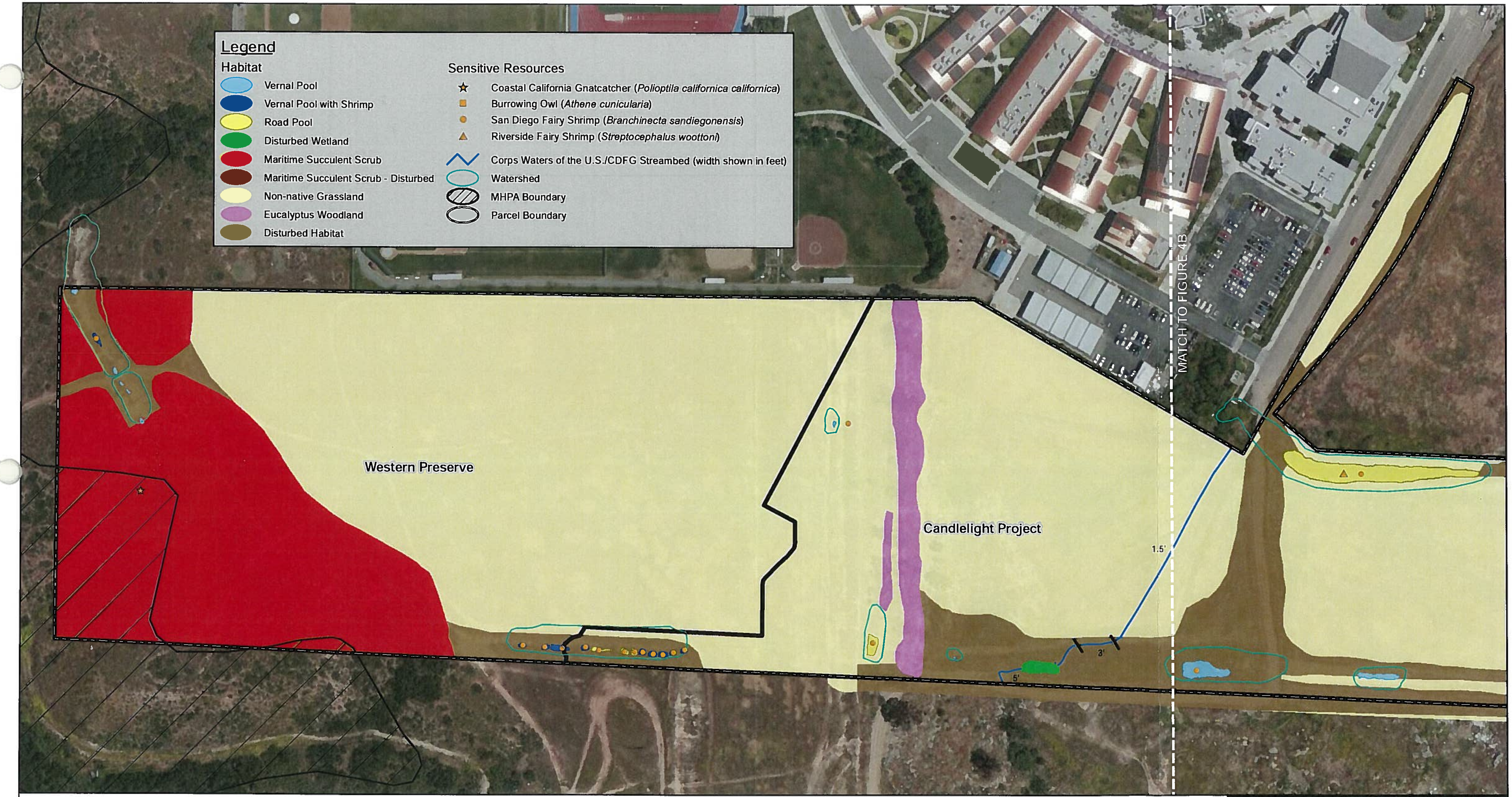

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Figure 3a

Vegetation and Sensitive Resources

CANDLELIGHT
BIOLOGICAL TECHNICAL REPORT

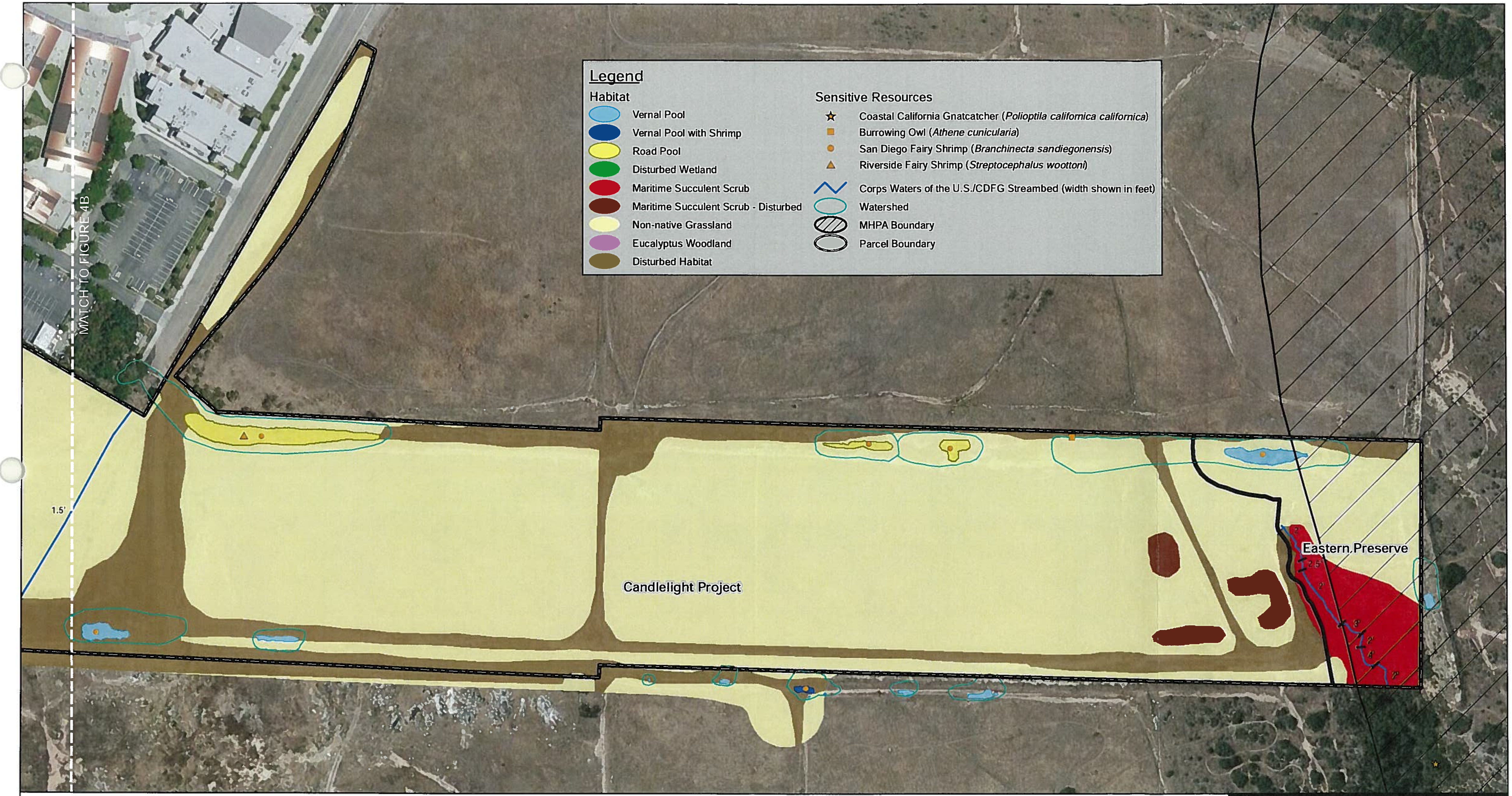

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Figure 3b

Vegetation and
Sensitive Resources

CANDLELIGHT
BIOLOGICAL TECHNICAL REPORT

Table 1
SURVEY INFORMATION

DATE	PERSONNEL	SURVEY TYPE
2012[1]		
February 7, 2012	Greg Mason	Vegetation Map Update
February 16, 2012	Darin Busby	QCB
February 17, 2012	Greg Mason	Vegetation Map Update
February 21, 2012	Darin Busby	QCB
March 1, 2012	Darin Busby	QCB
March 5, 2012	Darin Busby	QCB
March 11, 2012	Greg Mason	BUOW
March 12, 2012	Greg Mason	BUOW
March 13, 2012	Greg Mason	BUOW
March 15, 2012	Darin Busby	QCB
March 22, 2012	Greg Mason	QCB
April 4, 2012	Greg Mason	Rare plant
April 15, 2012	Greg Mason	BUOW
June 21, 2012	Greg Mason	Rare plant
2009[2]		
December 16, 2009	Larry Sward, Sally Trnka	Jurisdictional delineation update
2005[2]		
January 4, 2005	Keli Balo, Greg Mason	Wet season fairy shrimp
January 18, 2005	Sally Trnka, Amy Mattson	QCB
January 25, 2005	Keli Balo	Wet season fairy shrimp
January 28, 2005	Dale Ritenour, Keli Balo	QCB
February 1, 2005	Sally Trnka, Debbie Leonard, Brian Parker	QCB
February 9, 2005	Brian Parker, Roger Ditrick	QCB
February 16, 2005	Sally Trnka, Dale Ritenour, Roger Ditrick	QCB
February 18, 2005	Keli Balo	Wet season fairy shrimp
February 24, 2005	Sally Trnka, Amy Mattson, Roger Ditrick	QCB
March 2, 2005	Dale Ritenour, Keli Balo	QCB and wet season fairy shrimp
March 6, 2005	Brian Parker	QCB
March 9, 2005	Amy Mattson, Sally Trnka	QCB
March 14, 2005	Roger Ditrick, Brian Parker	QCB
March 18, 2005	Keli Balo	Wet season fairy shrimp
March 25, 2005	Sally Trnka, Brian Parker, Keli Balo	QCB
March 31, 2005	Keli Balo	Wet season fairy shrimp
April 14, 2005	Keli Balo	Wet season fairy shrimp
May 5, 2005	Keli Balo	Wet season fairy shrimp
May 11, 2005	Sally Trnka, Jasmine Watts	Rare plant
June 6, 2005	Dale Ritenour, Jasmine Watts	Rare plant
2004[2]		
January 9, 2004	Greg Mason, Keli Balo	Fairy shrimp
January 23, 2004	Greg Mason, Keli Balo	Fairy shrimp and BUOW
February 6, 2004	Greg Mason, Keli Balo	Fairy shrimp and jurisdictional delineation

Table 1 (cont.)
SURVEY INFORMATION

DATE	PERSONNEL	SURVEY TYPE
2004^{2} (cont.)		
February 18, 2004	Deborah Leonard, Kathy Pettigrew, Keli Balo	CAGN
February 20, 2004	Greg Mason, Keli Balo	Fairy shrimp
February 25, 2004	Deborah Leonard, Kathy Pettigrew, Keli Balo	CAGN
March 5, 2004	Greg Mason, Keli Balo	Fairy shrimp
March 6, 2004	Deborah Leonard, Kathy Pettigrew	CAGN
March 9, 2004	Roger Ditrick, Brian Parker, Patrick McNicholas, Sally Trnka	QCB
March 18, 2004	Greg Mason, Alison Fischer	Fairy shrimp
March 18, 2004	Sally Trnka, Dale Ritenour, Brian Parker	QCB
March 19, 2004	Greg Mason, Keli Balo	Fairy shrimp
March 23, 2004	Sally Trnka, Dale Ritenour, Brian Parker, Amy Mattson, Roger Ditrick	QCB
March 30, 2004	Roger Ditrick, Sally Trnka	QCB
April 2, 2004	Greg Mason, Keli Balo	Fairy shrimp
April 7, 2004	Roger Ditrick, Sally Trnka, Patrick McNicholas, Brian Parker	QCB
April 13, 2004	Amy Mattson, Patrick McNicholas	QCB
April 16, 2004	Greg Mason, Dale Ritenour, Keli Balo	Fairy shrimp and BUOW
April 20, 2004	Brian Parker, Patrick McNicholas	QCB
April 30, 2004	Greg Mason, Keli Balo	Fairy shrimp and rare plant survey
June 16, 2004	Greg Mason, Keli Balo	Rare plant
July 19, 2004	Greg Mason, Keli Balo, Dale Ritenour, Jasmine Watts	Dry season fairy shrimp
November 24, 2004	Greg Mason, Keli Balo	Wet season fairy shrimp
December 10, 2004	Larry Sward, Keli Balo	Wet season fairy shrimp
December 21, 2004	Greg Mason, Dale Ritenour, Keli Balo	Wet season fairy shrimp
December 23, 2004	Sally Trnka, Roger Ditrick, Amy Mattson	QCB
December 29, 2004	Larry Sward, Keli Balo	Wetland delineation

[1] Fieldwork conducted by Alden
[2] Fieldwork conducted by Helix

2.2.1 Vegetation Mapping

General biological surveys and vegetation mapping were conducted by Helix during winter and spring 2004. Additional surveys and vernal pool mapping were conducted during the 2004/2005 rainy season. Vegetation mapping was updated in February, 2012 by Alden to reflect changes that have occurred since the previous efforts. A global positioning satellite (GPS) system with submeter horizontal accuracy was used to record the locations of vernal pools, jurisdictional areas, and other sensitive resources on site during the 2004/2005 fieldwork. The site was surveyed on foot with the aid of binoculars where necessary. Vegetation communities were mapped according to Holland (1986) or Oberbauer (2008) classifications. All plant and animal species detected on site during site visits were recorded.

2.2.2 Rare Plants

A focused early spring rare plant survey was conducted on April 30, 2004. A second rare plant survey was conducted on June 16, 2004 to catch any late blooming rare plants that may occur on site (e.g., variegated dudleya [*Dudleya variegata*] and Otay tarplant [*Deinandra conjugens*]). A second round of rare plant surveys were conducted during the 2005 spring/summer seasons to search for any additional plants potentially present as a result of increased rainfall. An early spring survey was conducted on May 5, 2005 and a late spring survey was conducted on June 6, 2005. In addition, each water-holding basin was surveyed for vernal pool-associated rare plants during every fairy shrimp survey visit conducted in 2004 and 2005. Additional focused rare plant surveys were conducted on April 4, 2012, and June 21, 2012 (see Section 2.2.5). Rare plants were also searched for opportunistically during all other focused surveys on site. During all site visits, special attention was paid to the potential for City narrow endemic species to occur on site.

2.2.3 Jurisdictional Delineation

A jurisdictional delineation was conducted to determine the presence of Waters of the U.S. (including jurisdictional wetlands) within the study area during 2 site visits (February 26 and December 29, 2004). A follow up jurisdictional delineation visit was conducted on December 16, 2009 by Helix. All on-site areas with depressions or drainage channels were evaluated for the presence of Waters of the U.S. Each area was inspected according to current jurisdictional delineation guidelines.

2.2.4 Burrowing Owl

Winter and spring protocol surveys for the BUOW were conducted on January 23 and April 16, 2004, respectively. Additional surveys were conducted by Alden in 2012 (Table 1). The surveys focused on, but were not limited to, portions of the study area (as well as 500 feet off site) that had potential to contain burrows or to be used by the BUOW as foraging habitat. Areas in the project vicinity that contain potential BUOW habitat include grasslands and disturbed habitat along earthen berms where vegetation is sufficiently open to support burrows. Suitable habitat was examined by visual inspection while walking approximately parallel transects, with particular attention to any areas along the berms and where rodent activity was suspected.

A total of 4 focused BUOW surveys were conducted during the owl breeding season (February 15 - July 15) in 2012 according to the 1993 California Burrowing Owl Consortium survey protocol. An additional 9 survey visits were conducted during this same period to update vegetation mapping and survey for the QCB and rare plants. In total, the entire site was surveyed 13 times during this period. During each visit, BUOWs and evidence of BUOW occupancy was searched for. If BUOWs were present they would have been observed.

2.2.5 Fairy Shrimp

Helix conducted USFWS protocol wet and dry season surveys for the federally listed endangered San Diego and Riverside fairy shrimp (Helix 2004b and c) in 2004. Wet season surveys were conducted every 2 weeks throughout the rainy season. Each water-holding basin was sampled (including areas that did not contain vegetation indicative of vernal pools) until either the pools were dry or shrimp were found. A total of 10 sampling visits were conducted between January and May 2004 (Table 1). Mesh dip nets were used to survey the basins. All netted shrimp species were identified to species in the field and immediately returned to their basin of origin. Soil collection for the dry season survey was conducted on July 19, 2004. An additional 2004/2005 wet season survey was conducted to check for shrimp in newly ponding areas throughout the site (Helix 2005b). Take authorization for fairy shrimp was provided by the USFWS in a Biological Opinion (BO) issued for the project on June 21, 2010 (USFWS 2010) and no additional surveys are required at this time. The BO contains a condition requiring that additional vernal pool/fairy shrimp surveys be conducted prior to construction if construction does not occur within 2 years of issuance of the BO. Under this condition, additional fairy shrimp surveys would not be required until the project seeks permits to grade and construct the site.

2.2.6 Quino Checkerspot Butterfly

Two seasons (2004 and 2005) of USFWS protocol QCB presence/absence surveys were conducted on site in accordance with the Year 2002 Survey Protocol Information (USFWS 2002a) and Survey Recommendations (USFWS 2002b). Based on current protocol, no areas of the site were excluded. A total of 7 surveys were conducted between March 9 and April 20, 2004, and 14 surveys were conducted between December 23, 2004 and April 14, 2005. A third season of QCB surveys was conducted on site in 2012 by Alden (Table 1).

2.2.7 Coastal California Gnatcatcher

Three USFWS protocol surveys were conducted for the federally listed threatened CAGN in suitable habitat (maritime succulent scrub) on February 18, 25, and March 6, 2004 (Table 1; Helix 2004d).

2.3 SURVEY LIMITATIONS

Few survey limitations exist for the study area. Numerous site visits were performed and, during each visit, the total species list for the site was expanded if new species were observed. Since all surveys were conducted during daylight hours, the presence of nocturnal animals such as coyotes (*Canis latrans*), raccoons (*Procyon lotor*), and rodents could be determined only by indirect sign (tracks, scat, or burrows). A complete list of these species would require night surveys and trapping but is not warranted because potential to occur and the relative sensitivity of animals that might be detected are both low.

2.4 NOMENCLATURE

Nomenclature used in this report follows the conventions used in the City Biology Guidelines (City 2002) and the MSCP (City 1997a and b). Vegetation community classifications follow Holland (1986) and Oberbauer (2008); Latin plant names follow Hickman, ed. (1993) while common names follow Hickman or CNPS (2006). Sensitive plant status follows CNPS (2010) and CDFG (2012). Animal nomenclature is taken from Crother (2001) for amphibians and reptiles, American Ornithologists' Union (2009) for birds, and Baker et al. (2003) for mammals. Sensitive animal status follows CDFG (2011).

3.0 RESULTS

3.1 VEGETATION COMMUNITIES

Three wetland/riparian and 4 upland vegetation communities occur on the project site and associated off-site project areas. Wetland/riparian vegetation communities include disturbed wetland, vernal pool, and road pool (unvegetated ephemeral basin). Upland vegetation communities include maritime succulent scrub, non-native grassland, eucalyptus woodland, and disturbed habitat (Table 2; Figures 3a and 3b).

Table 2
EXISTING VEGETATION COMMUNITIES

Vegetation Communities*	On Site	Off Site	Total
Wetland/Riparian Habitats			
Disturbed wetland	0.02	0.00	**0.02**
Vernal pool	0.19	0.03	**0.22**
Road pool‡	0.24	0.00	**0.24**
Upland Vegetation Communities			
Maritime succulent scrub (Tier I)	5.9	0.0	**5.9**
Non-native grassland (Tier IIIB)	32.7	1.5	**34.2**
Other Areas			
Eucalyptus woodland (Tier IV)	0.6	0.0	**0.6**
Disturbed habitat (Tier IV)	5.2	0.5	**5.7**
TOTAL	**44.9**	**2.0**	**46.9**

*Upland habitats are rounded to the nearest 0.1 acre, while wetland habitats are rounded to the nearest 0.01; thus, totals reflect rounding

‡Unvegetated road pools (ephemeral basin) supporting fairy shrimp

3.1.1 Wetland/Riparian Vegetation Communities

Disturbed Wetland

This community is dominated by exotic wetland species that have invaded sites that have been previously disturbed or undergone periodic disturbances such that these invasive non-natives have displaced the native wetland flora. Species found within the 0.02 acre of disturbed wetland include curly dock (*Rumex crispus*), salt cedar (*Tamarix* sp.), mustard (*Brassica* sp.), fennel (*Foeniculum vulgare*), and Italian ryegrass (*Lolium multiflorum*).

Vernal Pools

Vernal pools are a highly specialized habitat supporting a unique flora and fauna. Natural vernal pools are normally associated with 2 important physical conditions: a subsurface hardpan or claypan that inhibits the downward percolation of water and topography characterized by a series of low hummocks (mima mounds) and depressions (vernal pools). These two physical conditions allow water to collect in the depressions during the rainy season. As this water evaporates, a gradient of low soil water availability to high soil water availability is created from the periphery of the pool to the center of the pool. The chemical composition of the remaining pool water becomes more concentrated as the pool water evaporates, creating a gradient of low ion concentration at the pool edge to high ion concentration at the pool center. A temporal succession of vernal pool plant species occurs at the receding pool margins, depending upon the physical and chemical characteristics of the pool. Vernal pools in a wet year will have a high proportion of native species that are endemic to this habitat. During these years, the exotic species characteristic of non-native grasslands will not invade these pools as they are unable to tolerate the physiological conditions. In years of scarce rainfall insufficient to saturate create a surface pool, native endemic flora may not germinate, and the pool may be invaded by exotic species.

Twenty four vernal pools (Figures 4a, 4b, and 5) with a total surface area of approximately 0.19 acre (8,276 square feet [sq ft]) and associated watersheds, were mapped on site and assessed in the USFWS BO (USFWS 2010). These pools are highly degraded and of low quality. The pools were created by the construction of the berms on site. Machinery used to form the berms left behind shallow depressions that hold water during the rainy season. As discussed above (Section 1.3), the berms were created between 1995 and 1997; therefore, the pools that currently occur on site are approximately 16 to 17 years old.

Five additional vernal pools (VPs 7-11, Figure 5) with a total surface area of 0.01 acre (519 sq ft) occur within the off-site road area south of the project site on the Bachmann Property. Created by berm construction, these vernal pools were mapped during protocol (fairy shrimp) surveys for the adjacent property owner to the south and are highly degraded and of low quality. As discussed above (Section 1.3), the berms were created between 1995 and 1997; therefore, the pools that currently occur within the off site project area are also approximately 16 to 17 years old. Per the City's guidelines, water-holding basins that support one or more vernal pool indicator plant species (Corps 1997) are considered vernal pools. However, the guidelines also state that the City's wetland definition is intended to differentiate naturally occurring wetland from those created through human activity, and it is not the City's intent to regulate artificially created wetlands in historically non-wetland areas. Due to the man-made nature of the pools on site, the areas are not considered City jurisdictional.

Vernal pools within the study area have been degraded by erosion, off-highway vehicle use, and agricultural activities. These vernal pools are dominated by non-native grasses and forbs, and generally support only one or two vernal pool indicator plant species. Vernal pool indicator plant species cover is less than one percent for all of the vernal pools. Indicator plant species observed within the vernal pools include quillwort (*Lilaea scilloides*), water clover (*Marsilea vestita*), dwarf woolly-heads (*Psilocarphus brevissimus*), and adobe popcorn flower (*Plagiobothrys acanthocarpus*).

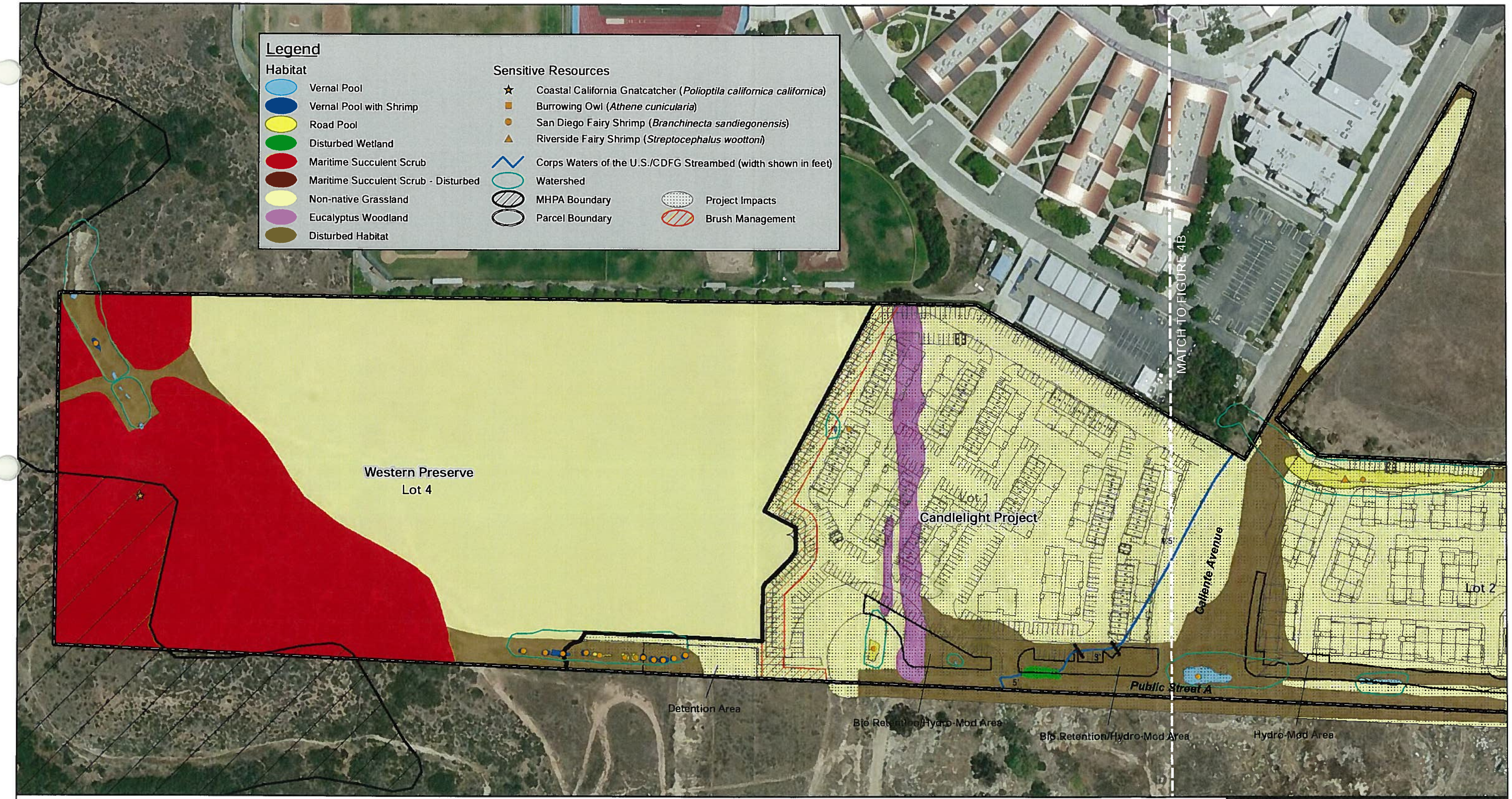

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Figure 4a

Project Impacts

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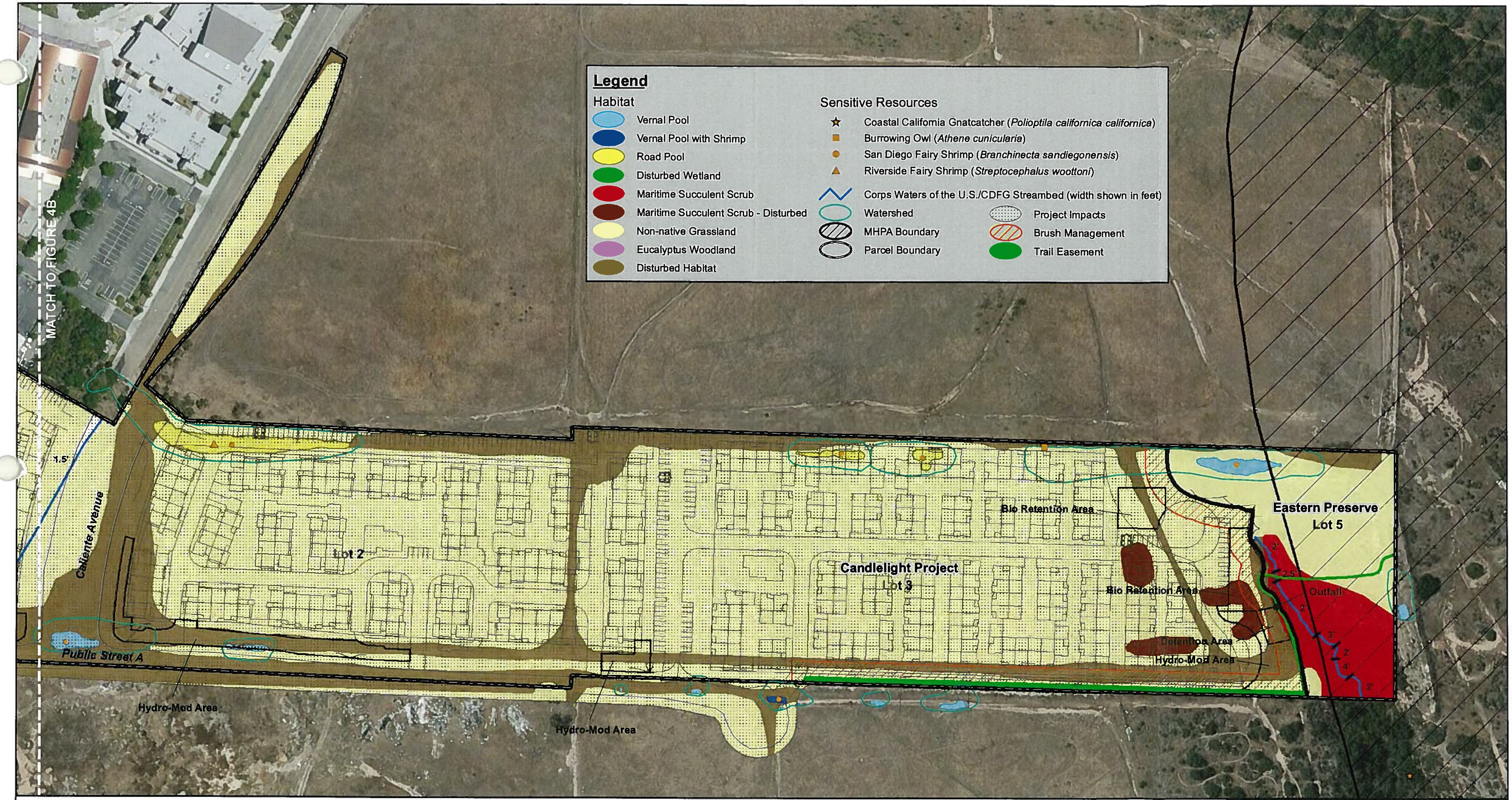

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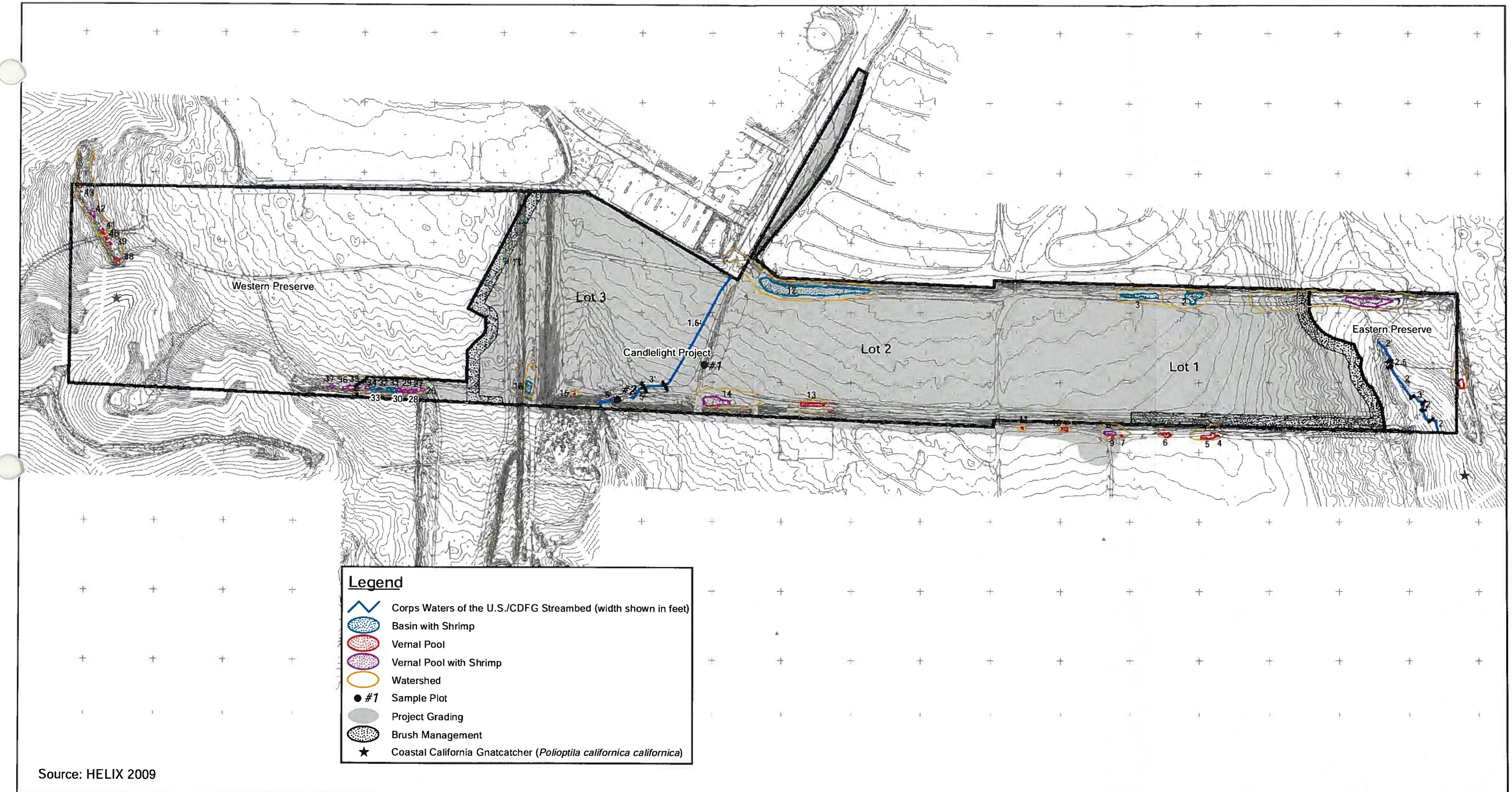
Figure 4b

Project Impacts

CANDLELIGHT
BIOLOGICAL TECHNICAL REPORT



Source: HELIX 2009

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Figure 5

Corps Jurisdictional Delineation/Impacts

CANDLELIGHT
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While the current vernal pools are clearly man-made, an aerial photograph analysis and review of previous studies show that it is possible that the surrounding area supported naturally occurring vernal pools in the past. The 1928 historic aerial photograph shows what appear to be remnants of mima mound topography characteristic of vernal pool complexes. There also is evidence of land disturbance in the 1928 aerial photograph, which could be a result of agricultural activity. In the next available aerial photograph (1955), the project site is clearly being used for agricultural purposes. The vernal pools are approximately 1,000 feet south of the J3 series originally identified by Bauder (1986).

Road Pools

Eight unvegetated water-holding basins were mapped on site as road pools (RPs; 2, 3, 12, 16, 17, and 31 to 33; Figure 5) with an overall surface area of approximately 0.24 acre (10,454 sq ft). These pools were addressed in the USFWS BO (USFWS 2010). No road pools occur within the off-site improvement (road) grading area. Road pools are distinguished from vernal pools based on the absence of vernal pool indicator plant species (Corps 1997). Like vernal pools described above, road pools were created by construction of the berm. The high soil compaction in these pools allows water to pond readily, even in years of low rainfall when vernal pools typically remain dry. All of the road pools lack vernal pool indicator plant species. Despite their low quality and lack of vegetation, the mapped road pools support San Diego and/or Riverside fairy shrimp and are therefore considered sensitive. There are many other depressions on site that hold water during rainy periods but do not support vernal pool indicator plant species or fairy shrimp. These basins are not considered sensitive habitat.

3.1.2 Upland Habitats

Maritime Succulent Scrub (Tier I)

Maritime succulent scrub is a low, open scrub community dominated by a mixture of stem and leaf succulent and drought-deciduous species that occur within sage scrub communities. This plant association occurs on thin rocky or sandy soils, on steep slopes of coastal headlands, and bluffs. Maritime succulent scrub is restricted to within a few miles of the coast from about Torrey Pines to Baja California, Mexico (Baja) and on San Clemente and Catalina islands. Maritime succulent scrub is considered a sensitive habitat by several wildlife agencies, including the CDFW and City. Maritime succulent scrub occupies the City's highest level of sensitivity (Tier I) for upland habitats and requires mitigation for impacts.

Approximately 5.9 acres of maritime succulent scrub (including disturbed) occur on site (Figures 3a and 3b). Plant species observed within this community include cliff spurge (*Euphorbia misera*), jojoba (*Simmondsia chinensis*), coast prickly pear cactus (*Opuntia littoralis*), and San Diego bur-sage (*Ambrosia chenopodiifolia*). Maritime succulent scrub also contains Diegan coastal sage scrub species such as California sagebrush (*Artemisia californica*), lemonadeberry (*Rhus integrifolia*), and California buckwheat (*Eriogonum fasciculatum*).

Non-native Grassland (Tier IIIB)

Non-native grassland is characterized by a dense to sparse cover of exotic annual grasses and is often associated with numerous species of showy-flowered native annual forbs (Holland 1986). Characteristic species within this vegetation community on site include Italian ryegrass, wild oats (*Avena* spp.), foxtail chess (*Bromus madritensis* ssp. *rubens*), ripgut grass (*B. diandrus*), filaree (*Erodium* spp.), and mustard. Although not as sensitive as native grasslands, non-native grasslands can support many of the same plant and animal species. Non-native grasslands also are valuable as habitat for native rodents and foraging habitat for sensitive raptor species. Non-native grasslands are located in large patches throughout the site where previous disturbance (agriculture) occurred. Non-native grasslands are recognized as a Tier IIIB upland vegetation community (common upland) by the City and require mitigation for impacts. Approximately 32.7 acres of non-native grassland occur on site (Figures 3a and 3b).

3.1.3 Other Habitats

Eucalyptus Woodland (Tier IV)

Eucalyptus woodland is dominated by eucalyptus (*Eucalyptus* sp.), an introduced species that produces a large amount of leaf and bark litter. The chemical and physical characteristics of this litter limits the ability of other species to grow in the understory and floristic diversity decreases. If sufficient moisture is available, eucalyptus become naturalized and are able to expand their range, an event which has occurred in numerous riparian areas. Approximately 0.6 acre of eucalyptus woodland occurs on site (Figure 3a).

Disturbed Habitat (Tier IV)

Disturbed habitat consists of lands previously and permanently altered by human activity that offer no biological value for native species. Such areas include dirt roads, graded areas, and dump sites where no native or naturalized species remain. City guidelines for mapping disturbed habitat require that the vegetation have no more than 50 percent relative cover of non-native grass species. Approximately 5.2 acres of disturbed habitat occurs on site. (Figures 3a and 3b). The disturbance is mostly due to dumping and off-road vehicular activity along the earthern berms that surround the site. Plants occurring within these areas include typical indicators of disturbance such as weedy Russian thistle (*Salsola tragus)*, pineapple weed (*Chamomilla suaveolens*), and star thistle (*Centaurea melitensis*). Disturbed habitat is considered Tier IV (other uplands) by the City, and mitigation for impacts is not required.

3.2 PLANT SPECIES OBSERVED

A list of all plant species observed on site is presented in Appendix A.

3.3 ANIMAL SPECIES OBSERVED OR DETECTED

A list of all animal species observed or detected on site is presented in Appendix B.

3.4 JURISDICTIONAL AREAS

A jurisdictional delineation was conducted to determine the presence of federal (Corps), state (CDFG), and City jurisdictional areas on site. All areas with depressions or drainage channels were evaluated for the presence of Corps Waters of the U.S., including jurisdictional wetlands. Each area was inspected according to federal wetland delineation guidelines. Presence of Corps jurisdictional features was evaluated using the criteria described within the Wetlands Delineation Manual (Environmental Laboratory 1987) and the Arid West Supplement (Corps 2008). Corps jurisdictional non-wetland Waters of the U.S. (e.g., ephemeral streambeds) were determined by the presence of bed and bank within unvegetated drainage courses. Corps jurisdictional areas occur in two drainages: one at the eastern end of the site and one through the center of the site directly south of Caliente Avenue (Figure 5). These two areas also are considered CDFW jurisdictional. City jurisdictional wetlands do not occur on site, as noted below.

3.4.1 Federal (Corps) Jurisdictional Areas

Jurisdictional Wetlands

Corps jurisdictional wetlands include 27 vernal pools (VPs 1, 7 to 11, 13 to 15, 26 to 30, and 34 to 43; Figure 5) totaling approximately 0.22 acre (9,583 sq ft) within the study area (Table 3).

Table 3
EXISTING CORPS JURISDICTIONAL AREAS (acre)*

Habitat	On Site	Off Site	Total
Wetlands			
Vernal pool	0.19	0.03	**0.22**
Non-wetland Waters of the U.S.			
Drainage	0.05	0.00	**0.05**
Road pools	0.24	0.00	**0.24**
TOTAL	**0.42**	**0.03**	**0.45**

*Totals reflect rounding

Jurisdictional Non-wetland Waters of the U.S.

Non-wetland Waters of the U.S. occur in two drainages (Figure 5). Both drainages are unvegetated and do not meet wetland criteria. The drainages do show signs of occasional water (bed and bank) passing through and are therefore characterized as non-wetland Waters of the U.S. covering approximately 0.05 acre (2,435 sq ft). The easternmost non-wetland Waters of the U.S. is approximately 300 feet in length and varies from 2 to 4 feet in width. The westernmost non-wetland Waters of the U.S. is approximately 600 feet in length and varies from 1.5 to 5 feet in width.

Eight unvegetated road pools (RPs 2, 3, 12, 16, 17, and 31 to 33; Figure 5; water-holding basins with fairy shrimp) occur on site and total approximately 0.24 acre (10,356 sq ft).

3.4.2 State (CDFW) Jurisdictional Areas

CDFW jurisdictional areas within the proposed project area include 0.02 acre of disturbed wetlands and 0.05 acre of streambed (Figure 6; Table 4).

Table 4
EXISTING CDFW JURISDICTIONAL AREAS (acre)*

Habitat	On Site	Off Site	Total
Wetlands			
Disturbed wetland	0.02	0.00	**0.02**
Non-wetland Waters of the State			
Streambed	0.05	0.00	**0.05**
TOTAL	**0.07**	**0.00**	**0.07**

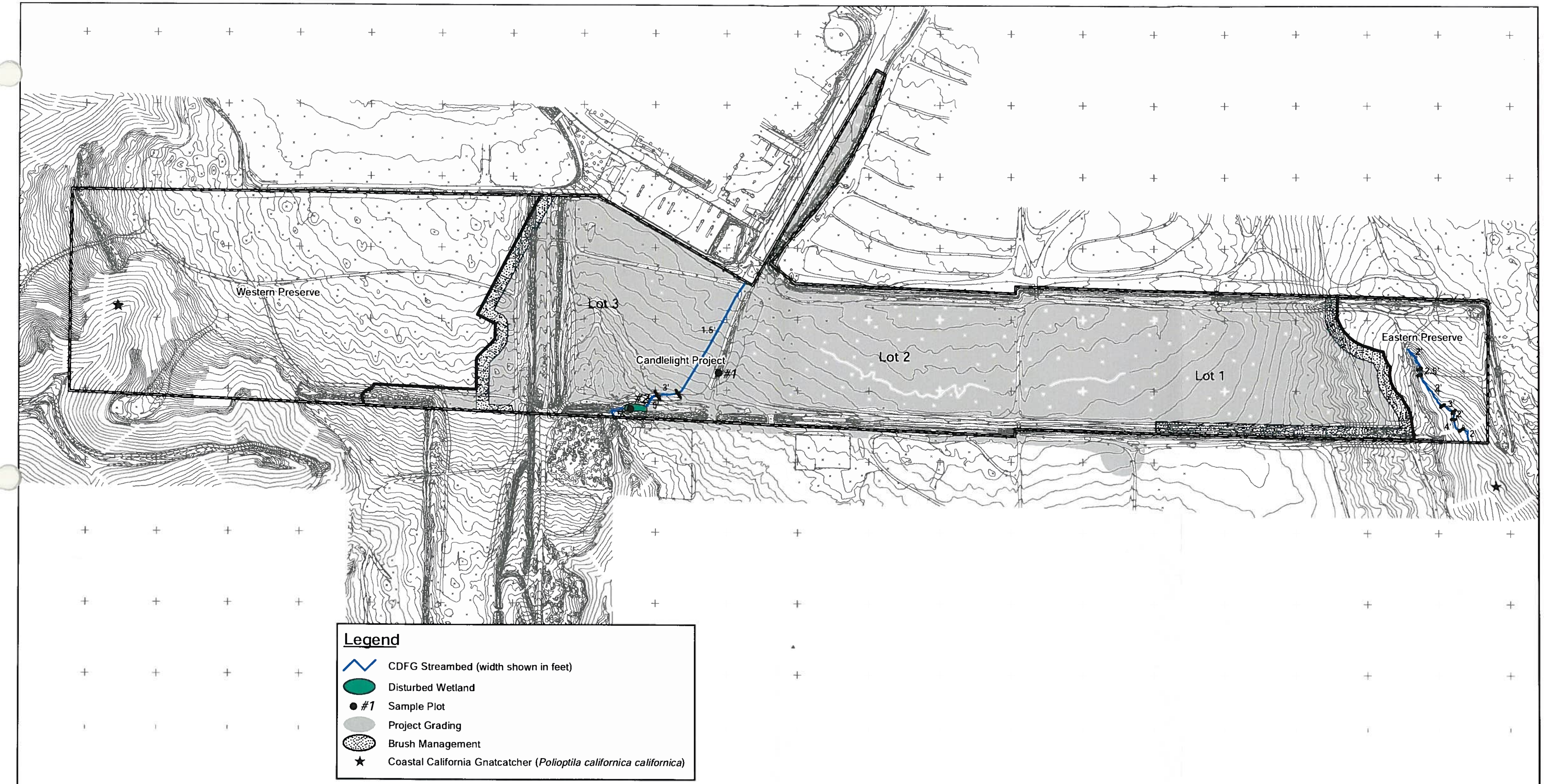
*Totals reflect rounding

3.4.3 City Wetlands

The Corps and CDFW jurisdictional areas discussed above do not meet the City's wetland definition. According to the City's Land Development Code Biology Guidelines (City 2002), seasonal drainage patterns (i.e., ephemeral/intermittent drainages), would not satisfy City's wetland definition unless wetland dependent vegetation is either present in the drainage or lacking due to past human activities. The non-wetland Waters of the U.S./streambed on site lack wetland vegetation and therefore are not City jurisdictional wetlands. The 0.02 acre of disturbed wetland located on site is not considered City jurisdictional wetland because it is man-made.

The man-made ephemeral drainage found in the center of the project site carries flows from the adjacent high school site directly south. The drainage was constructed to convey surface runoff from the high school and prevent flooding at the outfall adjacent to the high school. This drainage along with the constructed berms along the site perimeter provides a place for water to pond that now supports disturbed wetland vegetation. This area did not historically support wetland habitat and is not considered a City wetland because it is man-made.

As stated in the Environmentally Sensitive Lands (ESL) Regulations and Biology Guidelines, the City's wetland definition is intended to differentiate uplands from wetlands and naturally occurring wetlands from those created through human activity. It is not the intent of the City to regulate artificially created wetlands in historically non-wetland areas unless they have been delineated as wetlands by the Corps and/or CDFW (City 2002). As described in Section 3.1.1, 27 vernal pools within the study area were created by human activity (berm construction) between 1995 and 1997. While it is possible that the project site and surrounding area historically (at least prior to 1955) supported vernal pool habitat, the currently mapped vernal pools have only been in existence since



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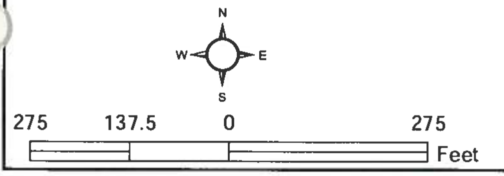

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Figure 6

CDFG Jurisdictional Delineation/Impacts

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construction of the berm and are not historic. Therefore, vernal pools within the study area are man-made and non-historic and are not considered City wetlands.

A small (less than 0.1 acre) area of mule fat (*Baccharis salicifolia*) and willows (*Salix* spp.) found at the southern terminus of Caliente Avenue is not located in an area that historically supported wetland habitat, and is not considered a City wetland because it is man-made. The adjacent high school's detention basin outlet and stormdrain outlet allow for water overflow to enter into this area that now supports scattered wetland species. School maintenance crews periodically clear this area of vegetation at the detention basin outlet.

4.0 SENSITIVE RESOURCES

4.1 SENSITIVE VEGETATION COMMUNITIES

Sensitive vegetation communities are considered rare within the region or sensitive by CDFW (Holland 1986) or the City (City 1997a and 2002). These communities in any form are considered sensitive because they have been historically depleted, are naturally uncommon, or support sensitive species. The study area supports four sensitive vegetation communities: maritime succulent scrub, vernal pools, disturbed wetland, and non-native grassland. Road pools are not considered a sensitive habitat (City 2001) although they may contain sensitive animal species (fairy shrimp).

4.2 SENSITIVE PLANT SPECIES

4.2.1 Sensitive Plants Observed

Sensitive plant species are considered rare, a characteristic that may be based on three distributional traits: geographic range, habitat specificity, or population size (Rabinowitz, et al. 1986). A species that exhibits a small or restricted geographic range (such as those endemic to the San Diego region) are geographically rare. A species may be more or less abundant but occur only in very specific habitats. Lastly, a species may be widespread but exist naturally in small populations.

The presence of any federally or state listed or City narrow endemic plant species within proposed project limits would pose a constraint to development. The presence of these species is determined through focused rare plant surveys conducted during the appropriate time of year. Typically, impacts to any listed or City narrow endemic plant species require species-specific mitigation, usually in the form of plant salvage and translocation to a suitable preserve area.

Three sensitive plant species were observed within the study area during the rare plant surveys conducted in 2004, 2005, and 2012: San Diego bur-sage, cliff spurge, and San Diego sunflower (*Viguiera laciniata*). None of these species is federally or state listed as threatened or endangered. No City narrow endemic plant species were observed within the study area. The sensitive plant species found within the study area occur within maritime succulent scrub on the western end of the project area. Each of these sensitive plant species is described below.

San Diego bur-sage (*Ambrosia chenopodiifolia*)
Listing: --/--; CNPS List 2.1 (see Appendix C for a listing and explanation of status codes for plant and animal species)
Distribution: Southwestern San Diego County, Arizona, and Mexico below 600 feet in elevation
Habitat: Dry, sunny hillsides in coastal sage scrub and maritime succulent scrub
Status on site: Scattered individuals were observed in maritime succulent scrub within the study area

Cliff spurge (*Euphorbia misera*)
Listing: --/--; CNPS List 2.2
Distribution: Coastal range extends from Corona Del Mar to Baja. In San Diego County, known from Carlsbad, Point Loma, San Diego, Sweetwater Valley, and Otay Mesa and also occurs across the border in the Tijuana Hills (Beauchamp 1986).
Habitat: Occurs on rocky soils in maritime succulent scrub, coastal sage scrub, and coastal bluff scrub
Status on site: Found in maritime succulent scrub within the study area

San Diego sunflower (*Viguiera laciniata*)
Listing: --/--; CNPS List 4.2
Distribution: Known from southern coastal and foothill San Diego County and Baja. Reported localities in San Diego County include San Onofre, Bonsall, Mission Hills, Mission Valley, Spring Valley, La Mesa, and Otay Lake (Beauchamp 1986).
Habitat: Open coastal sage scrub and maritime succulent scrub on a variety of soil types
Status on site: Subdominant species found in maritime succulent scrub within the study area

4.2.2 Sensitive Plants with Potential to Occur

City narrow endemic plant species not observed but with potential to occur are described in Table 5. Additional sensitive plant species that were not observed or detected but have potential to occur in the study area are described in Table 6.

Table 5
POTENTIAL FOR ALL NARROW ENDEMIC SPECIES TO OCCUR

SPECIES	STATUS*	POTENTIAL TO OCCUR
San Diego thorn-mint (*Acanthomintha ilicifolia*)	FT/SE CNPS List 1B.1	Low in the grassland within clay soil. Would have been observed if present.
Shaw's agave (*Agave shawii*)	--/-- CNPS List 2.1	Low in maritime succulent scrub. Would have been observed if present.
San Diego ambrosia (*Ambrosia pumila*)	FE/-- CNPS List 1B.1	Low. Not known from project vicinity.
Aphanisma (*Aphanisma blitoides*)	--/-- CNPS List 1B.2	Very low. No known populations in MSCP Plan Area.

Table 5 (cont.)
POTENTIAL FOR ALL NARROW ENDEMIC SPECIES TO OCCUR

SPECIES	STATUS*	POTENTIAL TO OCCUR
Coastal dunes milk vetch (*Astragalus tener* var. *titi*)	FE/SE CNPS List 1B.1 CA Endemic	Very low. Occurs in sandy places along the coast, including coastal dunes. Range includes coastal areas of Monterey, Los Angeles, and San Diego counties. Not known from project vicinity.
Encinitas baccharis (*Baccharis vanessae*)	FT/SE CNPS List 1B.1 CA Endemic	Low. Occurs in chaparral associated with nutrient poor soils such as southern maritime chaparral. Would have been observed if present. Not known from near the project study area.
Otay tarplant (*Deinandra conjugens*)	FT/SE CNPS List 1B.1	Moderate. Known to occur in project vicinity. Would have been observed during summer rare plant survey.
Short-leaved dudleya (*Dudleya brevifolia*)	--/SE CNPS List 1B.1 CA Endemic	Low. Occurs on dry, sandstone bluffs in chamise chaparral.
Variegated dudleya (*Dudleya variegata*)	--/-- CNPS List 1B.2	Moderate. Could occur along canyon rim in maritime succulent scrub. Would have been observed during focused summer rare plant survey.
San Diego button-celery (*Eryngium aristulatum* var. *parishii*)	FE/SE CNPS List 1B.1	Moderate. A vernal pool species that occurs in project vicinity. Would have been observed in pools on site if present.
Prostrate navarretia (*Navarretia prostrata*)	FT/-- CNPS List 1B.1 CA Endemic	Moderate. A vernal pool species that occurs in project vicinity. Would have been observed in pools on site if present.
Snake cholla (*Opuntia californica* var. *californica*)	--/-- CNPS List 1B.1	Low. Known to occur in project vicinity (Otay Mesa). Would have been observed if present.
California Orcutt's grass (*Orcuttia californica*)	FE/SE CNPS List 1B.1	Moderate. A vernal pool species that occurs in project vicinity. Would have been observed in pools on site if present.
San Diego mesa mint (*Pogogyne abramsii*)	FE/SE CNPS List 1B.1 CA Endemic	None. Not an Otay Mesa vernal pool species. Outside of species range.
Otay Mesa mint (*Pogogyne nudiuscula*)	FE/SE CNPS List 1B.1	Moderate. A vernal pool species that occurs in project vicinity. Would have been observed in pools on site if present.

*Refer to Appendix C for a listing and explanation of status and sensitivity codes.

Table 6
LISTED OR SENSITIVE PLANT SPECIES WITH POTENTIAL TO OCCUR

SPECIES	LISTING OR SENSITIVITY*	POTENTIAL TO OCCUR
San Diego County needlegrass (*Achnathurum diegoense*)	--/-- CNPS List 4.2	Low. Known from project vicinity but site is too disturbed.
Southcoast saltscale (*Atriplex pacifica*)	--/-- CNPS List 1B.2	Moderate. Occurs west of the project site within the southern slopes of Moody canyon. Would have been observed during focused rare plant surveys.
Orcutt's brodiaea (*Brodiaea orcuttii*)	--/-- CNPS List 1B.1 CA Endemic	Moderate. Found in non-native grassland areas.
Seaside calandrinia (*Calandrinia maritima*)	--/-- CNPS List 4.2	Low. Would have been observed if present.
Orcutt's dudleya (*Dudleya attenuata* ssp. *orcuttii*)	--/-- CNPS List 2.1	Low. Found in coastal bluff scrub, chaparral and coastal sage scrub. Would have been observed if present.
Palmer's goldenbush (*Ericameria palmeri* ssp. *palmeri*)	--/-- CNPS List 2.2	Low. Would have been observed if present.
San Diego barrel cactus (*Ferocactus viridescens*)	--/-- CNPS List 2.1	Moderate to high. Appropriate habitat found on site. Would have been observed during rare plant surveys. This species occurs within the adjacent Candlelight Villas West project site.
Palmer's grapplinghook (*Harpagonella palmeri*)	--/-- CNPS List 4.2	Low. Found in chaparral and grassland with clay soil. Would have been observed if present.
San Diego goldenstar (*Muilla clevelandii*)	--/-- CNPS List 1B.1	Moderate. Would have been observed if present in non-native grassland and maritime succulent scrub.
Little mousetail (*Myosurus minimus* ssp. *apus*)	--/-- CNPS List 3.1	Moderate. A vernal pool species that occurs in project vicinity. Would have been observed in pools on site if present.
Short-lobed broom-rape (*Orobanche parishii* ssp. *brachyloba*)	--/-- CNPS List 4.2	Low. Would have been observed if present.
Parry's tetracoccus (*Tetracoccus dioicus*)	--/-- CNPS List 1B.2	Low. Would have been observed if present.

*Refer to Appendix C for a listing and explanation of status and sensitivity codes.

4.3 SENSITIVE ANIMAL SPECIES

4.3.1 Sensitive Animals Observed or Detected

Ten sensitive animal species were observed or detected within the study area during biological surveys and are described below.

San Diego fairy shrimp (*Branchinecta sandiegonensis*)
Listing: FE/--
Distribution: San Diego County
Habitat: Seasonally astatic pools that occur in tectonic swales or earth slump basins and other areas of shallow standing water, often in patches of grassland and agriculture interspersed in coastal sage scrub and chaparral
Status on and off site (within project footprint): Many water-holding basins were sampled during the 2003-2004 and 2004-2005 season within the study area. VPs 1, 8, 14, 26 to 30 and RPs 2, 3, 12, 16, 17, and 31 to 33 contained San Diego fairy shrimp.

Riverside fairy shrimp (*Streptocephalus woottoni*)
Listing: FE/--
Distribution: Riverside, Orange, and San Diego counties; northern Baja
Habitat: Vernal pools and other ephemeral pools of at least 6 to 12 inches deep
Status on site: Many water-holding basins were sampled during the 2003-2004 and 2004-2005 season. RP 12 contained Riverside fairy shrimp.

Northern harrier (*Circus cyaneus*)
Listing: Nesting; --/CSC; MSCP Covered
Distribution: Widespread throughout the temperate regions of North America and Eurasia. Winters and migrates throughout California from below sea level in Death Valley to an elevation of 9,800 feet amsl.
Habitat: Coastal, salt, and freshwater marshlands, grasslands, and prairies.
Status on site: Observed flying over site foraging. Has potential to nest on site.

Orange-throated whiptail (*Cnemidophorus hyperythrus beldingi*)
Listing: --/CSC, Protected; MSCP Covered
Distribution: Southern Orange and southern San Bernardino (Colton) counties south to Baja cape
Habitat: Coastal sage scrub, chaparral, edges of riparian woodlands and washes. Also found in weedy, disturbed areas adjacent to these habitats. Important habitat requirements include open, sunny and shaded areas with abundant invertebrate prey base, particularly termites (*Reticulitermes* sp.).
Status on site: In canyon area in eastern portion of site

Loggerhead shrike (*Lanius ludovicianus*)
Status: --/CSC
Distribution: Widespread but declining throughout North America; winters south to Central America
Habitat: Open habitats including grasslands, scrublands, and ruderal areas with adequate perching locations
Status on site: Observed perched atop laurel sumac (*Malosma laurina*) in southeastern corner of site

Cooper's hawk (*Accipiter cooperii*)
Listing: Nesting; --/CSC; MSCP Covered
Distribution: Found throughout the continental U.S., excluding Alaska and parts of Montana and the Dakotas. Winters south to Mexico and Honduras.
Habitat: In San Diego County, tends to inhabit lowland riparian areas and oak woodlands in proximity to suitable foraging areas such as scrublands or fields
Status on site: One Cooper's hawk was observed soaring over the property (Merkel & Associates [Merkel] 1999)

San Diego black-tailed jackrabbit (*Lepus californicus bennettii*)
Listing: --/CSC
Distribution: Southern Santa Barbara County south on coastal slope to vicinity of San Quintin, Baja. Localities on eastern edge of range include Jacumba and San Felipe Valley in San Diego County.
Habitat: Occurs primarily in open habitats including coastal sage scrub, chaparral, grasslands, croplands, and open disturbed areas if there is at least some scrub cover present
Status on site: Observed in non-native grassland and maritime succulent scrub on site

Western spadefoot (*Spea hammondii*)
Listing: --/CSC
Distribution: Northern California into northern Baja
Habitat: Breeds in vernal pools and may be found within burrows within coastal sage scrub or maritime succulent scrub habitats
Status on site: Found in many of the water-holding basins on site

Coastal California gnatcatcher (*Polioptila californica californica*)
Listing: FT/CSC; MSCP Covered
Distribution: Southern Los Angeles, Orange, western Riverside, and San Diego counties south into Baja
Habitat: Coastal sage scrub
Status on site: One individual heard during second protocol survey in eastern maritime succulent scrub canyon approximately 100 feet off site. CAGN habitat extends into project area, which is considered occupied. Two individuals also observed within Moody Canyon west of the site.

Burrowing owl (*Athene cunicularia*)
Listing: --/CSC; MSCP Covered
Distribution: Lower British Columbia to Manitoba, Canada and the central and western U.S. south to northern Mexico and Baja
Habitat: Generally restricted to grasslands and agricultural lands. Uses burrows of California ground squirrel (*Spermophilus beecheyi*) for nest sites.
Status on site: Owl pellet and evidence of occupied burrow found at the northeastern edge of the site during the 2004 summer rare plant survey. Owl observed during on-site meeting in October 2004. No owls observed in subsequent site visits or 2012 protocol surveys. Based on the current CDFW owl guidelines a site is considered occupied if at least one burrowing owl has been observed occupying a burrow within the last three years. Since an owl has not been observed on site since 2004 the site is not considered to be occupied.

The following two sensitive species were observed on site by Merkel (1999):

White-tailed kite (*Elanus leucurus*)
Listing: Nesting; --/Fully Protected
Distribution: Breeds in the Pacific U.S. Winters to South America as far south as Chile.
Habitat: Nesting typically occurs in riparian or oak woodlands adjacent to grasslands where small mammals are hunted
Status on site: Two kites were observed hunting over the site (Merkel 1999)

Northwestern San Diego pocket mouse (*Chaetodipus fallax fallax*)
Listing: --/CSC
Distribution: Los Angeles and southern San Bernardino counties south into west-central Baja
Habitat: Open areas of coastal sage scrub and weedy growth, often on sandy substrates
Status on site: One dead mouse was found in the non-native grasslands (Merkel 1999)

4.3.2 Sensitive Animals with Potential to Occur

Additional sensitive animal species that were not observed or detected but have potential to occur on site are listed in Table 7.

Table 7
LISTED OR SENSITIVE ANIMAL SPECIES WITH POTENTIAL TO OCCUR

SPECIES	LISTING OR SENSITIVITY*	POTENTIAL TO OCCUR
INVERTEBRATES		
Quino checkerspot butterfly (*Euphydryas editha quino*)	FE/--	Low. Small amount of host plants present. Not known from immediate area, and not detected during surveys conducted by others or during Alden 2012 surveys.
Hermes copper butterfly (*Lycaena hermes*)	--/--	Low. Host plant redberry (*Rhamnus crocea*) occurs on the site in preserve area.

Table 7 (cont.)
LISTED OR SENSITIVE ANIMAL SPECIES WITH POTENTIAL TO OCCUR

SPECIES	LISTING OR SENSITIVITY*	POTENTIAL TO OCCUR
VERTEBRATES		
Reptiles and Amphibians		
Red-diamond rattlesnake (*Crotalus exsul*)	--/CSC	Moderate within maritime succulent scrub on site.
Western whiptail (*Cnemidophorus tigris*)	--/CSC	Moderate within maritime succulent scrub on site.
San Diego horned lizard (*Phrynosoma coronatum blainvillei*)	--/CSC MSCP Covered	High within maritime succulent scrub on site.
Silvery legless lizard (*Anniella pulchra pulchra*)	--/CSC	Low. Prefers loose soil with some vegetation, but can be found in leaf litter.
Birds		
Southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*)	--/CSC MSCP Covered	Moderate in maritime succulent scrub and coastal sage scrub. Would have been detected during CAGN surveys if present.
Bell's sage sparrow (*Amphispiza belli belli*)	BCC/CSC	Moderate in maritime succulent scrub on site. Would have been observed if present.
Cactus wren (*Campylorhynchus brunneicapillus*)	BCC/CSC MSCP Covered	Low. Limited habitat within maritime succulent scrub within the study area.
Burrowing owl (*Athene cunicularia*)	--/CSC MSCP Covered	Moderate. Suitable habitat present, previously observed on site in 2004. Recent surveys on this and adjacent site have been negative.
California horned lark (*Eremophila alpestris actia*)	--/CSC	Low. Prefers grasslands, fallow agricultural fields, and other open grassy areas.
Mammals		
Pallid bat (*Antrozous pallidus pacificus*)	--/CSC	Low. Generally found in xeric sage scrub, chaparral, or grassland communities and requires undisturbed rocky areas for roosting.
Dulzura pocket mouse (*Chaetodipus californicus femoralis*)	--/CSC	Low due to inappropriate soil types. Commonly occurs between grasslands and scrublands. Suitable habitat exists within study area. Trapping necessary for detection but not warranted.

Table 7 (cont.)
LISTED OR SENSITIVE ANIMAL SPECIES WITH POTENTIAL TO OCCUR

SPECIES	LISTING OR SENSITIVITY *	POTENTIAL TO OCCUR
VERTEBRATES (cont.)		
Mammals (cont.)		
Western mastiff bat (*Eumops perotis californicus*)	--/CSC	Moderate. Foraging habitat includes chaparral, sage scrub, and woodland habitats. Requires crevices in cliffs, trees, or buildings for roosting. Suitable habitat exists on site, but detection would likely require mist netting.
San Diego desert woodrat (*Neotoma lepida intermedia*)	--/CSC	High. Suitable habitat exists on eastern edge of site. Nests or indirect signs would likely have been observed during surveys.
Southern grasshopper mouse (*Onychomys torridus ramona*)	--/CSC	Moderate. Occurs in coastal sage scrub and chaparral with moderate shrub cover and soils appropriate for digging.
Pacific pocket mouse (*Perognathus longimembris pacificus*)	FE/CSC	Very low. Typically found in coastal sage scrub and grasslands with sandy soils. All recent records are from coastal areas between San Elijo Lagoon and San Mateo Creek.

*Refer to Appendix C for a listing and explanation of status and sensitivity codes

5.0 REGIONAL AND REGULATORY CONTEXT

5.1 MSCP EVALUATION

The City's MSCP Subarea Plan has been prepared to meet the requirements of the California Natural Communities Conservation Planning (NCCP) Act of 1992. This Subarea Plan is consistent with the NCCP and describes how the evaluation of proposed development projects relative to the City's portion of the MSCP Preserve (the MHPA) will be implemented.

5.1.1 MHPA Preserve

The MSCP (City 1997b) identifies an MHPA that is intended to link all core biological areas into a regional wildlife preserve. Approximately 1.1 acres of habitat lies within the MHPA on the western edge of the site and 1.4 acres of habitat lies within the MHPA on the eastern edge of the site. The areas of the project site within the MHPA support maritime succulent scrub, non-native grassland, disturbed habitat, and vernal pool. In addition, land immediately west and east of the property is located within the MHPA, which is considered a significant regional habitat and wildlife preserve and therefore, of high value.

5.1.2 MHPA Adjacency Guidelines

Development activities adjacent to the MHPA are subject to special conditions that ensure minimal direct or indirect impacts to the MHPA. Potential impact issues include habitat insularization, drainage/water quality, lighting, noise, roadkill, exotic plant species, raptor foraging/nesting, nuisance animal species, and human intrusion. Each of these issues is addressed in the Impacts (Section 6.0) and Mitigation (Section 7.0) sections, below.

5.1.3 Public Access, Trails, and Recreation

Section 1.5.2 of the City's MSCP Subarea Plan includes requirements that would apply to the proposed pedestrian trail to be built by the City in the Eastern Preserve. The specific conditions applicable to the project include trail signage, fencing, no pavement, and avoidance of sensitive resources.

5.1.4 Specific Management Directives

Section 1.5.3 of the City's MSCP Subarea Plan contains specific project requirements for certain areas within the MHPA. The Candlelight Villas East project area has no specific management directives outlined in the Subarea Plan.

5.1.5 Overall Management Policies and Directives

Section 1.5.3 of the City's MSCP Subarea Plan contains requirements and goals for all the MHPA areas within Otay Mesa. Policies relevant to the proposed project site are as follows:

Priority 1:

1. No unauthorized motorized vehicles except Border Patrol, MHPA (preserve) managers, maintenance personnel, or emergency vehicles will be allowed on any trails or off-trail in the MHPA. The Border Patrol should restrict use to the existing access roads as much as feasible to avoid disturbance of habitat.

2. Remove all trash, hazardous materials, and vehicles from the MHPA prior to transfer from private into public ownership and/or management. If hazardous materials remain, these areas should be signed to indicate their locations made off-limits to people.

3. Inventory vernal pool areas within the Otay Mesa Area for sensitive and target species where not previously or recently completed and assess for enhancement/restoration needs or opportunities, general status, and potential threats.

Priority 2:

Assess vernal pool areas proposed for development for transplantation of sensitive plants and soils containing seedbanks of sensitive flora and fauna. Include in mitigation programs arrangements for proper timing of soil and plant removal, proper storage if necessary and appropriate timing of enhancement/restoration efforts, including transplantation.

5.1.6 Special Conditions for Covered Species

Special conditions apply to covered species that would be potentially impacted by a project. These conditions apply to species classified as narrow endemic as well as other species specifically identified in the MSCP Subarea Plan.

MSCP conditions of coverage apply to the plant species that occur on site. Each of the animal species covered by the MSCP also is subject to conditions of coverage. The project would be required to comply with the conditions for each of these species contained in Table 3-5 of the MSCP. The conditions relevant to the subject property are noted below.

San Diego Barrel Cactus

Area-specific management directives must include measures to protect the species from edge effects and unauthorized collection, and must include appropriate fire management control practices to protect against a too-frequent fire cycle.

San Diego Fairy Shrimp

Area-specific management directives must include measures to protect against detrimental edge effects to this species.

Riverside Fairy Shrimp

Area-specific management directives must include measures to protect against detrimental edge effects to this species.

Coastal 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 improve habitat quality including vegetation structure.

Burrowing Owl

According to the Staff Report on Burrowing Owl Mitigation (CDFG 2012) a site is considered occupied by the burrowing owl if an owl has been observed on the site within the last 3 years. Given that the last owl sighting was in 2004 the site is not currently considered to be occupied. However, the project has incorporated artificial owl burrows into the on-site habitat restoration effort to help improve the habitat for this sensitive species. These burrows are restoration design features and not intended to serve as owl mitigation.

During the environmental analysis of proposed projects, burrowing owl surveys (using appropriate protocols) must be conducted in suitable habitat to determine if this species is present and the location of active burrows. If burrowing owls are detected, the following mitigation measures must be implemented: within the MHPA, impacts must be avoided; outside of the

MHPA, impacts to the species must be avoided to the maximum extent practicable; any impacted individuals must be relocated out of the impact area using passive or active methodologies approved by the wildlife agencies; mitigation for impacts to occupied habitat (at the Subarea Plan specified ratio) must be through the conservation of occupied burrowing owl habitat or conservation of lands appropriate for restoration, management and enhancement of burrowing owl nesting and foraging requirements.

Management plans/directives must include: enhancement of known, historical and potential burrowing owl habitat; and management for ground squirrels (the primary excavator of burrowing owl burrows). Enhancement measures may include creation of artificial burrows and vegetation management to enhance foraging habitat. Management plans must also include: monitoring of burrowing owl nest sites to determine use and nesting success; predator control; establishing a 300 foot wide impact avoidance area (within the preserve) around occupied burrows.

Northern Harrier

Area-specific management directives must manage agricultural and disturbed lands (which become part of the preserve) within 4 miles of nesting habitat to provide foraging habitat and include an impact avoidance area (900 feet or maximum possible within the preserve) around active nests.

Orange-throated Whiptail

Area-specific management directives must address edge effects.

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.

5.2 WILDLIFE CORRIDORS

Wildlife corridors can be local or regional in scale; their functions may vary temporally and spatially based on conditions and species presence. Wildlife corridors represent areas where wildlife movement is concentrated due to natural or anthropogenic constraints. Local corridors provide access to resources such as food, water, and shelter. Animals use these corridors, which are often hillsides or tributary drainages, to move between different habitats. Regional corridors provide these functions and link two or more large habitat areas. They provide avenues for wildlife dispersal, migration, and contact between otherwise distinct populations. The easternmost portion of the site is within the MHPA, as is the southwestern corner of the parcel (western preserve area). The MHPA in this portion of Otay Mesa provides connectivity between the Spring Canyon complex and Dennery Canyon to the north. The proposed project would preserve the MHPA on site and would not alter wildlife movement within the MHPA.

5.3 REGULATORY ISSUES

Regulations that apply to the project include the Clean Water Act, federal ESA, California Fish and Game Code, CEQA, and the City's ESL regulations. The Corps regulates impacts to jurisdictional Waters of the U.S., including wetlands. Impacts to wetlands and non-wetland Waters of the U.S. in the study area would be subject to regulation by the Corps in the form of a permit pursuant to Section 404 of the federal Clean Water Act. A Section 401 Water Quality Certification from the State Water Resources Control Board (SWRCB) also would be required. Impacts to CDFW jurisdictional areas would require a Streambed/Lake Alteration Agreement regulated under California Fish and Game Code Section 1602.

The federal ESA provides the legal framework for protection of species (and their habitats) identified as being in danger of extinction or threatened at a regional level. Under the federal ESA, impacts to protected species (those listed as threatened or endangered) are considered a take, which is prohibited except by appropriate USFWS permit. The applicant is currently processing an Individual Permit with the Corps for impacts to jurisdictional features on site. As part of this process, a USFWS Section 7 Consultation for impacts to federal listed species has been completed. The USFWS issued a BO on June 21, 2010 (USFWS 2010) which provided take authorization for the San Diego fairy shrimp, Riverside fairy shrimp, and CAGN.

In July 1997, the USFWS, CDFW, and City adopted the Implementing Agreement for the MSCP (City 1997a). This program allows the incidental take of threatened and endangered species as well as regionally sensitive species that are conserved by it (covered species). Fairy shrimp and other federal listed vernal pool associated plant species are not covered under the MSCP. Take authorization for impacts to fairy shrimp is instead provided through the USFWS BO. The currently proposed project is within the limits of the project addressed in the BO. Minor changes to the project as well as upland vegetation on site (increase in non-native grassland) have occurred and are reflected in this revised report. No changes to vernal pools and their associated listed species (fairy shrimp) have occurred. The currently proposed project would actually impact 3 fewer vernal pools (off-site pools 4, 5, and 6) than authorized in the BO. Additionally, as described above, the BO contains a condition requiring additional vernal pool surveys prior to construction if construction does not occur within 2 years of issuance of the BO. If there are changes to impacts to listed vernal pool species the BO and associated conservation measures would be amended accordingly through consultation with the USFWS and/or the City (if City has take authorization through the VP HCP at that time). Based on this information, the currently proposed project is in compliance with the USFWS BO.

The MSCP also designates regional preserves that are intended to be mostly void of development activities, while allowing development of other areas subject to the requirements of the program. Impacts to biological resources are regulated by the City's ESL regulations. Mitigation requirements for sensitive resources discussed in this document follow the City's ESL Biology Guidelines (City 2002 Section II, Development Regulations).

6.0 PROJECT IMPACTS

Project impacts may be considered either direct or indirect. A direct impact occurs when the primary effects of the project replace existing habitat with graded or developed areas. An indirect impact consists of secondary effects of a project, including habitat insularization, drainage/water quality, lighting, noise, roadkill, exotic plant species, raptor foraging/nesting, nuisance animal species, and human intrusion. The magnitude of an indirect impact may be the same as a direct impact; however, the effect usually takes a longer time to become apparent.

6.1 DIRECT IMPACTS

6.1.1 Vegetation Communities

Approximately 27.7 acres would be impacted upon implementation of the proposed project (Figures 4a and 4b; Table 8). No impacts would occur to the existing on-site MHPA. The impacted areas include non-native grassland, maritime succulent scrub, disturbed habitat, vernal pools, road pools, disturbed wetland, and eucalyptus woodland.

Table 8
IMPACTS TO VEGETATION COMMUNITIES[1]

Vegetation Communities	On Site	Off Site	Total
Wetland/Riparian Habitats			
Disturbed wetland	0.02	0.00	**0.02**
Vernal pool	0.12	0.01	**0.13**
Road pool[2]	0.23	0.00	**0.23**
Upland Vegetation Communities			
Maritime succulent scrub (Tier I)	0.2	0.0	**0.2**
Non-native grassland (Tier IIIB)	20.7	0.5	**21.2**
Other Areas			
Eucalyptus woodland (Tier IV)	0.6	0.0	**0.6**
Disturbed habitat (Tier IV)	4.5	0.8	**5.3**
TOTAL	**26.37**	**1.31**	**27.68**

[1] Upland habitats are rounded to the nearest 0.1 acre, while wetland habitats are rounded to the nearest 0.01 acre; thus, totals reflect rounding

[2] Unvegetated road pools (ephemeral basin) supporting fairy shrimp.

Wetland/Riparian Habitats

Disturbed Wetland

Approximately 0.02 acre of disturbed wetland within the study area would be impacted upon implementation of the proposed project (Figures 4a and 4b).

Vernal Pool

Impacts have been assessed to a total of 15 vernal pools (11 on site and 4 off site) with a combined surface area of 0.13 acre (Figures 4a and 4b; Table 9). One large vernal pool (VP 1) that supports San Diego fairy shrimp located at the northeastern edge of the project site would be preserved, however, approximately 0.35 acre of its watershed would be directly impacted. As such, this pool has been included in the impact calculations.

Table 9
SUMMARY OF IMPACTS TO VERNAL AND ROAD POOLS ON AND OFF SITE

Basin No.	Type	Affected	Area (sq ft)	Fairy Shrimp	Location
1	Vernal pool	Yes	2,415	SD	On site
2	Road pool	Yes	1,010	SD	On site
3	Road pool	Yes	1,001	SD	On site
8	Vernal pool	Yes	327	SD	Off site
9	Vernal pool	Yes	24	--	Off site
10	Vernal pool	Yes	128	--	Off site
11	Vernal pool	Yes	26	--	Off site
12	Road pool	Yes	7,442	SD, RS	On site
13	Vernal pool	Yes	524	--	On site
14	Vernal pool	Yes	1,533	SD	On site
15	Vernal pool	Yes	10	--	On site
16	Road pool	Yes	488	SD	On site
17	Road pool	Yes	33	SD	On site
26	Vernal pool	Yes	73	SD	On site
27	Vernal pool	Yes	49	SD	On site
28	Vernal pool	Yes	151	SD	On site
29	Vernal pool	Yes	121	SD	On site
30	Vernal pool	Yes	107	SD	On site
31	Road Pool	Yes	112	SD	On site
32	Road Pool	Yes	125	SD	On site
33	Road Pool	Yes	146	SD	On site
34	Vernal Pool	Yes	108	SD	On site
35	Vernal Pool	Yes	247[1]	SD	On site

[1] While only a part of Pool 35 will be directly impacted, the entire pool has been assessed as impacted.

The proposed project has been designed to avoid, to the maximum extent possible, project effects to vernal pools and road pools (discussed below). Impacts to these low-quality man-made vernal pools and road pools; however, are unavoidable due to site constraints and topography of the site. Impacts to vernal pools were assessed in the USFWS BO (USFWS 2010).

Road Pool

Eight road pools with a combined surface area of approximately 0.24 acre (10,357 sq ft) that support listed fairy shrimp species would be impacted upon implementation of the proposed project (Figures 4a and 4b; Table 9).

Upland Habitats

Maritime Succulent Scrub (Tier I)

Approximately 0.2 acre of disturbed maritime succulent scrub would be impacted upon implementation of the proposed project (Figures 4a and 4b).

Non-native Grassland (Tier IIIB)

Approximately 21.5 acres of non-native grassland would be impacted upon implementation of the proposed project (Figures 4a and 4b).

Other Habitats

Eucalyptus Woodland (Tier IV)

Approximately 0.6 acre of eucalyptus woodland would be impacted upon implementation of the proposed project (Figures 4a and 4b).

Disturbed Habitat (Tier IV)

Approximately 5.3 acres of disturbed habitat would be impacted upon implementation of the proposed project (Figures 4a and 4b). This includes the impact associated with the approximately 270-foot long pedestrian trail to be built by the City in the Eastern Preserve.

6.1.2 Sensitive Plant Species

Implementation of the proposed project would impact San Diego bur-sage, cliff spurge, and San Diego sunflower located within maritime succulent scrub on the eastern end of the site. None of these species is federally or state listed as threatened or endangered. In addition, no City narrow endemic plant species were observed on site. Impacts to these species are not considered significant due to the relatively low sensitivity of these species and the low number of individuals impacted.

6.1.3 Sensitive Animal Species

Implementation of the proposed project would impact the habitats of federally listed endangered San Diego and Riverside fairy shrimp, and federally listed threatened CAGN. Impacts to these species would be considered significant. These impacts would occur outside of the MHPA. The CAGN is a covered species under the MSCP Subarea Plan. The USFWS issued take authorization for impacts to the listed San Diego and Riverside fairy shrimp in the BO (USFWS

2010) prepared under the Section 7 consultation with the Corps for the project. Impacts to CAGN would be limited to indirect noise impacts only (Section 6.2.2, Noise) as this species occurs outside the proposed project development area.

Impacts to northern harrier, orange-throated whiptail, loggerhead shrike, Cooper's hawk, western spadefoot, and San Diego black-tailed jackrabbit would not be considered significant due to their low sensitivity status. Impacts to northwestern San Diego pocket mouse and white-tailed kite within would not be considered significant due to their low sensitivity status. Cumulative impacts to raptor foraging habitat would occur through the loss of non-native grassland and other upland habitats. Cumulative impacts to these species are addressed by the MSCP. Please also refer to Section 6.2.2 of this report with regard to potential indirect impacts to raptors.

6.1.4 Sensitive Plant and Animal Species with Potential to Occur

The potential for impacts to Otay mesa mint, San Diego button celery, Otay tarplant, variegated dudleya, prostrate navarretia, and California Orcutt's grass are low based on recent and previous surveys of the study area, which demonstrate that these species do not occur on site. As a result, the project would not have a significant impact on sensitive plants with potential to occur. Other sensitive plant species with potential to occur in the study area are listed in Tables 5 and 6. The potential for significant impacts to sensitive plant species, such as federally and state listed endangered vernal pool indicator plant species and narrow endemic species, is considered low based on recent and previous surveys of the study area.

Of those animal species that have not been observed but have potential to occur in the study area, only impacts to the federally listed endangered QCB and BUOW would be significant. No QCBs were observed during focused surveys of the study area. The potential for the QCB to occur in the study area is considered low. The BUOW has not been observed on the site since 2004; however, it is known to occur in the project vicinity and could occupy the site in the future.

6.1.5 Jurisdictional Areas (Corps, CDFW, and City)

Project-related impacts to Corps jurisdictional areas would encompass 0.13 acre of Corps-defined wetlands (e.g., vernal pools) and 0.28 acre of Corps-defined non-wetland Waters of the U.S. (e.g., ephemeral drainage and road pools with fairy shrimp) on- and off-site (Figure 5; Table 10).

Table 10
IMPACTS TO CORPS JURISDICTIONAL AREAS (acre)*

Habitat	On Site	Off Site	Total
Wetlands			
Vernal pool	0.12	0.01	**0.13**
Non-wetland Waters of the U.S.			
Drainage	0.05	0.00	**0.05**
Road pools	0.23	0.00	**0.23**
TOTAL	**0.40**	**0.01**	**0.41**

*Totals reflect rounding

Impacts to CDFW jurisdictional areas would encompass 0.02 acre of CDFW-defined wetlands (e.g., disturbed wetlands) and 0.05 acre of CDFW-defined non-wetland Waters of the State (e.g., ephemeral streambed; Figure 6; Table 11). No impacts to City-defined wetlands would occur.

Table 11
IMPACTS TO CDFW JURISDICTIONAL AREAS (acre)*

Habitat	On Site	Off Site	Total
Wetlands			
Disturbed wetland	0.02	0.00	**0.02**
Non-wetland Waters of the State			
Streambed	0.05	0.00	**0.05**
TOTAL	**0.07**	**0.00**	**0.07**

*Totals reflect rounding

The proposed project has been designed to avoid to the maximum extent possible project effects to Corps and CDFW jurisdictional areas. The project has been redesigned to avoid the natural (not constructed) ephemeral drainage channel on the eastern boundary of the project site located within the MHPA. The project design avoids impacts to VP 1, which is located in the northeastern portion of the site and is the largest and highest quality vernal pool on site and is located next to the City's planned open space preserve (MHPA). The other ephemeral drainage that traverses the central portion of the project site is a constructed drainage ditch of low quality. The other vernal pools and road pools are located in the depressions left when berms were graded around the perimeter of the property and are of low quality. The feasibility of preserving additional vernal pools, road pools, and drainages within the study area is limited by the (1) low quality of basins; (2) location of basins away from the MHPA; and (3) fact that potential for their long-term persistence is low.

6.1.6 Wildlife Corridors

Project development is proposed to avoid impacts within the MHPA and would not impact any wildlife corridors. In addition, the split-rail fencing along the City trail in the Eastern Preserve would not preclude wildlife movement.

6.1.7 MHPA

The designated trail located within the MHPA in the Eastern Preserve shall be at grade and follow existing dirt roads and will avoid existing vernal pools and their associated watersheds. The trail will have a bare ground surface. No decomposed granite, asphalt, or other material will be used on the trail. The trail will be a maximum of 4 feet in width, per the City MSCP Subarea Plan trail guidelines (Section 1.5.2). Both sides of the trail will be fenced along its entire length within the MHPA. The fence will be a natural wood, unpainted split-rail (or similar) design that will clearly demarcate the trail limits, provide a rustic/natural appearance, and allow for wildlife movement. Fence materials that could inhibit wildlife movement (e.g., chain link and barbed wire) will not be used. Given that the trail will occur on disturbed habitat and will comply with the requirements of the Subarea Plan, no significant impacts to sensitive biological resources will occur from the trail. Additionally, project grading and Brush Management Zones 1 and 2 would result in no impacts to the MHPA.

6.2 INDIRECT IMPACTS

Potential indirect project impacts consist of secondary effects of the project, including habitat insularization, drainage/water quality, lighting, noise, roadkill, exotic plant species, raptor foraging/nesting, nuisance animal species, and human intrusion. The magnitude of an indirect impact can be the same as a direct impact, but the effect usually takes a longer time to become apparent. Many indirect impacts are particularly critical due to the proximity of the MHPA and are addressed by the MSCP Subarea Plan as MHPA land use adjacency issues.

6.2.1 Vernal Pool Watersheds

The proposed project is designed such that all runoff from hardscape would be directed away from off-site pools ensuring that no contaminated water from project flows into these vernal pools or road pools. With protection of the vernal pool and road pool watersheds (as required by the City's ESL regulations) and project design measures that direct runoff away from these sensitive resources, no indirect impacts due to a lack of sufficient preserved watershed are anticipated. Additionally, the project would not functionally isolate the avoided pools from seed sources or pollinators in adjacent areas.

6.2.2 Other Indirect Impacts

Habitat Insularization

Habitat insularization is the fragmentation of large habitat areas into smaller "islands" effectively isolated from one another. Such fragmentation presents barriers to wildlife movement and breeding, splits animal and plant populations, and increases edge effects. Often, habitat insularization is associated with local species extirpation, since smaller habitat areas support relatively fewer species than larger ones. No impacts are expected to occur as a result of habitat insularization because the project would not isolate any habitat areas and the preserved areas are adjacent to or within the MHPA. Additionally, the trail in the Eastern Preserve will be fenced with a split-rail type fence that will not prohibit wildlife movement.

Drainage/Water Quality

Landscaping and irrigation associated with the residential development may result in increased runoff. Runoff due to irrigation is often associated with increased erosion, sedimentation, and pollution, which could significantly impact water quality in sensitive habitat in the adjacent MHPA. MHPA adjacency guidelines preclude release of runoff into the preserve. All potential drainage and toxin impacts to biological resources in the MHPA due to urban runoff would be minimized through project design features, including the use of detention basins. All runoff water would be treated on site in the identified bio-retention and hydro modification locations (Figures 4a and 4b). Additionally, the outfall on the eastern end of the project will be located entirely within the project footprint, outside of the Eastern Preserve and the MHPA. No water will be discharged directly into the MHPA. All runoff water will be discharged outside of the MHPA after being treated and having passed through an energy dissipating structure at the outfall location. Based on the project water quality design features, no significant indirect impacts resulting from drainage or impaired water quality would occur.

Lighting

Night lighting exposes adjacent wildlife species to an unnatural light regime, may alter their behavior patterns, and consequently result in a loss of species diversity. Unless appropriate measures are taken to prevent dispersion of light into the adjacent MHPA, lighting effects could be a significant impact.

To prevent such significant impacts, all outdoor lighting installed on development adjacent to open space areas shall be shielded to prevent light from spilling off site. Shielding can consist of the installation of fixtures that physically direct light away from the outer edges of the property or landscaping, berms, or other barriers at the edge of development that prevent light overspill. Final building plans for the development adjacent to the open space areas shall depict the shielded light fixtures or other mechanisms. Streetlights that shine into the open space areas should not be permitted. No significant indirect lighting impacts are expected.

Noise

Construction-related noise from such sources as clearing, grading, and vehicular traffic would be a temporary impact to wildlife. Noise-related impacts would be considered significant if sensitive species were displaced from their nests or territories and failed to breed.

Indirect noise impacts to breeding CAGNs could occur if clearing, grubbing, grading, or other construction activities create noise in excess of 60 decibels (dB) hourly average in occupied coastal sage scrub within the MHPA during the CAGN breeding season (March 1 to August 15). The project site abuts the MHPA along its eastern boundary.

Based on the adjacency of the MHPA to the project impact area, the appropriate habitat (maritime succulent scrub) within the MHPA, and the positive CAGN survey results, there is potential for significant indirect noise impact to breeding CAGNs during construction. In the long term, noise impacts resulting from the proposed project are not anticipated to be significant because of the proposed land use (residential).

Roadkill

The project is likely to result in an increase in the number of vehicles using roads servicing the project vicinity (i.e., Otay Mesa Road, SR 905, and Caliente Avenue). Roadkill impacts would be considered significant if they result in adverse effects to federally or state listed species. However, the increase in vehicular traffic would occur in an already heavily used portion of Otay Mesa Road and is not expected to significantly increase roadkill in the area.

Exotic Plant Species

Non-native plants could colonize areas disturbed by construction and could potentially spread into the adjacent preserve areas, particularly following disturbances such as fire. Such invasions could displace native plant species, reducing diversity, increasing flammability and fire frequency, change ground and surface water levels, and adversely affect the native wildlife that are dependent on native vegetation. Invasion of the open space by non-native plants would be considered a significant impact. To prevent potentially significant impacts, the use of weedy species would be avoided in landscaping to prevent their spread into the open space. Specifically, only native, non-invasive species would be planted within 100 feet of the MHPA and vernal pool complex. In addition, exotic/invasive plant species included in the California Invasive Plant Inventory prepared by the California Invasive Plant Council (Cal-IPC; 2006) would not be installed adjacent to the existing MHPA or proposed vernal pool complex. In addition, landscaping would not use plants that require intensive irrigation, fertilizers, or pesticides adjacent to the MHPA or vernal pool complexes.

Raptor Foraging/Nesting

Loss of sensitive upland habitats would result in a cumulative loss of raptor foraging habitat. This impact would be mitigated in conjunction with the upland habitat mitigation described in Section 7.1. Several raptor species were observed foraging on site. Impacts to nesting raptors may occur if construction occurs within the raptor breeding season (February 1 to August 1).

Nuisance Animal Species

The project has the potential for domestic animals to impact native wildlife. In particular, cats are known to harm native rodent and bird populations in locations where they have access to natural areas. Domestic animals could potentially significantly impact native wildlife within the MHPA; however, the low sensitivity of the wildlife detected in the project vicinity and the potential presence of coyotes could help control domestic animals that may wander from the developed areas into the open space. Erection of barriers as required per the City's MHPA adjacency guidelines is required to further inhibit nuisance animal species from entering the open space.

Human Intrusion

Increases in human activity in natural areas could result in degradation of sensitive vegetation communities by fragmenting habitat, forming edges (through creation of roads and trails), and removing existing plants. In addition, illegal dumping of landscape debris and trash may occur. No significant impacts would occur as a result of human activity given that project design measures include (1) fencing between the residential community and open space interface; (2) fencing (split-rail) along the proposed trail in the Eastern Preserve, and (3) bollards at the end of the maintenance road located at the eastern end of the project site. In addition, signage identifying the open space as preserved (on the eastern and western preserve areas) is required according to the Habitat Management Plan (HMP; Helix 2008a) for the project's open space. The project also would limit access to the adjacent MHPA and would eliminate OHV activity within the preserve.

7.0 MITIGATION MEASURES

The project would significantly impact sensitive vegetation communities and impact sensitive plant and animal species. The following measures are proposed to mitigate for these direct and indirect impacts.

7.1 MITIGATION FOR DIRECT IMPACTS

The following mitigation measures have been formulated to satisfy the requirements of the City's MSCP (City 1997a) and Biology Guidelines (City 2002). The mitigation ratios used in this report follow the City's ESL categorized five-tier system for impacts to sensitive upland vegetation/habitat communities within the MSCP (City 1997a):

- **Tier I**: Southern foredunes, Torrey pines forest, coastal bluff scrub, maritime succulent scrub, maritime chaparral, scrub oak chaparral, native grasslands and oak woodlands (mitigation ratios range from 1:1 to 2:1)
- **Tier II**: Coastal sage scrub and coastal sage scrub/chaparral ecotone (1:1 to 1.5:1)
- **Tier IIIA**: Mixed chaparral and chamise chaparral (0.5:1 to 1:1)
- **Tier IIIB**: Non-native grasslands (0.5:1 to 1:1)
- **Tier IV**: Disturbed, agricultural, and eucalyptus (0:1)

Although considered sensitive by the City, wetlands (including coastal wetlands, riparian habitats, freshwater marsh, natural flood channel, disturbed wetland, vernal pools, marine habitats, and eelgrass beds) are not included within the tier system. Mitigation ratios for wetlands range from 2:1 to 4:1.

7.1.1 Vegetation Communities/Jurisdictional Areas

Wetland/Riparian Habitats

Wetlands and non-wetland Waters of the U.S. are regulated by federal, state, and local agencies and typically represent a high constraint to development due to agencies' avoidance policy. If avoidance can be demonstrated to be unfeasible, impacts may occur with mitigation. As described above in Section 6.1.5, the proposed project has been designed to minimize impacts to sensitive resources on site. Wetland impacts shall be mitigated in-kind and achieve a no net loss of wetland function and value. Typically, wetlands are mitigated at a 2:1 to 4:1 ratio, depending upon the sensitivity of the impacted resource. Mitigation usually entails a combination of habitat preservation, restoration, and/or creation. For example, mitigation at 1:1 preservation and 1:1 creation would result in an overall 2:1 mitigation ratio.

Vernal Pools/Road Pools with Fairy Shrimp

The USFWS BO for the project identified conservation measures for impacts and to vernal pools with fairy shrimp, vernal pools without fairy shrimp, and road pools with fairy shrimp (USFWS 2010). In addition to the Candlelight project, the BO addressed impacts for vernal/road pool impacts that would occur from the future Candlelight Villas West project. The mitigation for this potential future project is included with the requirements for the current project (Table 12).

Table 12
MITIGATION FOR IMPACTS TO WETLANDS[1]

Habitat Type	Candlelight	Future Candlelight Villas West	Total Impacts	Restored on site	Preserved/ Enhanced on site	Total
Vernal/road pools supporting fairy shrimp	0.36	0.02	0.38	0.96	0.06	1.02
Vernal pools with no listed fairy shrimp	0.004	0.04	0.044	0.20	0.01	0.21
Disturbed wetland[2]	0.02	0.00	0.02	0.04	0.00	0.04
Waters of the U.S./Streambed[2]	0.05	0.00	0.05	0.05	0.00	0.05
TOTAL	**0.43**	**0.06**	**0.49**	**1.25**	**0.07**	**1.32**

[1] Based on USFWS BO, 2010
[2] Mitigation provided with restored vernal pool habitat (higher quality wetland)
[3] Supporting listed fairy shrimp species

Mitigation for vernal/road pool impacts shall include (1) preservation of VP 1 and enhancement of its associated watershed located in the Eastern Preserve Area; (2) restoration of vernal pool habitat within the western portion of the site, and preservation of VP 38 through 43 located in the Western Preserve Area (Figures 4a and 4b). Impacts to disturbed wetland and jurisdictional streambed also will be mitigated through vernal pool preservation and restoration (Table 12). Combined, the project would be required to restore 1.25 acres and preserve/enhance 0.07 acres of vernal pool habitat on site. An On-site Vernal Pool Restoration Plan has been prepared that described the proposed vernal pool restoration as well as enhancement of VP 1 (Helix 2008b). All restored pools and enhanced pools will be planted with vernal pool indicator plant species and inoculated with San Diego and/or Riverside fairy shrimp. However, only 0.96 acre of the restored pools will be required to support reproducing fairy shrimp populations (USFWS 2010).

Disturbed Wetland

The disturbed wetland habitat to be impacted is of low quality, man-made, and does not support any sensitive plant or animal species. As such, impacts to 0.02 acre of disturbed wetlands shall be mitigated through restoration of 0.04 acre of vernal pool habitat on site (Table 12) as called for in the BO.

Non-wetland Waters of the U.S./CDFW Streambed

Impacts to 0.05 acre of Corps non-wetland Waters of the U.S./CDFW streambed shall be mitigated through restoration of 0.05 acre of vernal pool habitat on site (Table 12) as called for in the BO.

Upland Habitats

Mitigation for direct impacts to upland vegetation communities shall be accomplished through on site preservation in the Western (15.76 acre) and Eastern (1.58 acre) Preserve areas (Figures 4a and 4b). These areas are adjacent to the current MHPA and would be incorporated into the MHPA as part of the project.

Maritime Succulent Scrub (Tier I)

Impacts to 0.2 acre of disturbed maritime succulent scrub shall be mitigated at a 1:1 ratio. The resulting acreage for mitigation inside the MHPA shall be approximately 0.2 acre of Tier I (in-kind) habitat. Between the Eastern and Western Preserve areas the project would preserve approximately 5.7 acre of maritime succulent scrub habitat within the MHPA. A surplus of approximately 5.5 acres of preserved MSS habitat on site will be used as partial mitigation for NNG impacts. In addition, 5.2 acres of maritime succulent scrub shall be restored in the western portion of the site within the on-site vernal pool restoration complex (Helix 2008b), all of which shall be used for mitigation for impacts to non-native grassland, as discussed below.

Table 13
MITIGATION FOR IMPACTS TO UPLANDS

Vegetation Community	Total Impacts (acre)	Mitigation (acre)
Maritime succulent scrub (Tier I)	0.2	0.2[1]
Non-native grassland (Tier IIIB)	21.2	17.1[2]
TOTAL	**22.4**	**17.3**

[1] On site preservation of MSS habitat within MHPA
[2] Remaining area of Western and Eastern preserve areas, including habitat restoration

Non-native Grassland (Tier IIIB)

Impacts to non-native grassland total 21.2 acres, all of which occurs outside the MHPA. Mitigation for NNG will be provided through habitat preservation and restoration in the on-site Western and Eastern Preserve Areas (to be incorporated into the MHPA). Combined, the preserve areas encompass 17.3 acres of habitat, 0.2 of which would be used for MSS mitigation. The remaining 17.1 acres would be used to mitigate the project's impacts to NNG habitat, all of which would be considered suitable for BUOWs as foraging and/or nesting habitat. This would result in an approximate mitigation ratio of .8:1, which is higher than the City's .5:1 ratio for NNG impacts. In addition to this preservation, habitat restoration of vernal pool and MSS habitats would occur in both preserve areas. While not a mitigation measure, the restoration effort also would incorporate 6 artificial BUOW burrows (4 in the western preserve and 2 in the eastern preserve) to help this species become established on the site.

7.1.2 Sensitive Plant Species Observed

Impacts to sensitive plant species observed on site are not considered significant; therefore, mitigation would not be required.

7.1.3 Sensitive Animal Species Observed

Direct impacts to CAGN and raptor habitat shall be mitigated through preservation of habitat in accordance with mitigation measures discussed above in Section 7.1.1, under Upland Habitats. If construction occurs during the raptor breeding season (February 1 to August 1), a pre-construction raptor nest survey shall be conducted. If active raptor nests are found, construction shall not occur within 300 feet of the nest until any fledglings have left the nest or until after August 1.

Impacts to listed fairy shrimp shall be mitigated at a 2:1 ratio in conjunction with the vernal pool/road pool mitigation discussed above in Section 7.1.1, under Wetland/Riparian Habitats). Restored vernal pool habitat shall support San Diego or Riverside fairy shrimp, as required in the BO. Additionally, the BO requires that fairy shrimp surveys be conducted within 2 years of initiation of project construction activities.

To avoid injuring or killing BUOWs during final on-site grading, a pre-construction survey of suitable BUOW habitat within proposed project activity areas (e.g., clearing, grading, construction, access, and materials storage) shall be conducted. The survey shall take place no more than 30 days prior to initiation of clearing and grading (and related activities such as equipment access or equipment/material staging). If necessary, weed removal (by whacking, bush hogging, or mowing) shall be conducted to make all potential burrows in the relevant impact area more easily observed. A qualified biologist shall monitor weed removal to ensure that active burrows are not disturbed during the process. Cameras may be used to determine if a burrow is active or inactive. A letter report shall be submitted to the Mitigation Monitoring Coordinator prior to the pre-construction meeting with the results of the pre-construction survey.

Prior to the issuance of the first grading permit, any impacted individuals must be relocated out of the impact area using passive or active methods approved by the CDFW (CDFG 2012) and the

City. In accordance with the approved method, a qualified biologist shall implement a relocation process including the collapse of the existing burrow within the project footprint consistent with the approved Exhibit A. At a minimum, the process would include the following:

- If owls are present during the pre-construction survey, a passive translocation plan shall be submitted to the CDFW and City and approved prior to commencement of construction activities. A qualified biologist shall implement an eviction process with the use of one-way doors according to the Staff Report on Burrowing Owl Mitigation (CDFG 2012). Once the owls have vacated the burrows (this should take approximately 48 hours after installation of one-way doors), all burrows shall be carefully excavated (to confirm they are empty) and then filled to prevent occupation or reoccupation. A qualified biologist shall carry out the eviction, excavation, and filling.

7.2 MITIGATION FOR INDIRECT IMPACTS

7.2.1 Vernal Pool Watersheds

Protective fencing (e.g., silt fencing and construction fencing) shall be installed along the interface of development and VP 1 to protect the watershed, providing a 50-foot buffer from the edge of development. Grading adjacent to VP 1 shall be scheduled when VP 1 is dry. A biological monitor shall be on site during construction in this area to ensure that activities stay within approved limits.

In addition, a 50-foot buffer shall be provided between the proposed brush management for the Candlelight Villas West project and the proposed vernal pool restoration area in the western portion of the site.

It is anticipated that the proposed 50-foot buffer and vernal pool watershed are sufficient to maintain the existing function and values of VP 1 and proposed function and values of the vernal pool creation area. In order to avoid indirect impacts, (1) vernal pool watersheds shall be preserved; (2) the project has been designed to direct development runoff away from existing vernal pools; and (3) fencing around VP 1 shall occur. In order to protect VP 1 and its watershed, the surrounding development has been designed to slope away from VP 1. These measures would provide the protection required to preserve the functioning habitat of VP 1.

A draft HMP (Helix 2008a) for the open space areas within the project site and adjacent Candlelight Villas West project site that incorporates short- and long-term maintenance activities, protective fencing, trash removal, public awareness, erosion control, and exotic pest removal has been prepared. The final HMP shall be approved by the wildlife agencies and City prior to issuance of the first grading permit. Prior to any clearing activities or recordation of a final map, an HMP for the on-site vernal pool mitigation open space areas shall be approved and implemented in coordination with the City and wildlife agencies. The applicant shall identify an appropriate habitat manager (i.e., natural lands management organization subject to approval of the City and wildlife agencies) to ensure conservation of biological resources in the on-site open space areas in perpetuity. A Property Analysis Record (PAR) or similar analysis shall be prepared for the on-site biological open space areas and used to estimate initial start-up costs and ongoing annual cost of management activities for the HMP. A preliminary PAR is provided in the HMP to help identify long term management costs for the preserve. A financial mechanism (e.g., non-wasting endowment) shall be established to ensure that funding is available and of a sufficient amount. The habitat manager shall be responsible for implementing the HMP. The City reserves the right to review the financing plan to ensure that funding is sufficient to cover City involvement in monitoring the manager or assuming manager's duties in the event of default.

The On-site Vernal Pool Restoration Plan (Helix 2008b) also shall be approved by the City and wildlife agencies prior to issuance of the first grading permit.

7.2.2 Other Indirect Impacts – MHPA Land Use Adjacency Guidelines

To mitigate for edge effect impacts due to construction activities, light overspill, noise, invasive plant species, and water quality, the following measures shall be required:

- Prior to the pre-construction meeting, a meeting shall be conducted with the project biologist and construction supervisors. All sensitive areas to be avoided shall be flagged and contractors shall be informed of the no-entry areas. Prior to construction of permanent fencing, the entire limits of grading shall be fenced with silt and orange construction fencing to preclude entry into sensitive MHPA or other open space areas. During grading and construction, a qualified biologist shall conduct regular monitoring visits to assure that construction personnel and equipment do not encroach upon any sensitive areas.

- Prior to issuance of the first occupancy permit, the applicant shall ensure that all lighting installed near the MHPA and other open space areas shall be directed away from the MHPA and other open space areas or shielded to prevent light overspill into the MHPA and other open space areas. Shielding may consist of the installation of fixtures that physically direct light away from the outer edges of the property or landscaping, berms, or other barriers at the edge of development that prevent light overspill.

- Prior to the first pre-construction meeting, the City Manager (or appointed designee) shall verify that the MHPA boundaries and the following project requirements regarding the CAGN are shown on the construction plans:

  No clearing, grubbing, grading, or other construction activities shall occur within 500 feet of the MHPA between March 1 and August 15 (CAGN breeding season) until the following requirements have been met to the satisfaction of the City Manager:

  A. A qualified biologist (possessing a valid ESA Section 10(a)(1)(A) Recovery Permit) shall survey appropriate habitat (coastal sage scrub) areas within the off-site MHPA that lie within 500 feet of the project footprint and would be subject to construction noise levels exceeding 60 dB hourly average for the presence of the CAGN. If no appropriate habitat is present then the surveys will not be required. If appropriate habitat is present, CAGN surveys shall be conducted pursuant to USFWS protocol survey guidelines within the breeding season prior to commencement of any construction. If CAGNs are present within the MHPA, the following conditions must be met:

I. Between March 1 and August 15, no clearing, grubbing, or grading of occupied CAGN habitat shall be permitted within the MHPA. Areas restricted from such activities shall be staked or fenced under the supervision of a qualified biologist; and

II. Between March 1 and August 15, no construction activities shall occur within any portion of the site where construction activities would result in noise levels exceeding 60 dB hourly average at the edge of occupied CAGN habitat within the MHPA. An analysis showing that noise generated by construction activities would not exceed 60 dB hourly average at the edge of occupied habitat must be completed by a qualified acoustician (possessing current noise engineer license or registration with monitoring noise level experience with listed animal species) and approved by the City Manager at least two weeks prior to the commencement of construction activities. Prior to commencement of construction activities during the breeding season, areas restricted from such activities shall be staked or fenced under supervision of a qualified biologist; or

III. At least two weeks prior to commencement of construction activities and under direction of a qualified acoustician, noise attenuation measures (e.g., berms, walls) shall be implemented to ensure that noise levels resulting from construction activities will not exceed 60 dB hourly average at the edge of habitat (within the MHPA) occupied by the CAGN. Concurrent with commencement of construction activities and construction of necessary noise attenuation facilities, noise monitoring* shall be conducted at the edge of occupied habitat area within the MHPA to ensure that noise levels do not exceed 60 dB hourly average. If the noise attenuation techniques implemented are determined to be inadequate by the qualified acoustician or biologist, then the associated construction activities shall cease until such time that adequate noise attenuation is achieved or until the end of the breeding season (August 16).

* Construction noise shall continue to be monitored at least twice weekly on varying days, or more frequently depending on the construction activity to verify that noise levels at the edge of occupied habitat within the MHPA are maintained below 60 dB hourly average or to the ambient noise level if it already exceeds 60 dB hourly average. If not, other measures shall be implemented in consultation with the biologist and the City Manager, as necessary, to reduce noise levels within occupied MHPA habitat to below 60 dB hourly average or to the ambient noise level if it already exceeds 60 dB hourly average. Such measures may include but are not limited to limitations on the placement of construction equipment and the simultaneous use of equipment.

B. If CAGNs are not detected within the MHPA during the protocol survey, the qualified biologist shall submit substantial evidence to the City Manager and applicable wildlife agencies which demonstrates whether or not mitigation measures such as noise walls are necessary between March 1 and August 15 as follows:

    I. If evidence indicates high potential for CAGN presence based on historical records or site conditions, Condition A.III shall be adhered to as specified above.
    II. If evidence concludes that no impacts to this species are anticipated, no mitigation measures would be necessary.

- Landscaping adjacent to biological open space shall consist entirely of native species.

- The use of structural and non-structural Best Management Practices, Best Available Technology, and use of sediment catchment devices downstream of paving activities shall reduce potential impacts associated with construction. The project design shall comply with the Standard Urban Stormwater Management Plan and Municipal Stormwater Permit criteria of the SWRCB and City.

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Appendix A
PLANT SPECIES OBSERVED

SCIENTIFIC NAME	COMMON NAME	HABITAT‡
Lycopodiae		
Selaginellaceae – Moss Family		
Selaginella bigelovii	spike moss	MSS
Selaginella cinerascens	ashy spike-moss	MSS
Monocotyledoneae		
Cyperaceae - Sedge Family		
Eleocharis sp.	spike-rush	
Juncaginaceae - Arrow-grass Family		
Lilaea scilloides	flowering-quillwort	VP
Juncaceae – Rush Family		
Juncus bufonius	toad rush	DH
Liliaceae – Lily Family		
Calochortus splendens	splendid mariposa	MSS
Yucca schidigera	Mojave yucca	MSS
Dichelostemma capitatum	blue dicks	MSS
Poaceae – Grass Family		
Avena barbata	slender wild oat	MSS, DH
Bromus diandrus	ripgut grass	NNG
Bromus hordeaceus	soft chess	MSS, DH
Bromus madritensis ssp. *rubens*	red broom	MSS, DH
Cynodon dactylon	Bermuda grass	DH
Gastridium ventricosum	nit grass	DH
Hordeum intercedens	wild barley	DH
Hordeum jubatum	foxtail barley	DH
Hordeum murinum	hare barley	DH
Lamarckia aurea	golden top	DH
Lolium perenne	perennial ryegrass	DH
Muhlenbergia microsperma	littleseed muhly	DH
Phalaris lemmonii	Lemmon's canary grass	DH
Poa annua	annual bluegrass	DH
Polypogon monspeliensis	annual beardgrass	DH
Schismus barbatus	Mediterranean schismus	DH
Bromus madritensis ssp. *rubens*	foxtail chess	DH
Nassella lepida	foothill needlegrass	MSS
Nasella pulchra	purple needlegrass	MSS
Vulpia myuros	foxtail fescue	MSS, DH

PLANT SPECIES OBSERVED – CANDLELIGHT

SCIENTIFIC NAME	COMMON NAME	HABITAT‡
Dicotyledoneae		
Aizoaceae – Carpet-Weed Family		
Mesembryanthemum nodiflorum	slender-leaved iceplant	DH
Mesembryanthemum crystallinum	iceplant	DH
Amaranthaceae – Amaranth Family		
Amaranthus blitoides	prostrate amaranthus	DH
Anacardiaceae – Sumac Family		
Malosma laurina	laurel sumac	MSS
Rhus integrifolia	lemonadeberry	MSS
Schinus molle	Peruvian pepper tree	
Apiaceae – Carrot Family		
Foeniculum vulgare	fennel	
Asteraceae – Sunflower Family		
Ambrosia chenopodiifolia	San Diego bur-sage	MSS
Artemisia californica	California sagebrush	MSS
Baccharis pilularis	coyote brush	
Baccharis salicifolia	mule fat	MSS
Baccharis sarathroides	broom baccharis	DH
Carduus pycnocephalus	Italian thistle	MSS, DH
Centaurea melitensis	tocalote	MSS, DH
Chamomilla suaveolens	pineapple weed	DH
Chrysanthemum coronarium	garland daisy	MSS, DH
Conyza canadensis	horseweed	DH
Conyza coulteri	Coulter's fleabane	DH
Deinandra fasciculata	fascicled tarplant	MSS, DH
Encelia californica	common encelia	MSS
Eriophyllum confertiflorum	golden yarrow	MSS
Filago californica	California filago	MSS, DH
Gnaphalium californicum	California everlasting	MSS
Gnaphalium canescens	white everlasting	MSS
Heterotheca grandiflora	telegraph weed	DH
Hypochaeris glabra	smooth cat's-ear	DH
Lactuca serriola	wild lettuce	DH
Lasthenia californica	goldfields	MSS
Lessingia filaginifolia	cudweed aster	MSS
Osmodenia tenella	osmadenia	MSS
Psilocarphus brevissimus	dwarf wooly heads	VP
Sonchus asper	prickly sow thistle	DH
Sonchus oleraceus	sow thistle	DH
Stephanomeria diegensis	San Diego wreath plant	MSS, DH
Stylocline gnaphaloides	everlasting nest straw	MSS

Appendix A (cont.)
PLANT SPECIES OBSERVED – CANDLELIGHT

SCIENTIFIC NAME	COMMON NAME	HABITAT‡
Dicotyledoneae (cont.)		
Asteraceae – Sunflower Family (cont)		
Viguiera laciniata	San Diego County sunflower	MSS
Boraginaceae – Borage Family		
Amsinckia intermedia	fiddleneck	
Amsinckia menziesii	rancher's fireweed	MSS
Heliotropium curvassavicum	salt heliotrope	DH
Cryptantha intermedia	popcorn flower	MSS
Plagiobothrys acanthacarpus	adobe popcorn flower	VP, MSS
Brassicaceae – Mustard Family		
Brassica nigra	black mustard	DH
Hirschfeldia incana	short-pod mustard	DH
Lepidium lasiocarpum	sand peppergrass	MSS
Raphanus sativus	radish	
Sisymbrium irio	London rocket	DH
Cactaceae – Cactus Family		
Opuntia prolifera	coastal cholla	MSS
Opuntia littoralis	coast prickly-pear	MSS
Capparaceae – Caper Family		
Isomeris arborea	bladderpod	MSS
Caprifoliaceae - Honeysuckle Family		
Sambucus mexicana	blue elderberry	
Caryophyllaceae – Pink Family		
Cardionema ramosissimum	sand mat	MSS
Spergularia bocconii	Buccone's sand-spurry	DH
Chenopodiaceae – Goosefoot Family		
Atriplex pacifica	southcoast saltscale	MSS, DH
Atriplex semiboccata	Australian saltbush	DH
Chenopodium murale	goosefoot	MSS
Salsola tragus	Russian-thistle, tumbleweed	DH
Convolvulaceae – Morning-Glory Family		
Calystegia macrostegia.	morning glory	MSS
Crassulaceae – Stonecrop Family		
Dudleya pulverulenta	chalk lettuce	MSS
Cuscutaceae – Dodder Family		
Cuscuta californica	witch's hair	MSS
Euphorbiaceae – Spurge Family		
Chamaesyce polycarpa	prostate spurge	
Eremocarpus setigerus	doveweed	
Euphorbia misera	cliff spurge	MSS

Appendix A (cont.)
PLANT SPECIES OBSERVED – CANDLELIGHT

SCIENTIFIC NAME	COMMON NAME	HABITAT‡
Dicotyledoneae (cont.)		
Fabaceae – Pea Family		
Astragalus trichopodus var. *lonchus*	ocean locoweed	
Lotus scoparius var. *scoparius*	California broom, deerweed	MSS
Medicago polymorpha	California burclover	DH
Melilotus albus	white sweetclover	DH
Melilotus indicas	sourclover	DH
Gentianaceae – Gentian Family		
Centaurium venustum	canchalagua	
Geraniaceae – Geranium Family		
Erodium brachycarpum	short-beak filaree	DH
Erodium botrys	storksbill	DH
Erodium cicutarium	red-stem filaree	DH
Lamiaceae – Mint Family		
Marrubium vulgare	horehound	DH
Salvia apiana	white sage	MSS
Salvia columbariae	chia	
Lythraceae – Loosestrife Family		
Lythrum hyssopifolium	grass poly	DH
Malvaceae – Mallow Family		
Malocothamnus fasciculatus	chaparral mallow	MSS
Malva parviflora	cheeseweed	DH
Sidalcea malvaeflora ssp. *sparsifolia*	wand checker-bloom	MSS
Myrtaceae – Myrtle Family		
Eucalyptus sp.	eucalyptus	EW
Nyctaginaceae – Four O'Clock Family		
Mirabilis californica	wishbone bush	MSS
Onagraceae – Evening Primrose Family		
Camissonia bistorta	California sun cup	MSS
Phytolaccaceae – Pokeweed Family		
Phytolacca americana	pokeweed	DH
Plantaginaceae – Plantain Family		
Plantago erecta	dwarf plantain	MSS
Polemoniaceae – Phlox Family		
Eriastrum filifolium	thread-leaf wooly-star	MSS
Eriastrum sapphirinum	wool-star	
Linanthus dianthiflorus	ground pink	
Navarretia hamata	skunkweed	MSS

Appendix A (cont.)
PLANT SPECIES OBSERVED – CANDLELIGHT

SCIENTIFIC NAME	COMMON NAME	HABITAT‡
Dicotyledoneae (cont.)		
Polygonaceae – Buckwheat Family		
Centrostegia thurberi	Thurber's spineflower	MSS
Chorizanthe brevicornu	brittle spineflower	MSS
Chorizanthe fimbriata	fringed spineflower	MSS
Chorizanthe procumbens	prostrate spineflower	MSS
Eriogonum fasciculatum ssp. *fasciculatum*	California buckwheat	MSS
Polygonum arenastrum	common knotweed	DH
Rumex crispus	curly dock	DH
Primulaceae – Primrose Family		
Anagallis arvensis	scarlet pimpernel	DH
Rhamnaceae – Buckthorn Family		
Rhamnus crocea	spiny redberry	MSS
Rosaceae – Rose Family		
Heteromeles arbutifolium	toyon	MSS
Rubiaceae – Madder Family		
Galium angustifolium	narrow-leaf bedstraw	MSS
Salicaceae – Willow Family		
Salix lasiolepis	arroyo willow	DH
Scrophulariaceae – Figwort Family		
Antirrhinum kelloggii	climbing snapdragon	
Cordylanthus rigidus	dark-tip bird's beak	MSS
Mimulus aurantiacus	San Diego monkeyflower	MSS
Simmondsiaceae – Jojoba Family		
Simmondsia chinensis	jojoba, goat-nut, pignut	MSS
Solanaceae – Nightshade Family		
Nicotiana glauca	tree tobacco	NNG, DH
Tamaricaceae		
Tamarix sp.	tamarisk	DH
Pteridophyte		
Marsileaceae - Waterclover Family		
Marsilea vestita ssp. *vestita*	water fern	VP

‡Habitat acronyms: DH=disturbed habitat/agricultural field; E=eucalyptus; MSS=maritime succulent scrub; VP=Vernal pool

†Sensitive species

Appendix B
ANIMAL SPECIES OBSERVED OR DETECTED – CANDLELIGHT

SCIENTIFIC NAME	COMMON NAME	HABITAT‡
INVERTEBRATES		
Crustaceans		
Branchinecta sandiegonensis†	San Diego fairy shrimp	VP
Podura aquatica	aquatic springtail	VP
Streptocephalus wootoni†	Riverside fairy shrimp	VP
Cladocera	Water fleas	VP
Copepod	Copepod	VP
Ostracod	Seed shrimp	VP
Insects		
Odonata	dragonfly	NNG
Coccinellidae sp.	ladybug	NNG
Butterflies		
Anthocharis sara	Sara orangetip	NNG
Apodemia mormo virgulti	Behr's metalmark	MSS
Brephidium exilis	pygmy blue	MSS
Coenonympha californica	California ringlet	DH
Cupido amyntula	western tailed-blue	MSS
Erynnis funeralis	duskywing skipper	MSS
Junonia coenia	buckeye	MSS
Paplio rutulus	western tiger swallowtail	NNG
Paplio zelicaon	anise swallowtail	NNG
Pontia protodice	common white	DH
Vanessa atalanta	red admiral	MSS
Vannessa annabella	west coast lady	MSS
Vannessa cardui	painted lady	MSS
VERTEBRATES		
Reptiles		
Uta stansburiana	side-blotched lizard	MSS
Sceloporus occidentali	western fence lizard	MSS
Cnemidophorus hyperythrus†	orange-throated whiptail	MSS
Spea hammondii†	western spadefoot	VP
Hyla regilla	Pacific treefrog	VP

Appendix B (cont)
ANIMAL SPECIES OBSERVED OR DETECTED – CANDLELIGHT

SCIENTIFIC NAME	**COMMON NAME**	**HABITAT‡**
VERTEBRATES (cont.)		
Birds		
Aphelocoma coerulescens	scrub jay	MSS
Athene cunicularia†	burrowing owl	DH
Buteo jamaicensis	red-tailed hawk	flyover
Cathartes aura	turkey vulture	flyover
Callipepla californica	California quail	MSS
Calypte anna	Anna's hummingbird	E, DH
Calypte costae	Costa's hummingbird	MSS
Tyrannus vociferans	Cassin's kingbird	DH, E
Carduelis psaltria	lesser goldfinch	E
Carpodacus mexicanus	house finch	E, DH
Chamaea fasciata	wrentit	MSS
Charadrius vociferus	killdeer	DH
Circus cyaneus†	northern harrier	flyover
Chordeiles acutipennis	lesser nighthawk	MSS
Sturnus vulgaris	European starling	E
Corvus corax	common raven	flyover
Falco sparverius	American kestrel	DH
Hirundo pyrrhonota	cliff swallow	NNG
Lanius ludovicianus†	loggerhead shrike	DH
Pipilo fuscus	California towhee	MSS
Pipilo maculatus	spotted towhee	NNG
Polioptila californica californica†	Coastal California gnatcatcher	MSS
Psaltriparus minimus	bushtit	MSS
Melospiza melodia	song sparrow	MSS, E
Sturnella neglecta	western meadowlark	DH
Columba livia	rock dove	flyover
Zenaida macroura	mourning dove	DH, E
Stelgidopteryx serripennis	rough-winged swallow	NNG
Accipiter cooperii†	Cooper's hawk	NNG
Aimophila ruficeps canescens	rufous-crowned sparrow	MSS
Elanus leucurus†	white-tailed kite	NNG

Appendix B (cont.)
ANIMAL SPECIES OBSERVED OR DETECTED – CANDLELIGHT

SCIENTIFIC NAME	COMMON NAME	HABITAT‡
VERTEBRATES (cont.)		
Mammals		
Felis concolor	mountain lion	MSS
Canis latrans	coyote	MSS
Urocyon cinereoargenteus	grey fox	MSS
Spermophilus beecheyi	California ground squirrel	DH
Dipodomys agilis	Pacific kangaroo rat	MSS
Sylvilagus audubonii	desert cottontail	MSS, DH
Thomomys bottae	Botta's pocket gopher	MSS, DH
Chaetodipus fallax fallax†	San Diego pocket mouse	NNG
Neotoma lepida intermedia	San Diego desert woodrat	MSS
Lepus californicus bennettii†	Black-tailed jackrabbit	NNG

‡Habitat acronyms: DH=disturbed habitat/agricultural field; E=eucalyptus; MSS=maritime succulent scrub; NNG=non-native grassland; VP=vernal pool

†Sensitive species

Appendix C
EXPLANATION OF STATUS CODES FOR PLANT AND ANIMAL SPECIES

U.S. Fish and Wildlife Service (USFWS)

FE	Federally listed endangered
FT	Federally listed threatened

California Department of Fish and Game (CDFG)

SE	State listed endangered
ST	State listed threatened
CSC	California species of special concern
Fully Protected and Protected	Fully Protected and Protected species may not be taken or possessed without a permit from the Fish and Game Commission and/or CDFG.

California Native Plant Society (CNPS) Codes

Lists

1A = Presumed extinct.

1B = Rare, threatened, or endangered in California and elsewhere. Eligible for state listing.

2 = Rare, threatened, or endangered in California but more common elsewhere. Eligible for state listing.

3 = Distribution, endangerment, ecology, and/or taxonomic information needed. Some eligible for state listing.

4 = A watch list for species of limited distribution. Needs monitoring for changes in population status. Few (if any) eligible for state listing.

Threat Code Extensions

.1 = Seriously endangered in California (over 80 percent of occurrences threatened/high degree and immediacy of threat)

.2 = Fairly endangered in California (20 to –80 percent occurrences threatened)

.3 = Not very endangered in California (less than 20 percent of occurrences threatened or no current threats known)

Note that all List 1A (presumed extinct in California) and some List 3 (need more information; a review list) plants lacking any threat information receive no threat code extension. Also, these Threat Code guidelines represent a starting point in the assessment of threat level. Other factors, such as habitat vulnerability and specificity, distribution, and condition of occurrences, are also considered in setting the Threat Code.

Schwerin & Assoc.
814 Morena Blvd., Ste.101, San Diego, Ca 92110
Phone (619) 220-4969 Fax (619) 220-7029
www.schwerin-assoc.com

June 8, 2015

To Whom it May Concern:

The City of San Diego's Transportation Department during its review of the EIR, discovered that the traffic calculations for the Traffic Impact Analysis used "greater than 20 dwelling units per acre" as a basis its calculations; while the Tentative Map used 19.93 (rounded up to 20) dwelling units per acre.

In order for the traffic calculations in the Traffic Impact Analysis report to be accurate and match the EIR, the dwelling units per acre must be "greater than" 20.

Therefore, the Tentative Map was updated to reflect a decrease of .09 acres for the developable acres (Lot 1 was decreased by .09 acres and Lot 4 (MHPA) increased). This increased the dwelling units per acre to 20.008 and required the following changes to the Tentative Map:

Area affected	Previous Tentative Map acres/units	Updated Tentative Map acres/units
Lot 1 acres	7.81 acres	7.72 acres
Dwelling unit per acre	19.93 dwelling units per acre	20.008 dwelling units per acre
Developable acres	23.83 acres	23.74 acres
Lot 4 acres	15.76 acres	15.85 acres
Total open space acres	17.86 acres	17.95 acres
Total open space rounded	17.9 acres	18 acres
Total developable acres rounded	23.8 acres	23.7 acres

This update to the Tentative Map made the environmental impact LESS than previously stated. Therefore, it was determined that the reports for this EIR would not need to be re-written/updated to reflect this negligible change of .09 acres on the Tentative Map.

Also note, some reports state that 476 dwelling units would be built and others studied impacts of 475 units. Therefore, 475 dwelling units will be used to be consistent. Some reports may show 476 units. The lower dwelling unit number would cause LESS of an environmental impact.

The attached report may have acres/units which do not reflect the latest Tentative Map updates described above. However, please note the current impact is less that the report may state and therefore, not considered a significant change requiring a report re-write.

Sincerely,

Kathy C

Kathy Corvin
Schwerin & Assoc.
(619) 220 4969

Appendix D

Geotechnical Investigations
Geocon Incorporated
April 2013 / February 2012 / June 2004

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 07177-52-03
April 15, 2013

Schwerin & Associates
814 Morena Boulevard
San Diego, California 92110

Attention: Ms. Kathy Corvin

Subject: TENTATIVE MAP GRADING PLAN REVIEW
CANDLELIGHT
SAN DIEGO, CALIFORNIA

References:
1. *Geotechnical Investigation, Candlelight Villas – Phase 1, San Diego, California*, prepared by Geocon Incorporated, dated June 2, 2004 (Project No. 07177-52-02).
2. *Update Geotechnical Letter, Candlelight, San Diego, California*, prepared by Geocon Incorporated, dated February 28, 2012 (Project No. 07177-52-03).
3. *Grading Plans, Candlelight, City of San Diego, California*, prepared by Schwerin & Associates, Sheets S-3, S-4, and S-6, dated April 16, 2013 (Project No. 40329).

Dear Ms. Corvin:

In accordance with your request, we have reviewed a copy of the referenced plans to check if the plans and details have been prepared in substantial conformance with the recommendations presented in our referenced geotechnical investigation report and letter.

Based upon our review of the project plans and the information contained within the geotechnical references, it is the opinion of Geocon Incorporated that the grading plans and storm water drainage details have been prepared in substantial conformance with the recommendations presented in the referenced geotechnical investigation report.

We limited our review to geotechnical aspects of project development and the review did not include other details on the referenced plans. Geocon Incorporated has no opinion regarding other details found on the referenced plans, civil or otherwise, that do not directly pertain to geotechnical aspects of site development.

If you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Shawn Foy Weedon
GE 2714

REGISTERED PROFESSIONAL ENGINEER
SHAWN WEEDON
No. 2714
Exp. 06/30/13
GEOTECHNICAL
STATE OF CALIFORNIA

SFW:dmc

(email) Addressee

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Proposal No. LG-12056
February 16, 2012

Schwerin & Associates
814 Morena Boulevard
San Diego, California 92110

Attention: Mr. Walter Schwerin

Subject: PROPOSAL FOR UPDATE GEOTECHNICAL REPORT
CANDLELIGHT
SAN DIEGO, CALIFORNIA

References:
1. *Geotechnical Investigation, Candlelight Villas – Phase 1, San Diego, California*, prepared by Geocon Incorporated, dated June 2, 2004 (Project No. 07177-52-02).
2. *Geotechnical Investigation, Candlelight West, San Diego, California*, prepared by Geocon Incorporated, dated August 30, 2004 (Project No. 07177-52-02).

Dear Mr. Schwerin:

In accordance with your request, we are pleased to submit our proposal to prepare an update geotechnical report for the subject project. The site is located south of San Ysidro High School and east and west of Caliente Boulevard in the western portion of Otay Mesa in San Diego, California. We prepared the referenced geotechnical investigation reports in 2004 associated with a planned residential development including excavating 27 backhoe trenches and performing various laboratory tests. We understand the update report will be used in conjunction with a tentative map level study with plans not yet available.

Topographically, the property is characterized by nearly flat to gently sloping mesa land over most of the site. A drainage canyon is located in the western portion of the property and flows offsite. An earthen berm approximately 10 feet high and 20 feet wide is present along the southern and eastern portions of the site. The majority of the site generally slopes gently south and westward, and eventually drains into the Tijuana River in Baja California, Mexico. Ground surfaces over much of the property are smooth and essentially featureless because of cultivation over many years. Site elevations vary from a high of approximately 532 feet Mean Sea Level (MSL) along the northern boundary to a low of approximately 405 feet MSL in the canyon drainage at the southwest corner of the site.

We would prepare an update geotechnical report to provide preliminary recommendations including grading, seismic design criteria, retaining wall design criteria, geologic hazards, and preliminary foundation recommendations. We expect the project would include multi-family and mixed use residential/retail structures. We would use the existing exploratory field and laboratory test data to prepare the update report. Additional field investigation may be required when development plans are prepared. In addition, an updated geotechnical investigation report will be required when final grading plans are available.

We propose to perform the scope of work outlined herein for an estimated fee of $2,000. Our services would be provided in accordance with the enclosed *Schedule of Fees Schedule of Fees/Terms and Conditions,* which is incorporated into and made part of this proposal. Invoices would be submitted at four-week intervals and itemized to reflect only the actual time and costs incurred. If unexpected conditions are encountered that require a significant modification to the recommended scope of work and/or which require an increase to the estimated amount, we would not proceed with the modified scope or increased amount without obtaining your verbal authorization. The proposed scope of services does not include the evaluation or identification of the potential presence of hazardous materials on the site.

It is mutually agreed between Client and Geocon that all services afforded and work performed by Geocon are provided pursuant to Civil Code Section 2782, *et seq.*, and such agreement is expressly integrated into and made a part of any and all contracts or agreements entered into between the parties.

Please carefully review the contents of this proposal, and the enclosed *Schedule of Fees/Terms and Conditions* and *Terms for Geotechnical Engineering Services.* If they meet with your approval, execute both copies of the *Terms for Geotechnical Engineering Services* and return them to our office. We will then sign the documents and return one fully executed copy to you.

We would commence with the scope of services outlined herein upon receipt of your written authorization to proceed on the basis of and conditions set forth in the *Terms for Geotechnical Engineering Services* and *Schedule of Fees/Terms and Conditions* enclosed herewith. Services provided by Geocon will be pursuant to the *Terms for Geotechnical Engineering Services* and *Schedule of Fees/Terms and Conditions* until or unless a mutually agreed upon, negotiated contract is finalized. Please note that it is necessary to indicate your project representative agent on the first sheet of *Terms for Geotechnical Engineering Services* and the address where all Client notices and communications should be sent. If you do not have an in-house project representative agent, please indicate a designated agent.

Should you have any questions regarding this proposal, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Shawn Foy Weedon, GE 2714
Associate/Senior Engineer

John Hoobs
Principal/Senior Geologist

SFW:JH:dmc

Enclosures: TGES; SF/TC-2009

(2) Addressee

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 07177-52-03
February 28, 2012

Schwerin & Associates
814 Morena Boulevard
San Diego, California 92110

Attention: Mr. Walter Schwerin

Subject: UPDATED GEOTECHNICAL LETTER
CANDLELIGHT
SAN DIEGO, CALIFORNIA

References:

1. *Geotechnical Investigation, Candlelight Villas – Phase 1, San Diego, California*, prepared by Geocon Incorporated, dated June 2, 2004 (Project No. 07177-52-02).
2. *Vesting Tentative Map, PDP and SDP Site/Grading Plan, Candlelight, Villas East, City of San Diego, California*, prepared by Schwerin & Associates, undated (Project No. 40329, Work Order No. 42-2966).

Dear Mr. Schwerin:

In accordance with your request, we have prepared this letter to update the referenced report dated June 2, 2004 and present supplemental preliminary design recommendations in accordance with the 2010 California Building Code (CBC). The site is located south of San Ysidro High School and east and west of Caliente Boulevard in the western portion of Otay Mesa in San Diego, California. We prepared the referenced geotechnical investigation report in 2004 associated with a planned residential development. Our investigation included excavating 27 backhoe trenches, performing laboratory tests, and providing recommendations for the previously-planned development. Based on discussions with you, we expect the new project will include multi-family and mixed use residential/retail structures; however, grading plans have not yet been developed for the construction of the development.

Based on our review of the referenced report and plans, the remaining recommendations in the referenced report remain applicable. We used the existing exploratory field and laboratory test data to prepare this update letter. Additional field investigation may be required when development plans are prepared. In addition, an updated geotechnical investigation report will be required when grading plans are available. Recommendations in the referenced report and this letter should be considered preliminary until we prepare an updated geotechnical investigation report when the grading plans for the project are available.

If detention basins, bioswales, retention basins, or water infiltration devices are being considered, Geocon Incorporated should be retained to provide recommendations pertaining to the geotechnical aspects of possible impacts and design. Distress may be caused to planned improvements and properties located hydrologically downstream. The distress depends on the amount of water to be detained, its residence time, soil permeability, and other factors. We have not performed a hydrogeology study at the site. Downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other impacts as a result of water infiltration. We opine the on-site soil is not conducive to infiltration based on the very dense nature of the fill and formational materials. The existing formational materials and fill soils can be classified as Hydrologic Soil Group D.

UPDATED GEOTECHNICAL INVESTIGATION

We should prepare an updated geotechnical investigation once development plans are available. The report should include recommendations for the planned development including foundations, retaining walls, seismic design criteria, and preliminary pavement design. The report should include a geologic map and geologic cross-sections, as necessary.

If you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Cristian A. Liang
Senior Staff Engineer

Shawn Foy Weedon
GE 2714

REGISTERED PROFESSIONAL ENGINEER
SHAWN WEEDON
No. 2714
Exp. 06/30/13
GEOTECHNICAL
STATE OF CALIFORNIA

CAL:SFW:dmc

(3) Addressee

FAULTING AND SEISMICITY

A review of geologic literature and experience with the soil and geologic conditions in the general area indicate that known active, potentially active, or inactive faults are not located at the site. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,000 years. The site is not located within a State of California Earthquake Fault Zone.

According to the computer program *EZ-FRISK* (Version 7.62), six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. The nearest known active faults are the Newport-Inglewood and Rose Canyon Fault system, located approximately 8 miles from the site and is the dominant source of potential ground motion. Earthquakes that might occur on the Rose Canyon Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood Fault are 7.5 and 0.33g, respectively. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Rose Canyon Fault are 6.9 and 0.26g, respectively. Table 1 lists the estimated maximum earthquake magnitude and peak ground acceleration for these and other faults in relationship to the site location. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA acceleration-attenuation relationships in our analysis.

TABLE 1
DETERMINISTIC SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood	8	7.5	0.30	0.25	0.33
Rose Canyon	8	6.9	0.25	0.23	0.26
Coronado Bank	15	7.4	0.21	0.16	0.20
Palos Verdes Connected	15	7.7	0.23	0.17	0.23
Elsinore	44	7.9	0.12	0.08	0.10
Earthquake Valley	48	6.8	0.06	0.05	0.04

It is our opinion the site could be subjected to moderate to severe ground shaking in the event of an earthquake along any of the faults listed on Table 1 or other faults in the southern California/ northern

Baja California region. We do not consider the site to possess a greater risk than that of the surrounding developments.

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2008) in the analysis. Table 2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
2% in a 50 Year Period	0.42	0.37	0.43
5% in a 50 Year Period	0.30	0.27	0.30
10% in a 50 Year Period	0.22	0.20	0.21

The California Geologic Survey (CGS) has a program that calculates the ground motion for a 10 percent of probability of exceedence in 50 years based on an average of several attenuation relationships. Table 3 presents the calculated results from the *Probabilistic Seismic Hazards Mapping Ground Motion* Page from the CGS website. The subject site is a Site Category C (soft rock).

TABLE 3
PROBABILISTIC SITE PARAMETERS FOR SELECTED FAULTS
CALIFORNIA GEOLOGIC SURVEY

Calculated Acceleration (g) Firm Rock	Calculated Acceleration (g) Soft Rock	Calculated Acceleration (g) Alluvium
0.23	0.25	0.29

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the 2010 California Building Code (CBC) guidelines or guidelines currently adopted by the City of San Diego.

SEISMIC DESIGN CRITERIA

We used the computer program *Seismic Hazard Curves and Uniform Hazard Response Spectra*, provided by the USGS. Table 4 summarizes site-specific design criteria obtained from the 2010 California Building Code (CBC; Based on the 2009 International Building Code [IBC]), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The planned buildings and improvements can be designed using a Site Class C where the fill soil is less than 20 feet or D for building pad with fill greater than 20 feet. The site class was determined in accordance with Section 1613.5.5 of the 2010 CBC.

TABLE 4
2010 CBC SEISMIC DESIGN PARAMETERS

Parameter	Values		2010 CBC Reference
Site Class	C	D	Table 1613.5.2
Fill Thickness, T (feet)	T≤20	T>20	--
Spectral Response – Class B (short), S_S	1.032g	1.032g	Figure 1613.5(3)
Spectral Response – Class B (1 sec), S_1	0.386g	0.386g	Figure 1613.5(4)
Site Coefficient, F_A	1.000	1.087	Table 1613.5.3(1)
Site Coefficient, F_V	1.414	1.629	Table 1613.5.3(2)
Maximum Considered Earthquake Spectral Response Acceleration (short), S_{MS}	1.032g	1.122g	Section 1613.5.3 (Eqn 16-36)
Maximum Considered Earthquake Spectral Response Acceleration – (1 sec), S_{M1}	0.545g	0.628g	Section 1613.5.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.688g	0.748g	Section 1613.5.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.364g	0.419g	Section 1613.5.4 (Eqn 16-39)

Conformance to the criteria in Table 4 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

FOUNDATION AND CONCRETE SLABS-ON-GRADE RECOMMENDATIONS

The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in Table 5.

TABLE 5
FOUNDATION CATEGORY CRITERIA

Foundation Category	**Maximum Fill Thickness, T (Feet)**	**Differential Fill Thickness, D (Feet)**	**Expansion Index (EI)**
I	$T<20$	--	$EI\leq 50$
II	$20\leq T<50$	$10\leq D<20$	$50<EI\leq 90$
III	$T\geq 50$	$D\geq 20$	$90<EI\leq 130$

Table 6 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 6
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	**Minimum Footing Embedment Depth (inches)**	**Continuous Footing Reinforcement**	**Interior Slab Reinforcement**
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

The embedment depths presented in Table 6 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively.

The concrete slab-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III.

Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that*

Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06). Concrete slabs on grade can be underlain by 4 inches of clean sand (3 inches for a 5-inch-thick slab. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.

The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI), Third Edition, as required by the 2010 California Building Code (CBC Section 1808.6). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented on Table 7 for the particular Foundation Category designated. The parameters presented in Table 7 are based on the guidelines presented in the PTI, Third Edition design manual.

TABLE 7
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) Third Edition Design Parameters	**Foundation Category**		
	I	**II**	**III**
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

Foundation systems for the building pads that possess a foundation Category I and a "very low" expansion potential (expansion index of 20 or less) can be designed using the method described in Section 1808 of the 2010 CBC. If post-tensioned foundations are planned, an alternative, commonly accepted design method (other than PTI Third Edition) can be used. However, the post-tensioned foundation system should be designed with a total and differential deflection of 1 inch. Geocon Incorporated should be contacted to review the plans and provide additional information, if necessary.

The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

If the structural engineer proposes a post-tensioned foundation design method other than PTI, Third Edition:

- The deflection criteria presented in Table 7 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

Our experience indicates post-tensioned slabs are susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. Current PTI design procedures primarily address the potential center lift of slabs but, because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning reduces the ability of the system to mitigate edge lift. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system.

Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces.

Isolated footings, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular foundation category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

For Foundation Category III, consideration should be given to using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

Foundation excavations should be observed by the geotechnical engineer (a representative of Geocon Incorporated) prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. If unexpected soil conditions are encountered, foundation modifications may be required.

Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in such concrete placement.

Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.
- If a swimming pool is proposed, Geocon Incorporated should be contacted to review the plans and the specific site conditions to provide additional recommendations, if necessary.
- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

The recommendations of this letter are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and, when in excess of 8 feet square, should be reinforced with 6 x 6 - W2.9/W2.9 (6 x 6 - 6/6) welded wire mesh placed in the middle of the slab to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based on the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete. Base or sand bedding is not required beneath the flatwork.

Even with the incorporation of the recommendations within this letter, exterior concrete flatwork has a potential of experiencing some movement due to swelling or settlement; therefore, welded wire mesh should overlap continuously in flatwork. Additionally, flatwork should be structurally connected to curbs, where possible.

Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

RETAINING WALLS AND LATERAL LOADS

Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 40 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal:vertical), an active soil pressure of 55 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an expansion index of 90 or less. For those buildings with finish-grade soils having an expansion index greater than 90 and/or where backfill materials do not conform to the criteria herein, Geocon Incorporated should be consulted for additional recommendations.

Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf should be added to the above active soil pressure. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted free-draining backfill material (EI of 50 or less) with no hydrostatic forces or imposed surcharge load. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

In general, wall foundations founded in properly compacted fill or formational materials should possess a minimum depth and width of one foot and may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within three feet below the base of the wall has an expansion index of 90 or less. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is expected.

The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the 2010 CBC. If the project possesses a seismic design category of D, E, or F, the proposed retaining walls should be designed with seismic lateral pressures. The seismic load exerted on the wall should be a triangular distribution with a pressure of 15H (where H is the height of the wall, in feet, resulting in pounds per square foot [psf]) exerted at the base of the wall and zero at the top of the wall. We used a peak site acceleration of 0.30g calculated from Section 1803.5.12 of the 2010 California Building Code (S_{DS}/2.5) and applying a pseudo-static coefficient of 0.5.

Footings that must be placed within seven feet of the top of slopes should be extended in depth such that the outer bottom edge of the footing is at least seven feet horizontally inside the face of the slope.

To resist lateral loads, a passive pressure exerted by an equivalent fluid weight of 350 pounds per cubic foot (pcf) should be used for the design of footings or shear keys poured neat in compacted fill. The passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.4 should be used for design.

The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet or other types of walls are planned, such as crib-type walls, Geocon Incorporated should be consulted for additional recommendations.

SITE DRAINAGE AND MOISTURE PROTECTION

Adequate site drainage is critical to reduce the potential for differential soil movement, erosion, and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures and the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The wall drains should extend to groundwater levels near the base of the wall. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

GEOCON
INCORPORATED

GEOTECHNICAL
CONSULTANTS

GEOTECHNICAL INVESTIGATION

CANDLELIGHT VILLAS – PHASE 1
SAN DIEGO, CALIFORNIA

PREPARED FOR

D. R. HORTON,
WESTERN PACIFIC HOUSING SERIES
CARLSBAD, CALIFORNIA

JUNE 2, 2004

GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS

Project No. 07177-52-02
June 2, 2004

D. R. Horton, Western Pacific Housing Series
5790 Fleet Street, Suite 210
Carlsbad, California 92009

Attention: Mr. Kurt Bausback

Subject: CANDLELIGHT VILLAS – PHASE 1
SAN DIEGO, CALIFORNIA
GEOTECHNICAL INVESTIGATION

Gentlemen:

In accordance with your request, and authorization of our Proposal No. LG-04005, we herein present the results of our geotechnical investigation for the subject project. The purpose of the investigation was to observe the soil and geologic conditions that may impact site development. The accompanying report presents the findings of our study and conclusions and recommendations pertaining to the geotechnical aspects of developing a residential subdivision on the property. Based on the results of our study, it is our opinion that the site is suitable for the proposed development, provided the recommendations of this report are followed.

Should you have any questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Ali Sadr
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GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed development of a multi-family residential subdivision, Candlelight Phase 1, located in the Otay Mesa area of San Diego, California (see *Vicinity Map*, Figure 1). The purpose of the study was to evaluate the soil and geologic conditions at the site and based on conditions encountered, provide recommendations for design and construction of the proposed development.

The scope of this investigation included a review of readily available published and unpublished geologic literature (see *List of References*). A field investigation was conducted for the entire Candlelight property that included the excavation of 27 backhoe trenches to a maximum depth of approximately 12 feet. The trench logs are presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the field investigation to evaluate pertinent physical properties for engineering analyses and to assist in providing recommendations for site grading and foundation design criteria. Details of the laboratory testing and a summary of the test results are presented in Appendix B.

The recommendations presented herein are based on analyses and data obtained from our exploratory excavations, laboratory tests, and our experience with similar soil and geologic conditions. The base map used for this study consists of a conceptual grading plan, 1 inch equals 60 feet, prepared by Hunsaker and Associates, undated (see Figures 2 and 3, map pocket).

2. SITE AND PROJECT DESCRIPTION

Phase 1 comprises the eastern portion of an elongate-shaped site, consisting of approximately 54 acres of undeveloped, cultivated farmland located in the Otay Mesa area, east of San Ysidro and south of U.S. Highway 905 (see *Vicinity Map*, Figure 1). The site is bound on the northern, eastern, and southern sides by undeveloped agricultural properties. Vacant land that will be developed during Phase 2 is located to the west of the site. It is our understanding that this vacant land will be used as borrow site for the current development.

Topographically, the property is characterized by mesa land with nearly flat to gently inclined ground surfaces over most of the site. A canyon drainage borders the eastern margin of the property and an eastern berm approximately 10-foot-high and 20-foot-wide is present along the majority of the site parameter. The majority of the site generally drains gently south and westward and eventually drains into the Tijuana River in Baja California, Mexico. Ground surfaces over much of the property are smooth and essentially featureless because of cultivation over many years. Site elevations vary from a high of approximately 532 feet Mean Sea Level (MSL) along the northern boundary to a low of approximately 410 feet MSL in the southwestern corner of the site.

Vegetation types consist of annual grasses or herbaceous plants disturbed by cultivation and former agricultural activity. Review of aerial photographs indicates the site was previously stripped of vegetation and has been seasonally cultivated. Existing manmade improvements include unimproved dirt roads and fills related to berms.

A review of the conceptual grading plan for Phase 1 indicates that the site will be graded to receive 68 multi-family building pads with associated streets and improvements. As mentioned above, the plans also indicate that Phase 2 will be utilized as borrow site. The grading of Phase 1 will result in maximum fills and cuts of approximately 22 and 7 feet, respectively. The cut and fill slopes planned for the project will be constructed at maximum heights of 5 and 25 feet, respectively, with 2:1 (horizontal: vertical) inclinations.

The above locations and descriptions are based on our site reconnaissance and a review of published geologic literature and the above-referenced grading plan. If property boundaries change from those shown on the geologic map, Geocon Incorporated should be contacted for review of plans and possible revisions to this report.

3. SOIL AND GEOLOGIC CONDITIONS

3.1 General

Two geologic formations and three surficial soil types were encountered during the investigation. Tertiary-age San Diego Formation and the Quaternary-age Terrace Deposits were encountered within the exploratory excavations, underling the surficial units of undocumented fill, topsoil and alluvium. The formational units and surficial materials are discussed below in order of increasing age. The approximate lateral extent of the formations and surficial soils is presented on the *Geologic Map*, Figures 2 and 3 (map pocket). Figure 4 depicts Geologic Cross Section A-A′.

3.2 Undocumented Fill (Qudf)

Undocumented fills exist mainly as large berms along the perimeter of the property and within an area at the west end of the property (see Figures 2 and 3). The fill is estimated to range from approximately 10 to 15 feet in thickness and generally consists of loose, very porous, clayey, sandy soil and may contain some trash and debris. The undocumented fill in its present condition is not suitable for support of structural loading, fill and/or surface improvements. Undocumented fill within planned areas of grading will require remedial grading. Spreading of the undocumented fill and removal of the unsuitable materials will be required prior to reusing this material as compacted fill.

3.3 Topsoil (unmapped)

A blanket of topsoil covers the entire site. The thickness of topsoil encountered in the excavations is approximately 2 to 4 feet. The topsoil is characterized as soft to firm and loose, dry to damp, dark brown, sandy clays and clayey sands derived from the underlying formations. The clayey portion of the topsoil typically possesses a "high" expansion potential. Removal and compaction of the topsoil will be necessary in areas to receive fill or structures. Due to the relatively thin thickness, topsoil is not shown on the *Geologic Map*, Figures 2 and 3.

3.4 Alluvium (Qal)

Alluvium is present within the natural drainage on the eastern and southwestern portion of the site. The maximum thickness of alluvium encountered was approximately 8 feet in Trench No. T-4. These alluvial soils are generally comprised of firm, moist, dark brown, sandy clay or clayey sand. The alluvium is compressible in its present condition and will require remedial grading within areas of planned development.

3.5 Terrace Deposits (Qtc and Qtg)

Quaternary-aged Terrace Deposits cap almost the entire mesa (see *Geologic Map*, Figures 2 and 3). These deposits are subdivided on the *Geologic Map* into two members. The upper Terrace Deposit member consists of a highly expansive clay deposit designated as Qtc. A medium-dense to dense, granular conglomeratic member (Qtg) underlies the clay. Each member is described below.

Terrace Deposit clay (Qtc) was encountered across a majority of the site. The thickness of clay encountered in the exploratory excavations ranged between 3 to 9 feet. This member primarily consists of stiff, moist, dark brown to olive, silty to sandy clay. The clay typically possesses highly expansive characteristics. The clay will require remedial grading in the form of removal and replacement with "low" expansive materials.

Terrace Deposits gravel (Qtg) is present below the terrace clay and consists of dense to very dense inter-bedded reddish-brown, clayey gravel and gravelly sands. This unit can be massive to horizontal bedding with approximate horizontal imbrications of gravel clasts and thin horizontal cobble layers. Interbedded horizontally laminated sand layers may also be present. Gravel clasts typically consist of rounded to subrounded volcanic, metasedimentary and granitic rock that varies in size with an estimated maximum diameter of approximately 30-inch. Differences in thickness of this unit are interpreted as ground-surface erosional variations and very irregular, disconformable contact with the underlying Tertiary-age San Diego Formation.

Excavation of the Terrace Deposit gravel will require moderate to heavy effort with conventional heavy-duty earth-moving equipment. Cobbles and boulders within the deposit generally increase in size with depth. In general, this unit consists of gravelly sand with approximately 30 percent or less cobble. This unit should provide "low" expansive capping material. Oversized boulders may require special handling and placement, as recommended in concluding sections of this report. Larger than normal excavators may be required for deeper utility trenches within this unit.

3.6 San Diego Formation (Tsd)

The Tertiary-aged (Pliocene) San Diego Formation was encountered below the Terrace Deposits and is exposed beyond the property boundary. These materials consist of massively bedded, well-sorted, fine-grained sandstones with some scattered cobble and gravel lenses. In general, the sediments of the San Diego Formation exhibit adequate shear strength and "very low" to "low" expansion characteristics.

4. GEOLOGIC STRUCTURE

Bedding and formational contact attitudes observed during the reconnaissance are mostly horizontal, exceptions being localized undulations and cross-laminations within a horizontally bedded unit. The coarse conglomeratic portions of the Terrace Deposits gravel (Qtg) are typically massive with few discernible attitudes, other than approximately horizontal imbrications of conglomerate clasts. Based on observations, adverse geologic structures do not present a significant hazard to development. During grading, however, cut slopes should be evaluated by an engineering geologist to verify the exposed geology and provide additional recommendations, if warranted.

5. GROUNDWATER

No groundwater seepage or springs were observed during our site reconnaissance. Each of the geologic units observed on the site has permeability characteristics that might be susceptible under certain conditions to water seepage. During the rainy season, perched water conditions are likely to develop within the drainage areas and may require special consideration to minimize construction difficulties.

6. GEOLOGIC HAZARDS

6.1 Faulting and Seismicity

Review of the *City of San Diego Seismic Safety Study, Geologic Hazards and Faults,* Sheet No. 3, 1995 edition, indicates the site is designated Geologic Hazard Categories 53 and 27. Category 53 is described as *Level or sloping terrain, unfavorable geologic structure, low to moderate risk* and Category 27 is described as *Otay, Sweetwater and others.*

No active, potentially active, or inactive faults are known to exist on the site. Reconnaissance mapping and review of published geologic maps and reports indicate the site is not located on any known *active* fault trace. Discontinuous fault strands of a *Potentially Active, inactive, presumed inactive or activity unknown* are mapped approximately 1,500 feet east of the site on the City of San Diego Seismic Safety Study. Projection of the strikes of these faults does not extend across the site. The Rose Canyon Fault is the nearest active fault, located approximately 8 miles northwest of the site.

The distance of known active faults to the site was determined from the computer program *EQFAULT* (Blake, 1989a, updated 2000). Principal references used by EQFAULT in selecting faults to be included were Jennings (1994), Anderson (1984), and Wesnousky (1986). The program also estimates ground accelerations at the site for the maximum seismic event. Attenuation relationships by Sadigh, et al. (1997), were used in the analysis.

The results of the deterministic analyses indicate that the Rose Canyon and Coronado Banks Faults are the dominant sources of potential ground motion at the site. Earthquakes having a maximum earthquake Magnitude of 7.2 and 7.4 are considered representative of the potential for seismic ground shaking at the site. The "maximum credible earthquake" is defined as the maximum earthquake that seems possible of occurring under the presently known tectonic framework (California Geological Survey, Number 43). The estimated maximum peak ground acceleration from the Rose Canyon Fault is approximately 0.30 g. Presented in Table 6.1 are the earthquake events and site accelerations based on attenuation relationships of Sadigh, et al. (1997), for the faults considered most likely to subject the site to ground shaking.

TABLE 6.1
DETERMINISTIC SITE PARAMETERS FOR SELECTED ACTIVE FAULTS

Fault Name	Distance From Site (miles)	Maximum Credible Magnitude	Maximum Credible Site Accelerations (g)
Rose Canyon	8	7.2	0.30 g
Coronado Bank	15	7.4	0.23 g
Elsinore-Julian	45	7.1	0.05 g
Newport-Inglewood (Offshore)	47	6.9	0.04 g
Elsinore-Coyote Mountain	48	6.8	0.03 g
Earthquake Valley	49	6.5	0.03 g

The site could be subjected to moderate to severe ground shaking in the event of a major earthquake on any of the above listed faults or other regional active faults in the southern California area. Structures for the site should be constructed in accordance with current UBC seismic codes and local ordinances.

6.2 Liquefaction

Liquefaction typically occurs when a site is located in a zone with seismic activity, onsite soils are cohesionless, groundwater is encountered within 50 feet of the surface, and soil densities are less than about 70 percent of the maximum dry densities. If all four previous criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations. The potential for liquefaction occurring at the site is considered to be "very low" due to the recommended remedial grading, lack of a near-surface permanent groundwater condition, and the dense nature of the formational materials.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 No soil or geologic conditions were observed that would preclude the development of the property as presently planned. It is our opinion that development of the site for the construction of residential structures utilizing conventional slab-on-grade foundations is considered feasible.

7.1.2 The surficial soils consisting of undocumented fill, alluvium and topsoil are not considered suitable for the support of fill or structural loads in their present condition and will require remedial grading in the form of removal, moisture conditioning as necessary, and compaction. The formational deposits, with the exception of the Terrace Deposits clays, are suitable for support of properly compacted fill or structural loads; however, the clays will require processing, moisture conditioning as necessary, and compaction.

7.1.3 Highly expansive clays of the upper portion of the Terrace Deposit exist across the majority of the site. It is anticipated that the clay varies in thickness from approximately 3 to 8 feet. Laboratory Expansion Index (EI) testing of these materials typically indicated highly expansive soils (EI greater than 90). Materials with an Expansion Index greater than 90 are not recommended to be placed or left in place within 5 feet of finish-grade elevations as they may result in soil heave and subsequent structural distress. Remedial grading in the form of mining the underlying sands and gravels and burying the clays and/or mixing with the sand and gravel to generate an acceptable finish-grade Expansion Index below 90 will be required.

7.2 Groundwater

7.2.1 The geologic units encountered on the site have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to water seepage. Since no springs, seeps or groundwater occurrences were encountered within the areas of proposed development during our field investigation, it is our opinion that the seepage potential for the geologic units is relatively low. It is recommended, however, that periodic observations be made by the geotechnical engineer or engineering geologist during grading and/or construction for the presence of groundwater.

7.3 Soil and Excavation Characteristics

7.3.1 The soil conditions encountered varied from highly expansive clays of the upper Terrace Deposit clays (Qtc) to very low expansive sands and gravels of the Terrace Deposit gravels (Qtg).

7.3.2 It is anticipated that surficial deposits (undocumented fill, alluvium and topsoil) and the Terrace Deposit clays can be excavated with a light to moderate effort with conventional heavy-duty grading equipment. A greater effort is anticipated to efficiently excavate the underlying Terrace Deposit gravels.

7.3.3 Terrace Deposits gravel or cemented zones that underlie the clay consist of medium-dense sands with localized cemented layers to very dense cobble and gravel with the percentage of gravel and size of cobbles typically increasing with depth. Excavations that extend into the larger boulders and strongly cemented sandstone zones will require a greater excavation effort. Deep utility excavations may require the use of a larger excavator (such as a Caterpillar 375) to efficiently dig the gravel deposit. Mine areas to generate low expansive soils, if extended into cobble zones, will require deep ripping with a large bulldozer (D9 or larger). In addition, larger cobbles and boulders (greater than 12 inches) should not be placed within 3 feet of finish grade.

7.3.4 Water-soluble sulfate testing was performed on selected soil samples. Test results indicate "negligible" water-soluble exposure based on Table 19-A-4 of the Uniform Building Code (UBC). It should be noted that the presence of water-soluble sulfates is not a visually discernible characteristic. Therefore, soil sampling before and after grading could yield different concentrations. Over time, landscaping activities (e.g., addition of fertilizers and other soil nutrients) or chemicals within the local water supply may affect the sulfate concentration.

7.3.5 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, it is recommended that further evaluation by a corrosion engineer be performed if improvements are planned that are susceptible to corrosion.

7.4 Grading

7.4.1 All grading should be performed in accordance with the City of San Diego Grading Ordinance and the *Recommended Grading Specifications* contained in Appendix C. Where the recommendations of Appendix C conflict with this report, the recommendations of this report should take precedence.

7.4.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and the grading plans can be discussed at that time.

7.4.3 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and site demolition should be exported from the site.

7.4.4 All potentially compressible surficial soils (topsoil, alluvium and undocumented fill) within areas of planned grading should be removed to expose dense formational materials prior to placing fill. The actual extent of unsuitable soil removals should be determined in the field during grading by the geotechnical engineer or engineering geologist. Overly wet, surficial materials will require drying or mixing with drier soils to facilitate proper compaction.

7.4.5 Remedial grading of the Terrace Deposit clays will be required, consisting of undercutting to a depth such that the top of the clay is at least 5 feet from finish grade. This may require mining non-clay areas to create sufficient volume to bury the clay. Undercutting of streets should also be considered to the lowest utility to remove the clays.

7.4.6 The site should be brought to final grade elevations with structural fill compacted in layers. In general, soils native to the site are suitable for re-use as fill if free from vegetation, debris and other deleterious material. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill, including backfill and scarified ground surfaces, should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density at slightly above optimum moisture content, as determined in accordance with ASTM Test Procedure D 1557-02. Fill materials below optimum moisture content may require additional moisture conditioning prior to placing additional fill.

7.4.7 To provide uniform bearing conditions on lots where cut-fill transitions occur, it is recommended that the cut portion be undercut to a depth of at least 3 feet and replaced with properly compacted low-expansive fill. In addition, a minimum of 5 feet undercut will be required for the Terrace Deposits clays.

7.5 Slope Stability

7.5.1 Slope stability analysis utilizing average drained direct shear strength parameters, based on laboratory testing and our experience with similar soil types in nearby areas, indicates that the proposed fill slopes should have calculated factors of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions if constructed of granular soils. Deep-seated slope stability and surficial slope stability calculations are presented on Figures 5 and 6.

7.5.2 No significant cut slopes (proposed heights less than 5 feet) are planned for the project.

7.5.3 The outer 15 feet (or a distance equal to the height of the slope, whichever is less) of fill slopes should be composed of properly compacted granular "soil" fill to reduce the potential for surficial sloughing. In general, soils with an Expansion Index of less than 90 and at least 35 percent sand-size particles should be acceptable as "granular" fill. Soils to be used to construct the planned fill slopes should be tested in the laboratory for acceptable shear strength. The use of cohesionless soils in the outer portion of fill slopes should be avoided.

7.5.4 All soil fill slopes should be overbuilt at least 3 feet horizontally and cut to the design finish grade. As an alternative, fill slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished slope.

7.5.5 All slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion.

7.6 Earthwork Grading Factors

7.6.1 Estimates of embankment shrink-swell factors are based on comparing laboratory compaction tests with the density of the material in its natural state and on experience with similar soil types. Variations in natural soil density as well as in compacted fill render shrinkage value estimates very approximate. As an example, the contractor can compact fills to any relative compaction of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has at least a 10 percent range of control over the fill volume. Based on the work performed to date and considering the above discussion, the following earthwork factors may be used as a basis for estimating how much the on-site soils may shrink or bulk when removed from their natural state and placed in compacted fills.

TABLE 7.6

Soils Unit	Shrink-Bulk Factors
Surficial Soils	10 to 15 Percent Shrinkage
Formational Materials	3 to 6 Percent Bulk

7.7 Seismic Design Criteria

7.7.1 Table 7.7 summarizes seismic design parameters obtained from the Uniform Building Code (UBC) Table 16-J for two different Soil Profile Types, S_C, and S_D, which are prevalent on this project. A summary of the Soil Profile Type for each lot based on fill depth should be provided in the final report of grading. The corresponding parameters listed on Table 7.7 should be used for seismic design. The values listed are for the Rose Canyon Fault, which is identified as a Type B fault and is more dominant than the nearest Type A fault due to its proximity to the site. The Rose Canyon Fault is located approximately 8 miles west of the site.

TABLE 7.7
SEISMIC DESIGN PARAMETERS

Parameter	S_C	S_D	UBC Reference
Seismic Zone Factor	0.40	0.40	Table 16-I
Soil Profile Type	S_C	S_D	Table 16-J
Seismic Coefficient, C_a	0.40	0.44	Table 16-Q
Seismic Coefficient, C_v	0.56	0.64	Table 16-R
Near-Source Factor, N_a	1.0	1.0	Table 16-S
Near Source Factor, N_v	1.0	1.0	Table 16-T
Seismic Source	B	B	Table 16-U

7.8 Foundations and Concrete Slab-on-Grade Recommendations

7.8.1 The following foundation recommendations are for one- or two-story residential structures and are separated into categories dependent on the thickness and geometry of the underlying fill soils as well as the Expansion Index of the prevailing subgrade soils of a particular building pad (or lot). The recommended minimum foundation and interior concrete slab design criteria for each category is presented on Table 7.8.1.

7.8.2 Foundations for Category I, II or III may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) dead plus live load. This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces.

TABLE 7.8.1
FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars two top and two bottom	No. 3 bars at 18 inches on center, both directions

CATEGORY CRITERIA

Category I:	Maximum fill thickness is less than 20 feet and Expansion Index is less than or equal to 50.
Category II:	Maximum fill thickness is less than 50 feet and Expansion Index is less than or equal to 90, or variation in fill thickness is between 10 feet and 20 feet.
Category III:	Fill thickness exceeds 50 feet, variation in fill thickness exceeds 20 feet, or Expansion Index exceeds 90 but is less than 130.

Notes:

1. All footings should have a minimum width of 12 inches.
2. Footing depth is measured from lowest adjacent subgrade.
3. All interior living area concrete slabs should be at least four inches thick for Categories I and II and 5 inches thick for Category III.
4. All interior concrete slabs should be underlain by at least 4 inches (3 inches for a 5-inch slab) of clean sand or crushed rock.
5. All slabs expected to receive moisture-sensitive floor coverings or used to store moisture-sensitive materials should be underlain by a vapor barrier covered with at least 2 inches of the clean sand recommended in No. 4 above.

7.8.3 The use of isolated footings that are located beyond the perimeter of the building and support structural elements connected to the building is not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

7.8.4 For Foundation Category III, consideration should be given to using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. In addition, consideration should be given to connecting patio slabs that exceed 5 feet in width to the building foundation to reduce the potential for future separation.

7.8.5 No special subgrade presaturation is deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soils should be sprinkled, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

7.8.6 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally inside the face of the slope.
- Where the height of the fill slope exceeds 20 feet, the minimum horizontal distance should be increased to H/3 (where H equals the vertical distance from the top of the slope to the toe) but need not exceed 40 feet. For composite (fill over cut) slopes, H equals the vertical distance from the top of the slope to the bottom of the fill portion of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.
- For cut slopes in dense formational materials, or fill slopes inclined at 3:1 (horizontal:vertical) or flatter, the bottom outside edge of building footings should be at least 7 feet horizontally from the face of the slope, regardless of slope height.
- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, it is recommended that the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements that are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

7.8.7 As an alternative to the foundation recommendations for each category, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (UBC Section 1816). Although this procedure was developed for expansive soils, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented on Table 7.8.2 for the particular foundation category designated. Our experience indicates that, unless reinforcing steel is placed at the bottom of perimeter footings and interior stiffener beams, post-tensioned slabs are susceptible to excessive edge lift, regardless of underlying soil conditions. Current PTI design procedures primarily address the potential for center lift of slabs but, because of the placement of the reinforcing tendons in the top of the slab, the resulting stress eccentricity after tensioning reduces the ability of the system to mitigate edge lift.

TABLE 7.8.2
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) Design Parameters	Foundation Category		
	I	II	III
1. Thornthwaite Index	-20	-20	-20
2. Clay Type—Montmorillonite	Yes	Yes	Yes
3. Clay Portion (Maximum)	30%	50%	70%
4. Depth to Constant Soil Suction	7.0 ft.	7.0 ft.	7.0 ft.
5. Soil Suction	3.6 ft.	3.6 ft.	3.6 ft.
6. Moisture Velocity	0.7 in./mo.	0.7 in./mo.	0.7 in./mo.
7. Edge Lift Moisture Variation Distance	2.6 ft.	2.6 ft.	2.6 ft.
8. Edge Lift	0.41 in.	0.78 in.	1.15 in.
9. Center Lift Moisture Variation Distance	5.3 ft.	5.3 ft.	5.3 ft.
10. Center Lift	2.12 in.	3.21 in.	4.74 in.

7.8.8 The UBC Section 1816 uses interior stiffener beams in its structural design procedures. If the structural engineer proposes a post-tensioned foundation design method other than

UBC Section 1816, it is recommended that interior stiffener beams be used for Foundation Categories II and III. The depth of the perimeter foundation should be at least 12 inches for Foundation Category I. Where the Expansion Index for a particular building pad exceeds 50 but is less than 91, the perimeter footing depth should be at least 18 inches, and where it exceeds 90 but is less than 130, the perimeter footing depth should be at least 24 inches. Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

7.8.9 The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting anticipated loads.

7.8.10 All exterior concrete flatwork not subject to vehicular traffic should be a minimum of 4 inches thick and when in excess of 8 feet square should be reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh to reduce the potential for cracking.

7.8.11 Where exterior flatwork abuts the structure at entrant or exit areas, the exterior slab should be dowelled into the structure's foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer.

7.8.12 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soils (if present), differential settlement of deep fills, or fills of varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and the placement of crack-control joints at periodic intervals, particularly where re-entrant slab corners occur.

7.9 Retaining Walls and Lateral Loads

7.9.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal:vertical), an active soil pressure of 45 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an Expansion Index of less than 90. For those lots with finish grade soils having an Expansion Index greater than 90 and/or where backfill materials do not conform to the above criteria, Geocon Incorporated should be consulted for additional recommendations.

7.9.2 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf should be added to the above active soil pressure.

7.9.3 All retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely impact the property adjacent to the base of the wall. A typical retaining wall drainage detail is presented on Figure 7. The above recommendations assume a properly compacted granular (Expansion Index less than 90) backfill material with no hydrostatic forces or imposed surcharge load. If conditions different than those described are anticipated or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

7.9.4 In general, wall foundations having a minimum depth and width of 1 foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within 4 feet below the base of the wall has an Expansion Index of less than 50. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is anticipated.

7.9.5 For resistance to lateral loads, an allowable passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed natural soils. The allowable passive pressure assumes a horizontal surface extending away from the base of the wall at least 5 feet or three times the height of the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. An allowable friction coefficient of 0.4 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the allowable passive earth pressure when determining resistance to lateral loads.

7.9.6 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet or other types of walls (such as crib-type walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

7.10 Drainage and Maintenance

7.10.1 Establishing proper drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Positive measures should be taken to properly finish-grade the building pads after the structures and other improvements are in place so that the drainage water from the lots and adjacent properties are directed off the lots and to the street away from foundations and the top of the slopes. Experience has shown that even with these provisions, a shallow groundwater or subsurface water condition can and may develop in areas where no such water conditions existed prior to the site development; this is particularly true where a substantial increase in surface water infiltration results from an increase in landscape irrigation.

7.10.2 All underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks for early detection of water infiltration and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for a prolonged period.

7.10.3 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Surface drains to collect excess irrigation water and transmit it to drainage structures, or impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the pavement, a cutoff wall should be provided along the edge of the pavement and should extend at least 6 inches below the bottom of the base material.

7.11 Plan Review

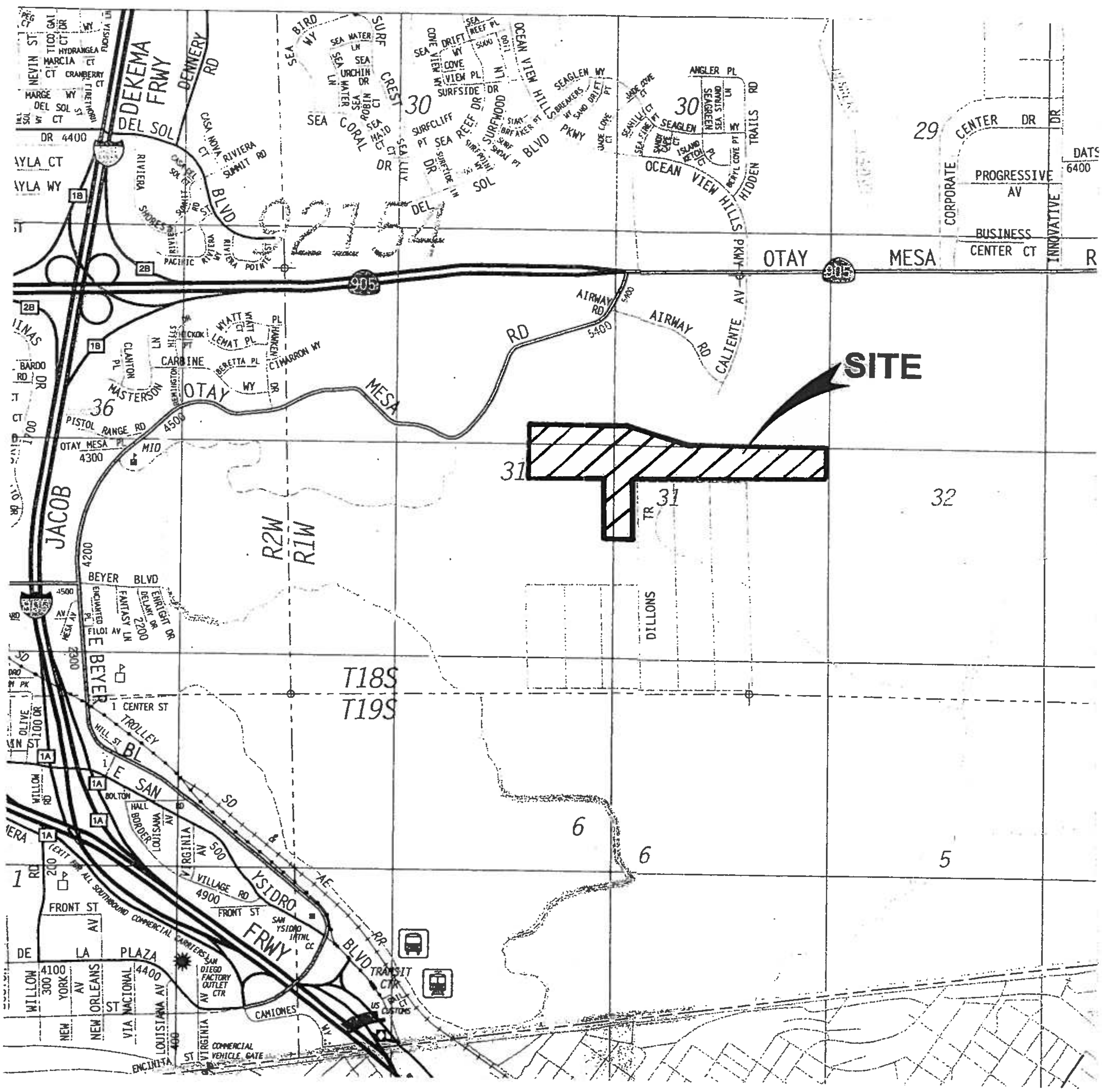
7.11.1 A review of the grading and foundation plans should be performed prior to finalization to verify their compliance with the recommendations of this report and determine the need for additional comments, recommendations and/or analysis.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



SOURCE: 2004 THOMAS BROS. MAP
SAN DIEGO COUNTY, CALIFORNIA

N
NO SCALE

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

AS/AML | DSK/E0000

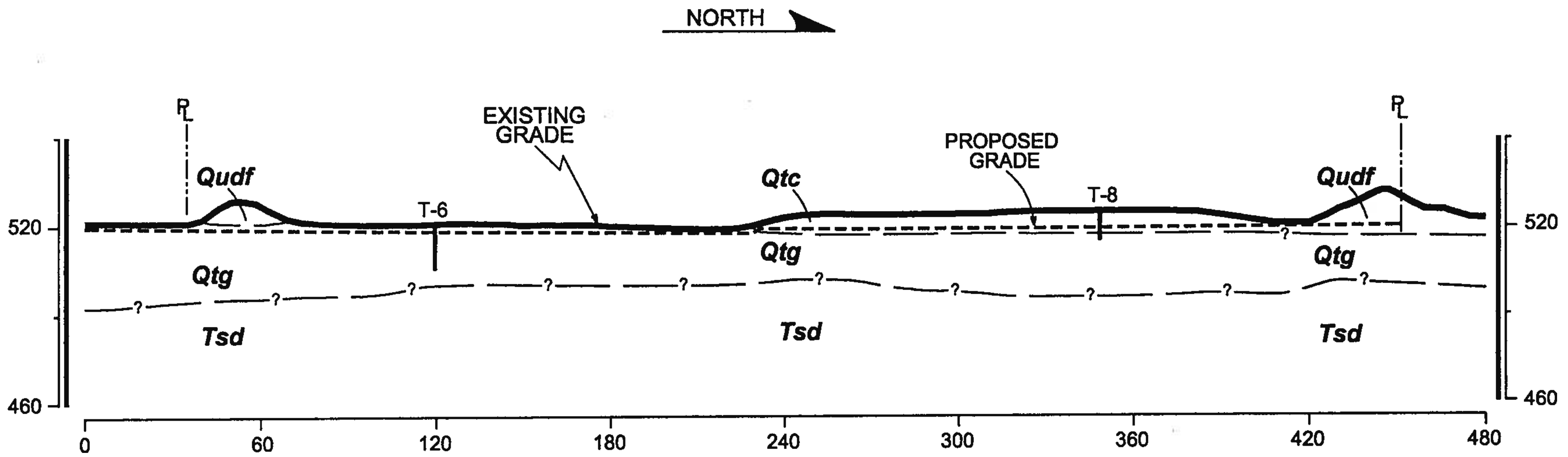
VICINITY MAP

CANDLELIGHT VILLAS PHASE 1
SAN DIEGO, CALIFORNIA

DATE 06-02-2004 | PROJECT NO. 07177 - 52 - 02 | FIG. 1

E:/GEOTECH/PLATE/GVICMP.DWG/aml

CANDLELIGHT VILLAS PHASE 1
SAN DIEGO, CALIFORNIA



GEOLOGIC CROSS - SECTION A-A'

SCALE 1"=60' (HORIZ. = VERT.)

GEOCON LEGEND

Qudf	........UNDOCUMENTED FILL
Qtc	........TERRACE DEPOSITS - CLAYEY MEMBER
Qtg	........TERRACE DEPOSITS - CONGLOMERATE MEMBER
Tsd	........SAN DIEGO FORMATION

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PROJECT NO. 07177 - 52 - 02
FIGURE 4
DATE 06 - 02 - 2004

ASSUMED CONDITIONS:

Slope Height	$H = 25$ feet
Slope Inclination	2:1 (Horizontal:Vertical)
Total Unit Weight of Soil	$\gamma_t = 125$ pounds per cubic foot
Angle of Internal Friction	$\phi = 25$ degrees
Apparent Cohesion	$C = 250$ pounds per square foot
No Seepage Forces	

ANALYSIS:

$\lambda_{c\phi} = \dfrac{\gamma H \tan\phi}{C}$ Equation (3-3), Reference 1

$FS = \dfrac{N_{cf} C}{\gamma H}$ Equation (3-2), Reference 1

$\lambda_{c\phi} = 6$ Calculated Using Eq. (3-3)

$N_{cf} = 24$ Determined Using Figure 10, Reference 2

$FS = 1.9$ Factor of Safety Calculated Using Eq. (3-2)

REFERENCES:

(1) Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954.

(2) Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS — FILL SLOPES

CANDLELIGHT VILLAS – PHASE 1

SAN DIEGO, CALIFORNIA

FIGURE 5

ASSUMED CONDITIONS:

Slope Height	H	=	Infinite	
Depth of Saturation	Z	=	3	feet
Slope Inclination	2:1	(Horizontal:Vertical)		
Slope Angle	i	=	26.6	degrees
Unit Weight of Water	γ_w	=	62.4	pounds per cubic foot
Total Unit Weight of Soil	γ_t	=	125	pounds per cubic foot
Angle of Internal Friction	ϕ	=	25	degrees
Apparent Cohesion	C	=	250	pounds per square foot

Slope saturated to vertical depth Z below slope face.
Seepage forces parallel to slope face

ANALYSIS:

$$FS = \frac{C + (\gamma_t - \gamma_w) Z \cos^2 i \tan \phi}{\gamma_t Z \sin i \cos i} = 2.1$$

REFERENCES:

(1) Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage,* Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62.

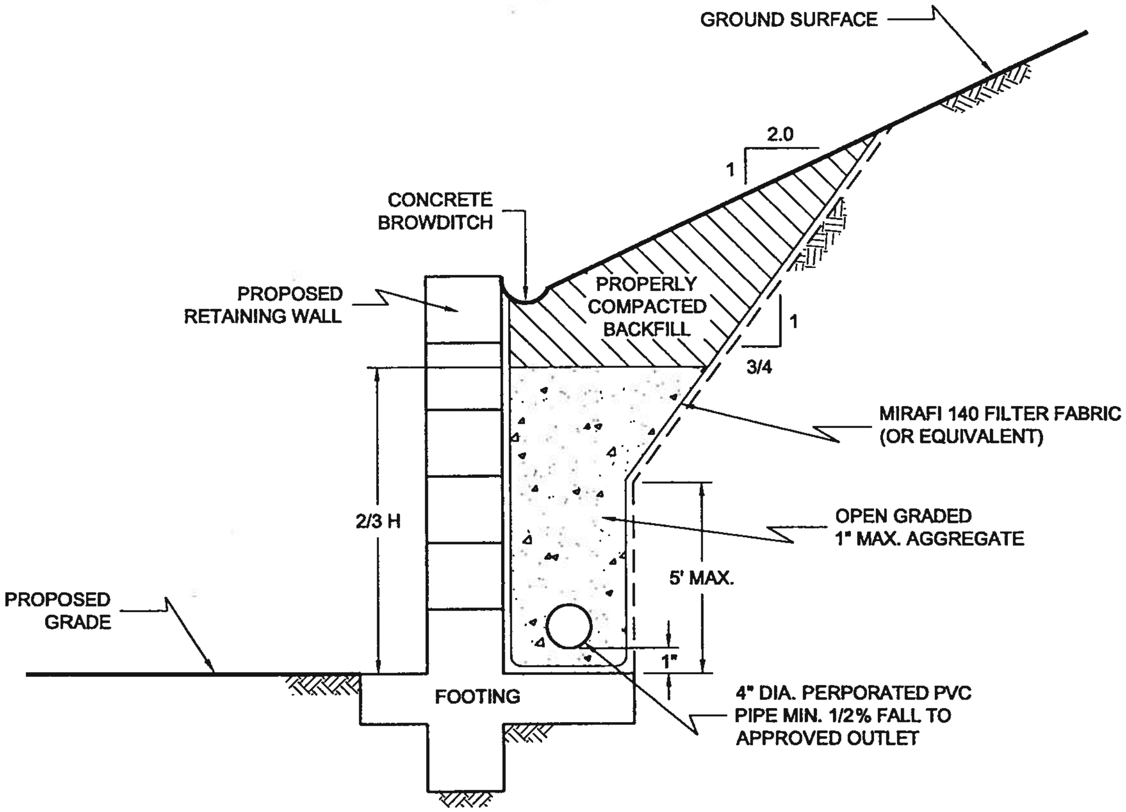
(2) Skempton, A. W., and F. A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81.

SURFICIAL SLOPE STABILITY ANALYSIS

CANDLELIGHT VILLAS – PHASE 1

SAN DIEGO, CALIFORNIA

FIGURE 6



NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

GEOCON
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GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
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SAN DIEGO, CALIFORNIA

SR/RA		DSK/E0000	DATE 06 - 02 - 2004	PROJECT NO. 07177 - 52 - 02	FIG. 7

RWDDLDWG/ra

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

Our field investigation was performed on January 12 and 13, 2004, and consisted of a site reconnaissance and the excavation of 27 exploratory trenches. The exploratory trenches were excavated to maximum depths of approximately 12 feet using a John Deere 555 trackhoe. As trenching proceeded, the soil and geologic conditions encountered were logged and sampled.

The soil conditions encountered in the excavations were visually examined, classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for *Description and Identification of Soils* (Visual-Manual Procedure D2488). Logs of the trenches are presented on Figures A-1 through A-27. The logs depict the general soil and geologic conditions encountered and the depth at which samples were obtained. The approximate locations of the trench excavations are shown on the *Geologic Map*, Figures 2 and 3 (map pocket).

TRENCH T 1

ELEV. (MSL.) 496 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**TOPSOIL** Firm, damp, red brown, Clayey SAND; trace silt			
2				CL	Firm, damp, brown, fine to medium, Sandy CLAY; increasing fine to medium sand at 3 feet			
4				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium grained, Clayey SAND; some subrounded gravel, cobbles and boulders to maximum 24-inches			
					TRENCH TERMINATED AT 5 FEET No groundwater encountered Backfilled			

Figure A-1,
Log of Trench T 1, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

▨ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◪ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 2

ELEV. (MSL.) 503 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**ALLUVIUM** Firm, damp, dark brown, Silty CLAY; upper 1 foot disced			
2	T2-1			CL	Firm, damp, dark brown,Silty CLAY; with trace white secondary mineral growths			
4	T2-2			SM	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium, Silty SAND; some subrounded gravel, cobbles and boulders to maximum 14-inches			
6								
8					- Increase in gravel, cobbles and boulders at 9 feet			
10								
					TRENCH TERMINATED AT 11 FEET No groundwater encountered Backfilled			

Figure A-2, Log of Trench T 2, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 3

ELEV. (MSL.) 518 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY; upper 1 foot disced			
2								
					TERRACE DEPOSITS -CONGLOMERATE MEMBER Medium dense, damp, medium brown, fine to medium, Clayey SAND; some subrounded gravel, cobbles and boulders to maximum 14-inch			
4								
6				SC				
8								
10					- Trace gravel, cobbles and boulders			
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled			

Figure A-3,
Log of Trench T 3, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 4

ELEV. (MSL.) 507 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**ALLUVIUM** Firm, damp, brown, Silty CLAY			
		▨			Firm, damp, dark brown, Silty CLAY			
2	T4-1 ⊠	▨						
4		▨		CL				
6		▨		ML	Firm, damp, brown, Clayey SILT			
8	T4-2 ⊠	▒		SM	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, fine to medium grained, Silty SANDSTONE; massive, weakly cemented			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled			

Figure A-4,
Log of Trench T 4, Page 1 of 1

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 5

ELEV. (MSL.) **513** DATE COMPLETED **01-12-2004**

EQUIPMENT **JD 510**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				SC	**TOPSOIL** Loose, moist, brown, Clayey, fine to medium SAND with some gravel			
4				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, brown, fine to medium, Clayey SAND; trace gravel, cobbles and boulders			
6				GP	Becomes Gravel, Cobbles and Boulders to maximum 24-inches			
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled			

Figure A-5,
Log of Trench T 5, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 6

ELEV. (MSL.) 521 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2	T6-1			CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
4 6	T6-2			SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Loose, damp, yellow brown, fine to medium, Clayey SAND; trace subrounded gravel, cobbles and boulders to 14-inches			
8 10				GP	Becomes Gravel, Cobbles and Boulders			
					TRENCH TERMINATED AT 10½ FEET No groundwater encountered Backfilled			

Figure A-6,
Log of Trench T 6, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 7

ELEV. (MSL.) 527 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2	T7-1			CL	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, dark brown, Silty CLAY			
4								
6				SP	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Becomes dense, fine to coarse SAND, Gravel, Cobbles, and Boulders			
8								
	T7-2			SC	Dense, damp, red brown to yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders			
10								
					TRENCH TERMINATED AT 11 FEET No groundwater encountered Backfilled			

Figure A-7,
Log of Trench T 7, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

▨ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◩ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

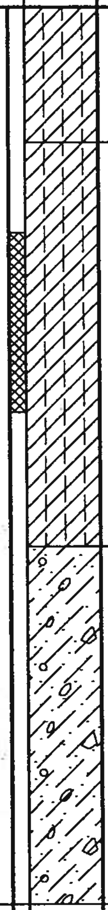
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 8

ELEV. (MSL.) 524 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2 4	T8-1			CH	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, dark brown, Silty CLAY			
6 8				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, red brown to yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to maximum 16-inch			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled			

Figure A-8,
Log of Trench T 8, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

▩ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 9

ELEV. (MSL.) 524 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2		▨		CH	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, dark brown, Silty CLAY; with scattered, white secondary mineral growths			
4								
6								
8		░		SM	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Dense, damp, red brown to yellow brown, fine to medium grained, Silty SANDSTONE, some subrounded Gravel, Cobbles and Boulders to maximum 24-inches			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled			

Figure A-9,
Log of Trench T 9, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 10

ELEV. (MSL.) 523 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2 4				CH	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, dark brown, Silty CLAY; with scattered white to tan secondary mineral growths			
6 8					- Trace subrounded gravel, cobbles and boulders			
				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, red brown to yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to maximum 14-inches			
10								

TRENCH TERMINATED AT 10 FEET
No groundwater encountered
Backfilled

Figure A-10,
Log of Trench T 10, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 11

ELEV. (MSL.) **521** DATE COMPLETED **01-12-2004**

EQUIPMENT **JD 510**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2 4 6	T11-1 ▨			CH	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, brown, Silty CLAY			
8				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to maximum 14-inches			
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled			

Figure A-11,
Log of Trench T 11, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▨ ... DISTURBED OR BAG SAMPLE
- ◪ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 12

ELEV. (MSL.) 526 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2		▨		CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
4		▨		CH	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, dark brown, Silty CLAY; trace white secondary mineral growths			
6 8 10		▨		SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, red brown to yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to maximum 14-inches			
					TRENCH TERMINATED AT 11 FEET No groundwater encountered Backfilled			

Figure A-12,
Log of Trench T 12, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 13

ELEV. (MSL.) 516 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2 4	T13-1			CH	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, dark brown, Silty CLAY			
6				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, moist, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders			
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled			

Figure A-13,
Log of Trench T 13, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

▨ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◪ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 14

ELEV. (MSL.) 524 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2								
4				CH	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, dark brown, Silty CLAY; trace white secondary mineral growths			
6								
8				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to maximum 14-inches			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled			

Figure A-14,
Log of Trench T 14, Page 1 of 1

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 15

ELEV. (MSL.) 512 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4				SC	**FILL** Very loose, dry, interlayered, fine to coarse grained, Silty SAND and fine to medium grained, Clayey SAND; with trash and debris			
6				SM	Very loose, damp, light olive to tan, fine to medium grained, Silty SAND; trace subrounded gravel, cobbles and boulders to 30-inches			
8 10				GP	Predominantly COBBLES and Boulders, caving of trench between 8 and 10 feet			
				SM	**SAN DIEGO FORMATION** Dense, damp, olive, fine to medium grained, Silty SANDSTONE; trace gravel, massive, weakly cemented			
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled			

Figure A-15,
Log of Trench T 15, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 16

ELEV. (MSL.) 523 DATE COMPLETED 01-12-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2		▨		CL	**FILL** Firm, damp, Silty CLAY			
4 6 8 10		▨		SC/CL	Firm, damp, intermixed yellow brown, fine to medium, Clayey SAND and brown, Silty CLAY fragments; trace subrounded gravel, cobbles and boulders			
	T16-1 ⊠	▨		SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium grained, Clayey SAND; trace subrounded gravel, cobble and boulders to 14-inches			
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled			

Figure A-16,
Log of Trench T 16, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 17

ELEV. (MSL.) 530 DATE COMPLETED 01-13-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2	T17-1			CH	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, dark brown, Silty CLAY; trace white secondary mineral growths			
4 6				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium grained, Clayey SAND; trace subrounded gravel, cobbles and boulders			
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled			

Figure A-17,
Log of Trench T 17, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

TRENCH T 18

ELEV. (MSL.) 518 DATE COMPLETED 01-13-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Loose, damp, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles, and Boulders to 24-inches			
4								
	T18-1 ▨							
6								
				SM	**SAN DIEGO FORMATION** Dense, damp, olive to tan, fine to medium, Silty SANDSTONE; massive, indurated, weakly cemented			
8	T18-2 ▨							
10								
					TRENCH TERMINATED AT 11 FEET No groundwater encountered Backfilled			

Figure A-18,
Log of Trench T 18, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 07177-52-02

TRENCH T 19

ELEV. (MSL.) 527 DATE COMPLETED 01-13-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2 4 6		▨		SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobble, and Boulders to 14-inches			
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled			

Figure A-19,
Log of Trench T 19, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

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PROJECT NO. 07177-52-02

TRENCH T 20

ELEV. (MSL.) 510 DATE COMPLETED 01-13-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY; trace subrounded gravel and cobbles			
2		▨			**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobble, and Boulders to 30-inches			
4		▨		SC				
6		▨						
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled			

Figure A-20,
Log of Trench T 20, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

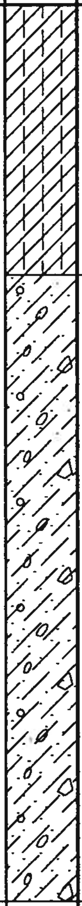
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 21

ELEV. (MSL.) 525 DATE COMPLETED 01-13-2004

EQUIPMENT JD 510



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					**TOPSOIL** Firm, damp, brown, Silty CLAY; trace subrounded gravel and cobbles			
2				CL				
					TERRACE DEPOSITS -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to 20-inches			
4								
6				SC				
8					-Trace subrounded gravel, cobbles and boulders			
10					TRENCH TERMINATED AT 10 FEET No groundwater encountered Backfilled			

Figure A-21,
Log of Trench T 21, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 22

ELEV. (MSL.) 512 DATE COMPLETED 01-13-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS. (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY; trace subrounded gravel and cobbles			
2 4				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Loose, damp, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to 30-inches			
6 8	T22-1 ☒			SM	**SAN DIEGO FORMATION** Dense, damp, olive, fine to medium, Silty SANDSTONE; massive, indurated, weakly cemented			
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled			

Figure A-22,
Log of Trench T 22, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

☒ ... DISTURBED OR BAG SAMPLE

◨ ... STANDARD PENETRATION TEST

◩ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 23

ELEV. (MSL.) 505 DATE COMPLETED 01-13-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2		▨		CL	**TOPSOIL** Firm, damp, Silty CLAY; trace subrounded gravel, cobbles and boulders			
4		▨		SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to 20-inches			
6		░		SM	**SAN DIEGO FORMATION** Dense, damp, olive, fine to medium, Silty SANDSTONE; massive, weakly cemented			
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled			

Figure A-23,
Log of Trench T 23, Page 1 of 1

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 24

ELEV. (MSL.) 502 DATE COMPLETED 01-13-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2		⁘		SM	**SAN DIEGO FORMATION** Loose, damp, olive, fine to medium, Silty SANDSTONE; massive, weakly cemented			
4		⁘						
6	T24-1 ▩	⁘			-Decreased cementation			
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled			

Figure A-24,
Log of Trench T 24, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▩ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 25

ELEV. (MSL.) 529 DATE COMPLETED 01-13-2004

EQUIPMENT JD 510

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
2				CH	**TERRACE DEPOSITS** -CLAY MEMBER Firm, damp, brown, Silty CLAY; trace white secondary mineral growth			
4								
				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Medium dense, damp, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to 18-inches			
6								
					-Trace subrounded gravel, cobbles and boulders			
8								
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled			

Figure A-25,
Log of Trench T 25, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▩ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 26

ELEV. (MSL.) **508** DATE COMPLETED **01-13-2004**

EQUIPMENT **JD 510**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY; trace subrounded gravel, cobbles and boulders			
2 4 6				SC	**TERRACE DEPOSITS** -CONGLOMERATE MEMBER Loose, damp, yellow brown, fine to medium grained, Clayey SAND, some subrounded Gravel, Cobbles and Boulders to 14-inches			
8				SM	**SAN DIEGO FORMATION** Dense, damp, olive, fine to medium grained, Silty SANDSTONE; trace subrounded gravels and cobbles, massive, weakly cemented			
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled			

Figure A-26,
Log of Trench T 26, Page 1 of 1

07177-52-02.GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

▨ ... DISTURBED OR BAG SAMPLE

◧ ... STANDARD PENETRATION TEST

◪ ... CHUNK SAMPLE

■ ... DRIVE SAMPLE (UNDISTURBED)

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. 07177-52-02

TRENCH T 27

ELEV. (MSL.) **491** DATE COMPLETED **01-13-2004**

EQUIPMENT **JD 510**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4		▨		CL	**TOPSOIL** Firm, damp, dark brown, Silty CLAY			
6 8		░		SM	**SAN DIEGO FORMATION** Dense, damp, yellow brown, fine to medium, Silty SANDSTONE; trace subrounded gravel and cobbles, massive, weakly cemented			
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled			

Figure A-27,
Log of Trench T 27, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▩ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were analyzed for maximum dry density and optimum moisture content, expansion potential, water-soluble sulfate, and shear strength characteristics. The results of the laboratory tests are presented on Tables B-I through B-IV.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-02

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T7-1	Dark brown, Silty CLAY	112.0	17.4
T7-2	Yellowish to reddish brown, Clayey, fine to coarse SAND	132.9	7.5
T16-1	Yellowish brown, Clayey, fine to coarse SAND	129.9	9.1

TABLE B-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080-03

Sample No.	Dry Density (pcf)	Moisture Content (%)	Unit Cohesion (psf)	Angle of Shear Resistance (degrees)
T7-2	118.8	8.3	470	42
T16-1	117.3	8.9	360	48

Soil samples remolded to approximately 90 percent of the laboratory maximum dry density at near optimum moisture content.

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-03

Sample No.	Moisture Content		Dry Density (pcf)	Expansion Index	Classification
	Before Test (%)	After Test (%)			
T7-1	15.2	37.6	92.9	152	Very High
T7-2	9.4	19.1	111.2	8	Very Low
T16-1	8.2	16.2	114.5	1	Very Low
T17-1	14.0	33.7	96.4	136	Very High

TABLE B-IV
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

Sample No.	Water-Soluble Sulfate Content (percent)	Exposure
T7-1	0.047	Negligible
T17-1	0.039	Negligible

APPENDIX C

APPENDIX C

RECOMMENDED GRADING SPECIFICATIONS

FOR

CANDLELIGHT VILLAS – PHASE 1
SAN DIEGO, CALIFORNIA

PROJECT NO. 07177-52-02

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1. These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon Incorporated. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2. Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. It will be necessary that the Consultant provide adequate testing and observation services so that he may determine that, in his opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep him apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3. It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, adverse weather, and so forth, result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that construction be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1. **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2. **Contractor** shall refer to the Contractor performing the site grading work.

2.3. **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4. **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5. **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6. **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7. **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1. Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1. **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than 3/4 inch in size.

3.1.2. **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3. **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than 3/4 inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2. Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3. Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4. The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized, provided it is acceptable to the governing agency, Owner and Consultant.

3.5. Representative samples of soil materials to be used for fill shall be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6. During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

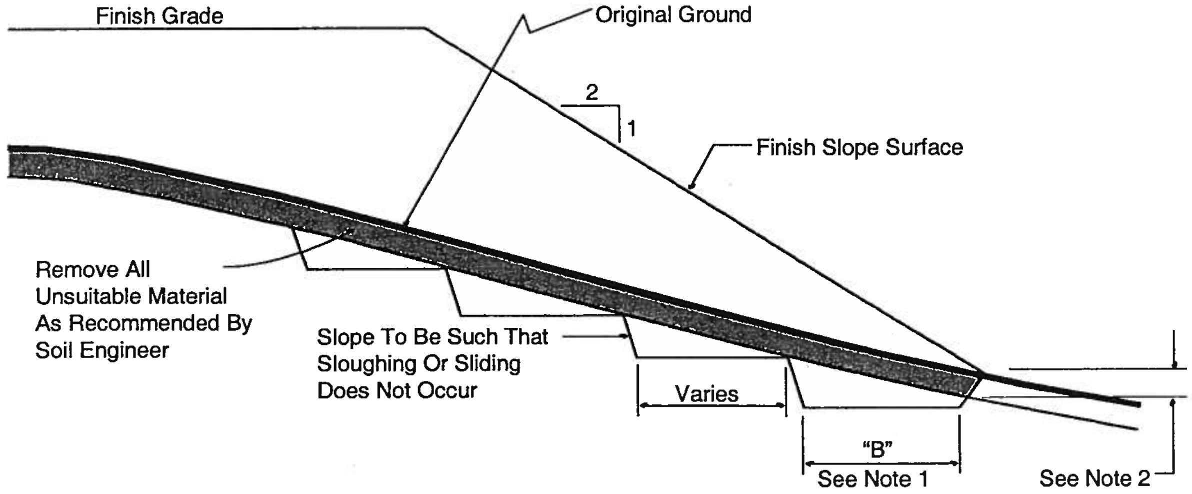
4.1. Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1-1/2 inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2. Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments which are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3. After clearing and grubbing of organic matter or other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction shall be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4. Where the slope ratio of the original ground is steeper than 6:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES:

(1) Key width "B" should be a minimum of 10 feet wide, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the bottom key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5. After areas to receive fill have been cleared, plowed or scarified, the surface should be disced or bladed by the Contractor until it is uniform and free from large clods. The area should then be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6.0 of these specifications.

5. COMPACTION EQUIPMENT

5.1. Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2. Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1. *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1. *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2. In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D1557-00.

6.1.3. When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4. When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5. After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D1557-00. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6. Soils having an Expansion Index of greater than 50 may be used in fills if placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7. Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8. As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2. *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1. Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2. Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3. For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4. For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5. Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6. All rock placement, fill placement and flooding of approved granular soil in the windrows must be continuously observed by the Consultant or his representative.

6.3. *Rock* fills, as defined in Section 3.1.3., shall be placed by the Contractor in accordance with the following recommendations:

6.3.1. The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent, maximum slope of 5 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post--construction infiltration of water.

6.3.2. *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made will be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3. Plate bearing tests, in accordance with ASTM D1196-93, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the number of passes of the compaction equipment to be performed. If performed, a minimum of three plate bearing tests shall be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4. A representative of the Consultant shall be present during *rock* fill operations to verify that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading. In general, at least one test should be performed for each approximately 5,000 to 10,000 cubic yards of *rock* fill placed.

6.3.5. Test pits shall be excavated by the Contractor so that the Consultant can state that, in his opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

6.3.6. To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

6.3.7. All *rock* fill placement shall be continuously observed during placement by representatives of the Consultant.

7. OBSERVATION AND TESTING

7.1. The Consultant shall be the Owners representative to observe and perform tests during clearing, grubbing, filling and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill shall be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test shall be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

7.2. The Consultant shall perform random field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion as to whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

7.3. During placement of *rock* fill, the Consultant shall verify that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant shall request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. If performed, plate bearing tests will be performed randomly on the surface of the most-recently placed lift. Plate bearing tests will be performed to provide a basis for expressing an opinion as to whether the *rock* fill is adequately seated. The maximum deflection in the *rock* fill determined in Section 6.3.3 shall be less than the maximum deflection of the properly compacted *soil* fill. When any of the above criteria indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

7.4. A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

7.5. The Consultant shall observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.

7.6. Testing procedures shall conform to the following Standards as appropriate:

7.6.1. Soil and Soil-Rock Fills:

7.6.1.1. Field Density Test, ASTM D1556-00, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2. Field Density Test, Nuclear Method, ASTM D2922-96, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3. Laboratory Compaction Test, ASTM D1557-00, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*

7.6.1.4. Expansion Index Test, ASTM D4829-95, *Expansion Index Test.*

7.6.2. Rock Fills

7.6.2.1. Field Plate Bearing Test, ASTM D1196-93 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

8.1. During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

8.2. After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

9. CERTIFICATIONS AND FINAL REPORTS

9.1. Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

9.2. The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

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LEGEND

- *Qudf*........UNDOCUMENTED FILL
- *Qal*........ALLUVIUM
- *Qtc*........TERRACE DEPOSIT - CLAY MEMBER
- *Qtg*........TERRACE DEPOSIT - CONGLOMERATE MEMBER
- ....APPROX. LOCATION OF GEOLOGIC CONTACT
- T-27 ....APPROX. LOCATION OF EXPLORATORY TRENCHES

GEOLOGIC MAP
CANDLELIGHT VILLAS PHASE 1
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 60'	DATE 06 - 02 - 2004
PROJECT NO. 07177 - 52 - 02	FIGURE 2
SHEET 1 OF 2	

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GRAPHIC SCALE
0' 30' 60' 90' 120' 180' 240'
SCALE 1" = 60'

GEOLOGIC MAP
CANDLELIGHT VILLAS PHASE 1
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 60'	DATE 06 - 02 - 2004		
PROJECT NO. 07177 - 52 - 02		FIGURE 3	
SHEET 2 OF 2			

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Appendix E

Hazardous Materials/Waste Studies
Alden Environmental, Inc., July 2012
Tetra Tech EM, Jan. 2004

ALDEN
ENVIRONMENTAL, INC
3245 University Ave, #1188 | San Diego, CA 92104 | **Phone/Fax:** 619.284.3815

July 20, 2012

Mr. Walter T. Schwerin, P.E.
Schwerin & Associates
814 Morena Blvd., Ste. 101
San Diego, CA 92110

Subject: Cortese List Search Results for the Candlelight Project (40329)

Dear Mr. Schwerin:

This letter report presents the results of site research conducted in response to the City's request to confirm that no new solid waste facilities or hazardous sites have been added to the Cortese List since the 2004 Environmental Site Assessment (ESA) report was prepared for the project. The Cortese List is a consolidation of data provided by various California state agencies to record and track known hazardous materials sites. The consolidated database includes hazardous waste facilities, contaminated drinking water wells, and underground storage tanks. The list is used to help identify hazardous materials issues that may be significant per the California Environmental Quality Act (CEQA).

The online database for the Cortese list was queried to determine if there were any new sites identified within 1,000 feet of the Candlelight project limits since the 2004 EAS report was prepared. Results are presented in the enclosure. The query found that there are no sites located within the Candlelight project limits. The nearest site identified was on the adjacent San Ysidro High School site to the north. This site, identified as Sweetwater High School No. 12, was a school investigation site with no further action required. No other sites occur within 1,000 feet of the Candlelight project limits.

In addition to the online database search, numerous biological field surveys were conducted by Alden Environmental, Inc. (Alden) in early 2012 in support of the project's environmental review process with the City of San Diego. The entire site was walked during each of these site visits and there was no evidence of any new dumping of trash, debris, or other potentially hazardous materials on the site. The existing earthen berms and fences have helped keep illegal dumping from occurring on the site.

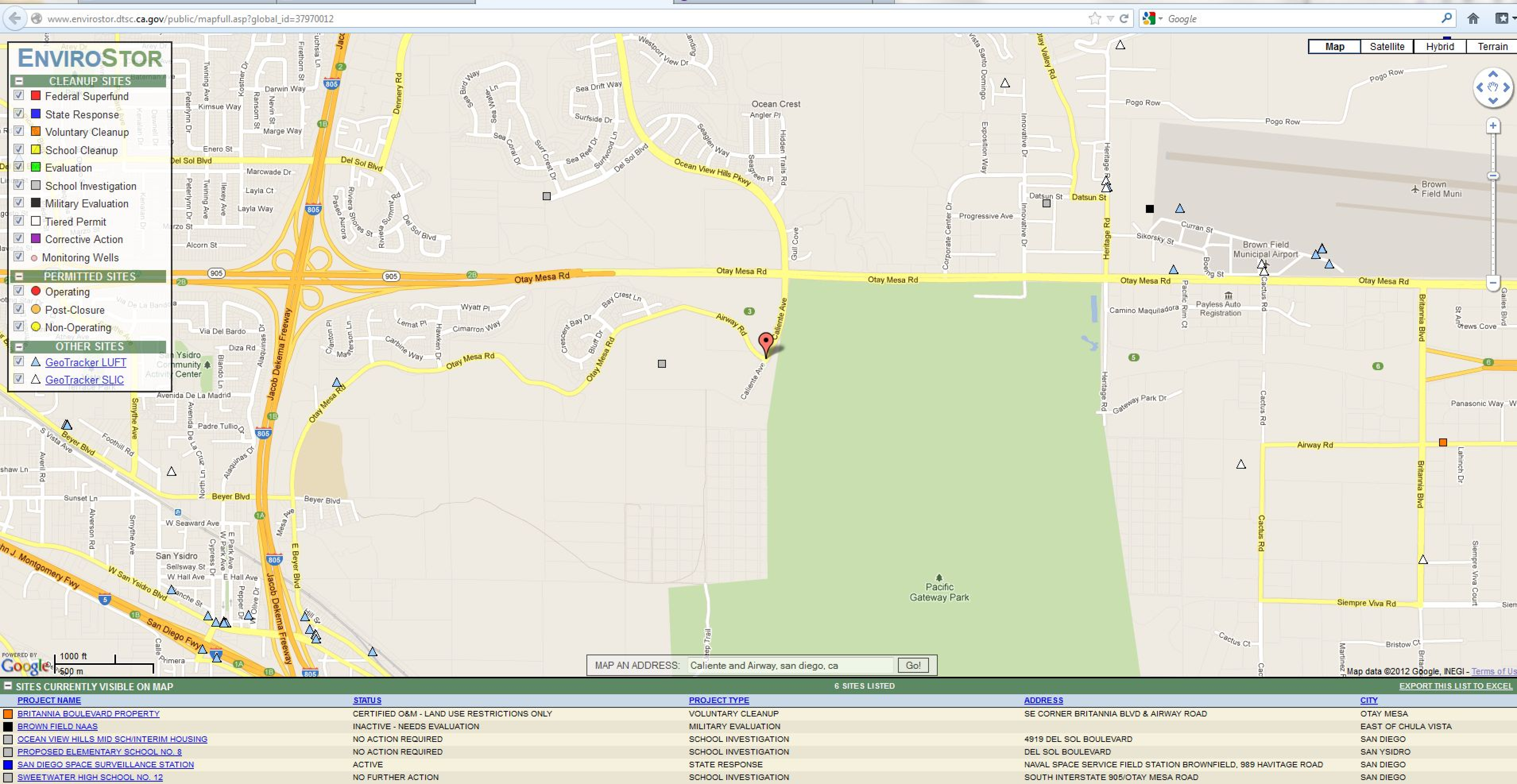
Based on the results of the Cortese list research and recent field observations, no new hazardous materials facilities or waste sites have been identified on site since the 2004 EAS report.

Please contact me if you have any questions regarding this letter report.

Sincerely

Greg Mason
Senior Biologist

Enclosure: Online Database Query Results



ENVIROSTOR

CLEANUP SITES

- ☑ 🟥 Federal Superfund
- ☑ 🟦 State Response
- ☑ 🟧 Voluntary Cleanup
- ☑ 🟨 School Cleanup
- ☑ 🟩 Evaluation
- ☑ ▨ School Investigation
- ☑ ■ Military Evaluation
- ☑ ☐ Tiered Permit
- ☑ 🟪 Corrective Action
- ☑ ○ Monitoring Wells

PERMITTED SITES

- ☑ 🔴 Operating
- ☑ 🟠 Post-Closure
- ☑ 🟡 Non-Operating

OTHER SITES

- ☑ △ GeoTracker LUFT
- ☑ △ GeoTracker SLIC

MAP AN ADDRESS: Caliente and Airway, san diego, ca Go!

SITES CURRENTLY VISIBLE ON MAP 6 SITES LISTED EXPORT THIS LIST TO EXCEL

	PROJECT NAME	STATUS	PROJECT TYPE	ADDRESS	CITY
🟧	BRITANNIA BOULEVARD PROPERTY	CERTIFIED O&M - LAND USE RESTRICTIONS ONLY	VOLUNTARY CLEANUP	SE CORNER BRITANNIA BLVD & AIRWAY ROAD	OTAY MESA
■	BROWN FIELD NAAS	INACTIVE - NEEDS EVALUATION	MILITARY EVALUATION		EAST OF CHULA VISTA
▨	OCEAN VIEW HILLS MID SCH/INTERIM HOUSING	NO ACTION REQUIRED	SCHOOL INVESTIGATION	4919 DEL SOL BOULEVARD	SAN DIEGO
▨	PROPOSED ELEMENTARY SCHOOL NO. 8	NO ACTION REQUIRED	SCHOOL INVESTIGATION	DEL SOL BOULEVARD	SAN YSIDRO
🟦	SAN DIEGO SPACE SURVEILLANCE STATION	ACTIVE	STATE RESPONSE	NAVAL SPACE SERVICE FIELD STATION BROWNFIELD, 989 HAVITAGE ROAD	SAN DIEGO
▨	SWEETWATER HIGH SCHOOL NO. 12	NO FURTHER ACTION	SCHOOL INVESTIGATION	SOUTH INTERSTATE 905/OTAY MESA ROAD	SAN DIEGO

Tetra Tech EM Inc.

One Dallas Centre ◆ 350 N. St. Paul St., Suite 2600 ◆ Dallas, TX 75201 ◆ (214) 754-8765 ◆ FAX (214) 922-9715

January 30, 2004

Mr. Tom Noon
California Region President
D.R. Horton, Inc.
5927 Priestly Drive, Suite 200
Carlsbad, CA 92008

Subject: **REPORT OF PHASE I ENVIRONMENTAL SITE ASSESSMENT**
Candlelight
San Diego County, California
Tetra Tech Project P2261.04.1.SDW0.0014.1A

Dear Mr. Noon:

Tetra Tech EM Inc. (Tetra Tech) is pleased to submit this report of our Phase I Environmental Site Assessment (ESA) for the above referenced property. This report is intended for the use of D.R. Horton, Inc. and its subsidiaries only. Our services have been performed under mutually agreed upon terms and conditions. If other parties wish to rely on this report, please have them contact us so that a mutual understanding and agreement of the terms and conditions for our services can be established prior to their use of this information.

The purpose of our services was to identify obvious environmental concerns from practices and activities that have occurred on the site or adjacent sites that could potentially contaminate the site. No subsurface evaluation was performed as a part of this assessment.

The Phase I ESA is a general characterization of environmental concerns based on readily available information and site observations. The assessment was performed in general accordance with the American Society of Testing and Materials (ASTM) E 1527-00 "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process".

PHYSICAL DESCRIPTION AND SITE RECONNAISSANCE

The target property consists of approximately 54 acres of vacant undeveloped land located in the vicinity of Otay Mesa Road and Caliente Avenue in San Diego, San Diego County, California. The property consists of five separate parcels including 645-080-08, 645-060-32, 33, 35, and 645-061-05.

Tetra Tech conducted the site and area reconnaissance on November 25, 2003. The site reconnaissance was performed to identify obvious visual indications of present or past activities that have or could have contaminated the site.

Parcels 645-060-32, -35 and 645-080-08 are located south of Caliente Avenue and consist of undeveloped land with non-native vegetation. Parcel 645-061-05 is located south of parcels 645-060-32 and -35 and consists of undeveloped land covered with dense non-native vegetation. Parcel 645-060-33 is located east of the Otay Mesa Road and Airway Road intersection and consists of undeveloped land. The elevation of the target property is reportedly between 515 and 530 feet above sea level. The general topographic gradient is to the southwest. A Site Location Map is presented as Figure 1 and a Site Map is presented as Figure 2.

No underground storage tanks (USTs) or aboveground storage tanks (ASTs) were present on the target property at the time of the site reconnaissance. No evidence of past or present USTs, such as fill caps or vent pipes, was observed on the target property. No unusual ground conditions, which might indicate the presence of USTs, waste oil tanks or hydraulic lifts were observed on the target property during the site reconnaissance.

No hazardous materials or hazardous waste were observed on the target property. No landfills were observed during our site reconnaissance, and no evidence of previous landfill activities was discovered or reported during our historical and regulatory research of the site. However, minor amounts of trash and debris were located throughout the site. No electrical transformers, oil-filled electrical equipment, or hydraulic systems were identified at the subject site. No stressed vegetation or other obvious environmental concerns were observed on the target property.

Municipal potable water and utilities are not currently supplied to the target property. The City of San Diego and San Diego Gas & Electric will provide the utilities and water in the future. Municipal wastewater and sewage disposal services were not provided to the target property at the time of the site reconnaissance. No septic tank systems were observed on the target property.

The target property is surrounded by undeveloped land with the exception of San Ysidro High School located to the north of the target property.

HISTORICAL REVIEW

Review of the 1958, 1974, 1994, 2002, and 2003 aerial photographs indicate that the target property appears to be historically undeveloped land. However, parcels 645-060-35 and 645-080-08 may have been used agriculturally for a limited time as apparent in the 1963 aerial photograph. Unpaved roads are visible on the target property. The 2002 photograph indicates parcel 645-060-33 to be undeveloped and clear of vegetation, and the remainder of the target property to be undeveloped.

REGULATORY REVIEW

Tetra Tech contracted Environmental Data Resources, Inc to perform a database search of information published by the state and federal regulatory agencies for the target property and adjacent and surrounding properties. Tetra Tech also contacted local and municipal agencies to determine if the target property or nearby properties are listed as having a past or present record of actual or potential environmental impact or are under investigation for an environmental impact.

The target property is not identified as being evaluated by the federal government for remedial action under the Comprehensive Environmental Response, Compensation and Liability Act or any other federal, state, or local environmental regulations. Two sites within a one mile radius of the subject property were listed in these databases.

One facility was reported on the Cortese database. *Communications Tower-SD*, located at 4515 Otay Mesa, is downgradient and located approximately one mile west of the target property. Due to its distance and location, this facility does not appear to present a recognized environmental condition (REC) to the target property.

One facility was reported on the Solid Waste Facility/Landfill Sites database. *Dillon Trail*, located approximately ½ mile southeast of the target property, is reported as a closed solid waste disposal site that accepted inert, mixed municipal wastes. This facility is downgradient to the target property. Due to the location of this facility, it does not appear to present a REC to the target property.

CONCLUSIONS

Tetra Tech performed this assessment in general conformance with the scope and limitations of ASTM E 1527-00 of the target property to identify any RECs in connection with the property including the presence, or likely presence, of any hazardous substances or petroleum products on the target property under conditions that indicate an existing release, a past release, or a material threat of a release into structures on the target property or into the ground, groundwater, or surface water. This assessment included an evaluation to the extent practicable of the past and present land uses at the target property and on adjacent properties. Our findings are summarized below.

- Tetra Tech's review of historical information did not indicate environmental concerns to the target property from either activities on the target property or from surrounding properties.
- During Tetra Tech's site reconnaissance, no on-site or off-site RECs resulting from past or present activities were observed.
- Tetra Tech's review of the regulatory agency information did not indicate sources of environmental concerns to the target property.

This assessment has revealed no evidence of RECs in connection with the target property. No further assessment is recommended at this time.

LIMITATIONS

The findings and opinions are relevant to the dates of our site work and should not be relied on to represent conditions at later dates. If additional information becomes available that might impact our environmental conclusions, we request the opportunity to review the information, reassess the potential concerns, and modify our opinion, if warranted. Although this assessment has attempted to identify the potential for contamination of the target property, potential sources of contamination may have escaped detection due to: (1) the limited scope of this assessment; (2) the inaccuracy of public records; (3) the presence of undetected and unreported environmental accidents; (4) inaccessible areas; and/or (5) deliberate concealment of detrimental information.

We appreciate the opportunity to be of service to you. Please call us if you have any questions or if we may be of further service.

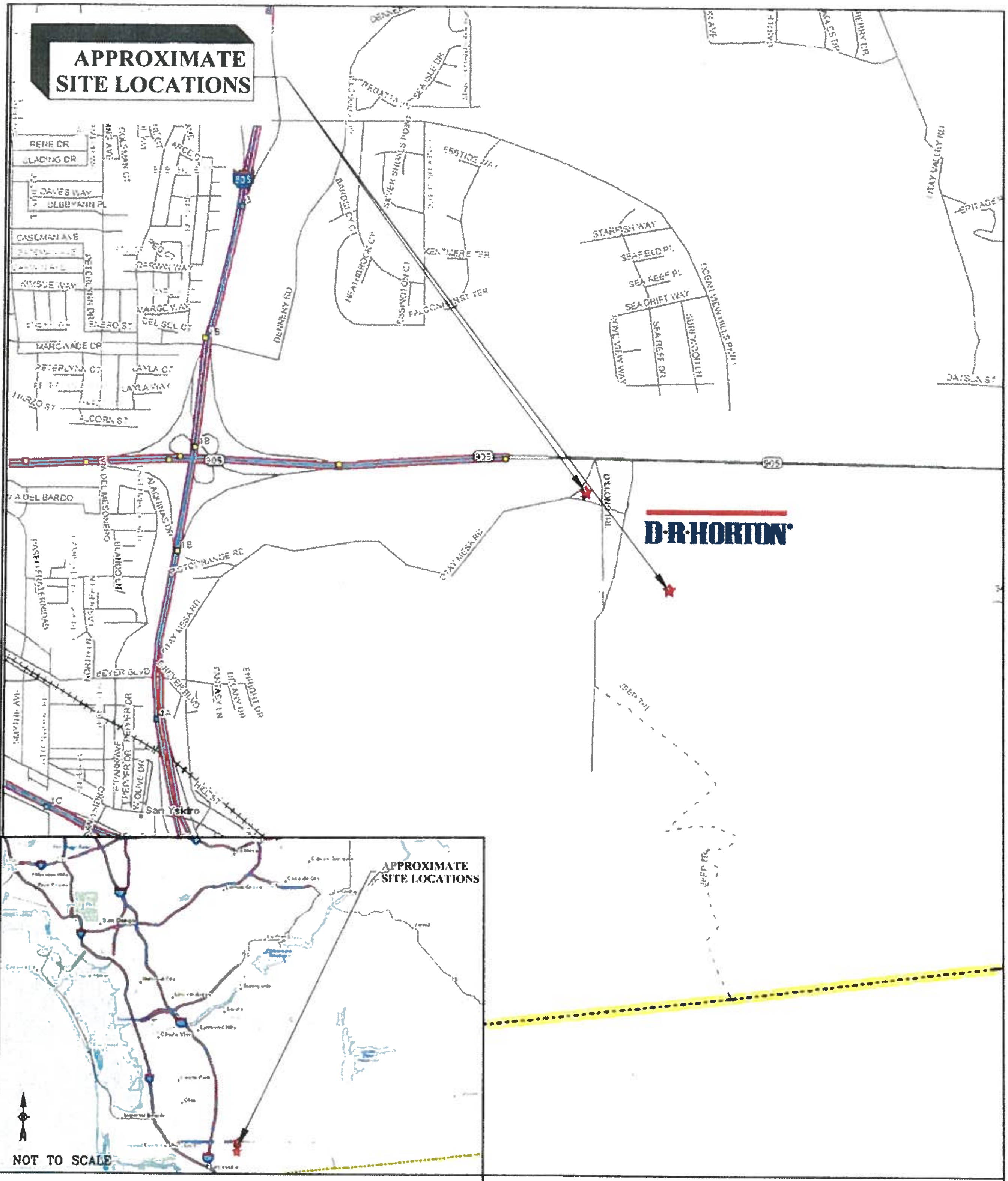
Sincerely,
TETRA TECH EM INC.

Lona Pease
On behalf of and with permission by:
Ruth Ann Erro
Environmental Scientist

Cathy L. Beed
On behalf of and with permission by:
Robert J. Korzekwa
Operations Manager

Attachments:

Figure 1	Site Location Map
Figure 2	Site Map
Figure 3	Aerial Map
Figure 4	Topographic Map



SOURCE: MODIFIED FROM DELORME STREET ATLAS USA, 2003

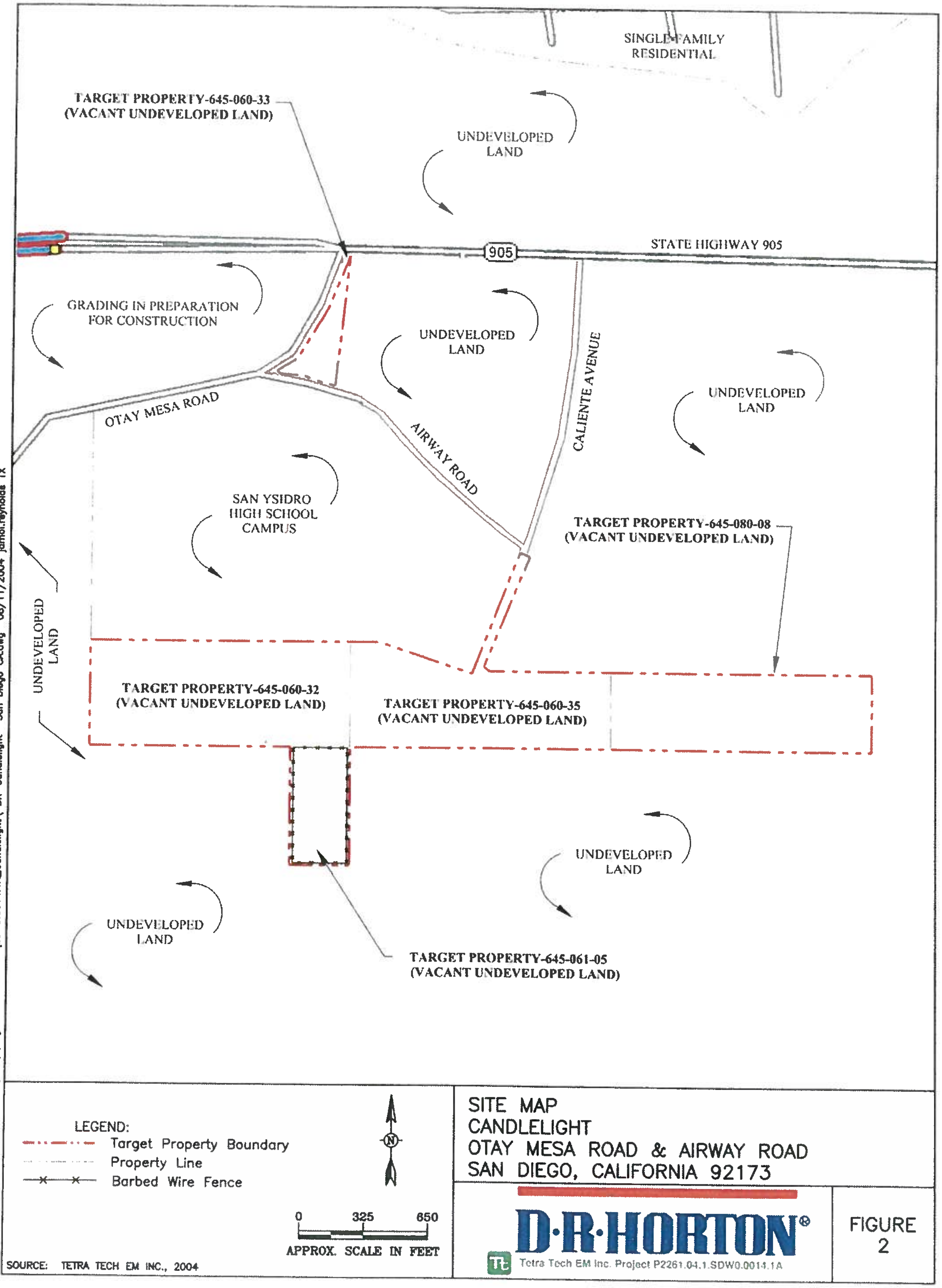
SITE LOCATION MAP
CANDLELIGHT
OTAY MESA ROAD & AIRWAY ROAD
SAN DIEGO, CALIFORNIA 92173

D·R·HORTON®

Tetra Tech EM Inc. Project P2261.04.1.SDW0.0014.1A

FIGURE
1

T:\CADD\P\2261\04 (2003-2004 Projects)\Region 1-California\SDW0.0014.1A_Candlelight\ DR-Candlelight- San Diego CA.dwg 08/11/2004 jamal.reynolds TX



LEGEND:

- Target Property Boundary
- Property Line
- Barbed Wire Fence

SOURCE: TETRA TECH EM INC., 2004

SITE MAP
CANDLELIGHT
OTAY MESA ROAD & AIRWAY ROAD
SAN DIEGO, CALIFORNIA 92173

D·R·HORTON®

Tetra Tech EM Inc. Project P2261.04.1.SDW0.0014.1A

FIGURE
2

T:\CADD\P\2261\04 (2003-2004 Projects)\Region 1-California\SDW0.0014.1A_Candlelight\ DR-Candlelight- San Diego CA.dwg 08/11/2004 jamal.reynolds TX

Appendix F

Cultural Resources Investigations
ASM Affiliates, July 2015
Brian F. Smith and Associates, Oct. 2010
Brian F. Smith and Associates, May 2004

ASM
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archaeology • ethnography
history • architectural history
2034 Corte Del Nogal, Carlsbad, California 92011

July 24, 2015

Greg Mason
Principal/Senior Biologist
Alden Environmental, Inc.
3245 University Ave. #1188
San Diego, CA 92104

Re: Archaeological Record Search Update and Additional Archaeological Survey for Candlelight Villas Project, Otay Mesa, San Diego County, California

Dear Mr. Mason,

This investigation was conducted by ASM Affiliates, Inc. (ASM) to provide a cultural resources study update for the Candlelight Villas Project (Smith 2010; Smith and Meier 2004, 2005) in order to identify any previously unidentified cultural resources and review the status of previously recorded resources within the 49-acre Candlelight Villas project area. The current investigation consisted of a records search update with the South Coastal Information Center (SCIC) of the California Historical Resources Information System and the Native American Heritage Commission (NAHC) as well as a condition assessment of 10 previously recorded sites that are within or intersect the 49-acre project footprint. This letter report for submission to the U.S. Army Corps of Engineers (USACE) and the California State Historic Preservation Officer (SHPO) presents the results of the updated records search and the condition assessment survey for compliance with Section 106 of the National Historic Preservation Act (NHPA) and the California Environmental Quality Act (CEQA).

The entire project footprint was previously surveyed for CEQA and the City of San Diego, and all sites were evaluated under CEQA and City of San Diego guidelines. The last condition assessment of the property was conducted five years ago, and a Section 106 undertaking necessitates a cultural resource study update to examine if conditions have changed since the last survey and if the prior CEQA work was of sufficient standards for Section 106 compliance.

The Candlelight Villas Project is located in the Otay Mesa area in San Diego, California (Figure 1). Specifically, the project is situated within the Otay Mesa Community Plan area of the city of San Diego, south of Otay Mesa Road and east of Interstate 805, as shown on the USGS *Imperial Beach* topographic quadrangle (Figure 2). The proposed project consists of construction of multifamily attached homes, open space, and road improvements making up the approximately 49-acre Area of Potential Effect (APE).

Environmental Setting

The following description of the environmental setting of the project area was adapted from the previous condition assessment of the APE by Smith (2010).

The current study area is located on a coastal mesa capped by the Lindavista Formation, a unit of Pleistocene marine and terrace deposits, which is underlain by the Otay Formation, an Oligocene marine deposit, both of which are fossiliferous sedimentary deposits (Deméré and Walsh 1993). The project area is positioned north and west of Dillon Canyon, with Moody Canyon located to the west. Intermittent streams flow from these canyons and drain this part of the mesa into the Otay River Valley and the Tijuana River Valley. The project area is generally flat, and the elevation is approximately 500 ft. ASML. Soils in the project area consists of clay mixed with pockets of bentonite and/or cobbles, comprised mostly of granite, basalt, and quartzite. These lithic materials, generally hard and extremely resistant to erosion, were preferred by the prehistoric inhabitants of the San Diego region for the manufacture of flaked tools and grinding implements (Robbins-Wade 1990).

The biological setting of the project area is dominated by nonnative vegetation, with small pockets of native coastal sage and mule fat scrub near the edge of Dennery Canyon. Additionally, the project area contains numerous small vernal pools containing San Diego and Riverside fairy shrimp. The vernal pools are primarily located along the western and eastern edges of the property, although there are a few isolated pools in the central and northern portion of the project area. The project area also exhibits generally mild temperatures; however, several instances of winter frost, as well as some weeks in the summer with temperatures reaching 100°F, are recorded annually. Precipitation averages between 12 and 16 in. (30 to 40 cm) of rainfall annually, mostly between October and May (Beauchamp 1986). These environments tend to support a wide variety of wildlife, particularly birds, small mammals, and reptiles (Beauchamp 1986). The project area, although currently a vacant lot, has been used for farming and grazing for more than 125 years. Modern impacts to the site include the dumping of building debris and trash and off-road vehicle use, as well as the grading of a soil berm that surrounds most of the APE.

Cultural Background

The prehistoric and historic cultural setting for the project's region is briefly outlined below. For its wider context, see more detailed discussions of prehistoric archaeology (Jones and Klar 2007; Moratto 1984), ethnography (Heizer 1978; Kroeber 1925), and history (Pourade 1960-1977; Pryde 2004). For more narrowly focused discussions of the local issues and evidence, see, for example, the historic properties background study for metropolitan San Diego (Carrico 2008; McDonald and Eighmey 2008; Schaefer and Van Wormer 2008; Warren et al. 2008).

Prehistoric Archaeology

The prehistory of San Diego County has most frequently been divided chronologically into three or four major periods. An Early Man stage, perhaps dating back tens of thousands of years, has been proposed, but no widely accepted evidence of human occupation of North America dating prior to about 12,000 B.C. has emerged. More generally accepted divisions include a Terminal Pleistocene/Early Holocene period (ca. 12,000-6000 B.C.), a Middle/Late Holocene period (ca. 6000 B.C.-A.D. 800), and a Late Prehistoric period (ca. A.D. 800-1769).

For the Terminal Pleistocene/Early Holocene period (ca. 12,000-6000 B.C.), the earliest chronologically distinctive archaeological evidence is the Clovis pattern. Dated elsewhere in North America to around 11,500 B.C., Clovis assemblages are distinguished primarily by large fluted projectile points. At least three isolated fluted points have been reported within San Diego County. The most widely recognized archaeological pattern within this period is termed San Dieguito and has been dated from at least as early as 8500 B.C. to perhaps around 6000 B.C. Proposed characteristics to distinguish San Dieguito flaked lithic assemblages include large projectile points, bifaces, crescents, scraper planes, scrapers, hammers, and choppers. A key issue has concerned ground stone, which was originally suggested as having been absent from San Dieguito components but has subsequently been recognized as occurring infrequently within them. It was initially suggested that San Dieguito components, like other Paleo-Indian manifestations, represented the products of highly mobile groups that were organized as small bands and focused on the hunting of large game. However, in the absence of supporting faunal evidence, this interpretation has increasingly been called into question, and it has been suggested that the San Dieguito pattern represented a more generalized, Archaic-stage lifeway, rather than a true Paleo-Indian adaptation. A vigorous debate has continued for several decades concerning the relationship between the San Dieguito pattern and the La Jolla pattern that succeeded it and that may have also been contemporaneous with or even antecedent to it. The issue has been whether the two patterns represent the products of distinct ethnic groups and/or cultural traditions, or different functional poses of the same people.

Archaeological evidence from the Middle/Late Holocene Period (ca. 6000 B.C.-A.D. 800) period in the coastal San Diego region has been characterized as belonging to the Archaic stage, Millingstone horizon, Encinitas tradition, or La Jolla pattern. Distinctive characteristics of the La Jolla pattern include extensive shell middens, portable ground stone metates and manos, crudely flaked cobble tools, occasional large expanding-stemmed projectile points (Pinto and Elko forms), and flexed human burials. Investigators have called attention to the apparent stability and conservatism of the La Jolla pattern throughout this long period.

A Late Prehistoric period (ca. A.D. 800-1769) in coastal San Diego County has been distinguished, primarily on the basis of three major innovations: the use of small projectile points, brownware pottery, and the practice of human cremation. Labels applied to the archaeological manifestations of this period include Yuman, Cuyamaca, Patayan, and Hakataya. Traits characterizing the Late Prehistoric period include a shift toward greater use of inland rather than coastal settlement locations, greater reliance on acorns as an abundant but labor-expensive food resource, a greater emphasis on hunting of both large and small game, a greater amount of interregional exchange, more elaboration of nonutilitarian culture, and possibly denser regional populations.

Ethnographic Evidence

In ethnohistoric times, central and southern San Diego County was occupied by speakers of a Yuman language or languages, variously referred to as Kumeyaay, Diegueño, Tipai, and Ipai. Kumeyaay territory extended from south of Agua Hedionda Lagoon, Escondido, and Lake Henshaw to south of Ensenada in northern Baja California, and east nearly as far as the lower Colorado River. A few important ethnohistoric accounts of the Kumeyaay are available from Hispanic-period explorers and travelers, Spanish administrators, and Franciscan missionaries. Many accounts by ethnographers, primarily recorded during the early twentieth century, are available.

The Kumeyaay inhabited a diverse environment that included littoral, valley, foothill, mountain, and desert resource zones. Because of the early incorporation of coastal Kumeyaay into the mission system, most of the available ethnographic information relates to inland groups that lived in the Peninsular Range or the Colorado Desert. There may have been considerable variability among the Kumeyaay in settlement and subsistence strategies and in social organization. Acorns were a key resource, but a wide range of other mineral, plant, and animal resources were exploited, including coastal fish and shellfish. Some degree of residential mobility seems to have been practiced, although its extent and nature may have varied considerably among different communities and settings. The fundamental Kumeyaay social unit above the family was the *šimuł* (patrilineage) and the residential community or band. Leaders performed ceremonial, advisory, and diplomatic functions, rather than judicial, redistributive, or military ones. There seems to have been no national level of political unity and perhaps little sense of commonality within the language group.

Kumeyaay material culture was effective, but it was not highly elaborated. Structures included houses with excavated floors, ramadas, sweathouses, ceremonial enclosures, and acorn granaries. Hunting equipment included bows and arrows, curved throwing sticks, nets, and snares, as well as nets and hooks of bone and shell for fishing. Processing and storage equipment included a variety of flaked stone tools, milling implements, ceramic vessels, and baskets. Nonutilitarian culture was not neglected. A range of community ceremonies were performed, with particular emphases placed on making individuals' coming of age and on death and mourning.

History

European exploration of the San Diego area was initiated with the maritime expeditions of Juan Rodriguez Cabrillo in 1542 and Sebastián Vizcaíno in 1602. However, the historic period proper did not begin until 1769, when expeditions under the leadership of Gaspar de Portolá and Junípero Serra reached the region from Baja California and passed northward along the coastal plain to seek Monterey. In that year, a royal presidio and the Misión San Diego de Alcalá were founded, and the incorporation of local Kumeyaay into the mission system was begun.

In 1821, Mexico consummated its independence from Spain, and the region became more open to outside visitors and influences. The missions were secularized in 1833. Native Americans released from the San Diego mission returned to their native villages, moved east to areas lying beyond Mexican control, or sought work on ranchos or in the town of San Diego. Numerous large land grants were issued to private owners during the Mexican period.

The conquest and annexation of California by the United States in the Mexican-American War between 1846 and 1848 ushered in many more changes. Many Californio families lost their lands to outsiders, and cultural patterns that were brought by immigrants from the eastern U.S. gradually supplanted old Californio customs. The region experienced cycles of economic and demographic booms and busts. Aspects of development included the creation of transportation networks based on port facilities, railroads, highways, and airports; more elaborate systems of water supply and flood control; grazing livestock and growing a changing array of crops; supporting military facilities; limited amounts of manufacturing; and accommodating visitors and retirees. After false starts, San Diego converted itself to a substantial city, and then into a metropolis, with exceptionally wide civic boundaries encompassing such suburbs as Ocean Beach, Pacific Beach, Clairemont, and La Jolla. Other cities were incorporated in the coastal region, including National City, Coronado, Chula Vista, Imperial Beach, Del Mar, Solana Beach, and Encinitas.

Results of Record Search Update

Records searches were obtained for the project as part of the initial survey and during the site-testing programs (Smith and Meier 2004, 2005). The area surrounding the APE, and including the APE, has been subjected to previous archaeological surveys and site testing programs by Brian F. Smith and Associates (BFSA). In 2010, BFSA conducted a literature review and record search update for the project APE and a 1-mi. radius surrounding it.

The current investigation has again requested an update of all cultural resources and cultural resource studies within 1 mi. of the Candlelight Villas APE with the SCIC at San Diego State University (SDSU). The updated record search did not yield any newly recorded resources within the project APE since the 2010 BFSA cultural resources update, but two reports have been filed that encompass the current project APE. These reports consist of the draft and final version of the Environmental Impact Report for the Otay Mesa Community produced by the City of San Diego. An additional 12 studies have been conducted with a 1-mi. radius of the current project APE, and four new sites have been recorded within that same radius since 2010 (Tables 1 and 2). The complete results of the current record search with the SCIC are compiled in Confidential Appendix A of this letter report.

Table 1. Cultural resource reports within a 1-mi. radius of the Candlelight Villas APE submitted since the last cultural resource update in 2010

Report No.	Authors	Date	Title
SD-14078	NI GHABHLAIN, SINEAD, SARAH STRINGER BOWSHER, SHELBY GUNDERMAN, and CHAD A. WILLIS	2010	CULTURAL RESOURCE INVENTORY AND EVALUATION FOR THE SAN YSIDRO RAIL YARD IMPROVEMENT PROJECT

Report No.	Authors	Date	Title
SD-13276	BRAY, MADELEINE and BRAD BREWSTER	2011	FINAL CULTURAL RESOURCES SURVEY AND ASSESSMENT FOR THE METROPOLITAN AIRPARK PROJECT, OTAY MESA, SAN DIEGO CA
SD-13277	BREWSTER, BRAD	2011	METROPOLITAN AIRPARK PROJECT, OTAY MESA, SAN DIEGO, CA- HISTORIC RESOURCES ASSESSMENT
SD-14044	NI GHABHLAIN, SINEAD, MICHELLE DALOPE, and SARAH STINGER-BOWSHER	2011	ARCHAEOLOGICAL RESOURCES SURVEY REPORT FOR THE FURBY-NORTH PROPERTY, SAN DIEGO, CALIFORNIA
SD-13866	TSUNODA, KOJI	2012	REVISED FIRST SUPPLEMENTAL HISTORIC PROPERTY SURVEY REPORT FOR THE SAN YSIDRO RAIL YARD IMPROVEMENT PROJECT: OTAY MESA PARCEL A BIOLOGICAL MITIGATION SITE
SD-13907	ESA ASSOCIATES	2012	METROPOLITAN AIRPARK PROJECT
SD-13986	BRUNZELL, DAVID	2012	ARCHAEOLOGICAL MONITORING PROGRAM VISTA DEL MAR ELEMENTARY SCHOOL AND DEL SOL BOULEVARD EXTENSION CITY OF SAN DIEGO, SAN DIEGO COUNTY, CALIFORNIA
SD-14252	ROBBINS-WADE, MARY	2012	ARCHAEOLOGICAL RESOURCES INVENTORY: OLD OTAY MESA ROAD IMPROVEMENTS OTAY MESA, SAN DIEGO, CALIFORNIA PROJECT NO. 228335
SD-14583	TSUNODA, KOJI	2012	SAN YSIDRO RAIL YARD IMRPOVEMENT PROJECT: OTAY MESA PARCEL A BIOLOGICAL MITIGATION SITE
SD-14368	CITY OF SAN DIEGO	2013	DRAFT PROGRAM ENVIRONMENTAL IMPACT REPORT FOR THE OTAY MESA COMMUNITY PLAN UPDATE, CITY OF SAN DIEGO PROJECT NUMBER 30330/304032
SD-14714	CITY OF SAN DIEGO	2013	FINAL PROGRAM ENVIRONMENTAL IMPACT REPORT FOR THE OTAY MESA COMMUNITY PLAN UPDATE, CITY OF SAN DIEGO
SD-15229	KRISTIN TENNESEN	2013	ETS #24738.03, CULTURAL RESOURCES MONITORING FOR THE INTRUSIVE POLE INSPECTIONS, METRO DISTRICT, SUB-AREAS BORD, SNYS, IMPE, OTAY, SBAY, HILT, MONT, SSDE, LINC PROJECT, SAN DIEGO COUNTY, CALIFORNIA (HDR #207357)

Table 2. Sites within a 1-mi. radius of the Candlelight Villas APE recorded since the last cultural resource update in 2010

Designation					
Primary Number P-37-	Trinomial CA-SDI-	Era	Site Type	Distance from APE	Recorder, Date
032101	020343	Prehistoric	AP2. Lithic scatter	1277 m	Dalope 2011
032102	020344	Prehistoric	AP2. Lithic scatter	972 m	Dalope 2011
034240	021440H	Prehistoric	AH2. Foundation, AH8. Dam	368 m	Blake and Tsunoda 2014
034241	021441H	Prehistoric	Historic water pump and power pole	532 m	Blake and Tsunoda 2014

The NAHC was also contacted on July 13, 2015 to request a search of the Sacred Land Files for the project APE and a 1-mi. radius surrounding it as well as a list of tribal contacts that may have information regarding culturally sensitive properties in the area should the lead agency wish to consult with them. As of yet, ASM has not received a response from the NAHC to this request. A copy of the formal request letter can be found in Appendix B of this report.

Condition Assessment Site Survey Results

On July 17, 2015 ASM Senior Archaeologist, James T. Daniels, Jr., attempted to re-locate the nine sites that are within or intersect the 49-acre Candlelight Villas APE to update any potential changes to the sites. All of the previously recorded sites (SDI-8640, -8641, -8642, -8643, -8644, -8644, -8645, -9541, -10,522, -10,523) were located using GIS data from the SCIC and a Trimble GeoXH7 handheld GPS with decimeter accuracy. Confidential Figure 3 shows the locations of the previously recorded sites that are within or intersect the current APE. Overview photographs and photographs of artifacts encountered were taken with a Sony Cybershot with integrated GPS and compass, and a detailed log of the photographs can be found in Confidential Appendix C. While the photographs taken of artifacts found on the surface have geospatial information, GPS points were also taken with the Trimble GPS unit, as the GPS unit's accuracy is much greater than that of the camera. This information will be converted into an ArcGIS shapefile as well as Google Earth .kmz file and will be provided in a data CD to accompany this report.

The following sections provide a brief summary of the sites within the project APE and the results of the current condition assessment.

SDI-8640

Site SDI-8640 intersects the northwestern corner of the current project APE on the eastern edge of Moody Canyon. The site was first recorded by Steven A. Apple of MSA in 1980 as a prehistoric site with an associated lithic scatter. In 1984, the site was revisited by Joines, Serr, and Robbins-Wade of RBR & Associates, who recorded the site as a light-density lithic scatter with two areas of concentration (Loci A and B) consisting of scraper planes, scrapers, cores, and over 40 flakes of fine-grained volcanic material. The site boundary was also extended to the west beyond the boundary defined by Apple in 1980. In 1987, Locus A on the western end of the site was tested by Robbins-Wade of RBR & Associates. A total of one mano, one scraper plane, nine scrapers, one scraper plane/scraper, two scraper/hammers, two hammers, 18 cores, and 155 flakes were recovered from the surface and shovel test pits (STPs). Artifacts were recovered from just the upper 10 cm of deposit. The integrity of Locus A was noted as fair to good, but a dirt road was reported to run through the locus along with a pile of artificial fill. RBR & Associates noted that Locus B had poor integrity, as that portion of the site had been farmed and contained numerous dirt roads and evidence of off-road vehicle activity. ASM noted similar disturbance in 1990 when J. R. Cook excavated two test units at the site. Based on the site record, 51 artifacts, including four unifaces and 47 flakes, were collected from the surface. The site was deemed insignificant as a result of the evaluation.

The site boundary was again modified by BFSA in 2004 and subsequently evaluated again. A total of 17 artifacts were collected from the surface. Eight STPs were also excavated, and just two of the STPs yielded subsurface materials (one flake each) between 10 and 20 cm below the surface (cmbs). One test unit was excavated to a depth of 30 cmbs and yielded six flakes. The site was again recommended as not significant.

During the current investigation, the portion of the site that intersects the Candlelight Villas APE was revisited and was noted to be heavily disturbed by earth movement to create the berm at the edge of the APE (Figure 4). No artifacts were noted within the boundaries of the site, but one isolate flake was identified just 20 m southwest of the site boundary (Figure 5). Several other pieces of fine-grained volcanic material typically used for lithic tools in this area were also identified within about 35 m of the site boundary, but were not discernable flakes or had been damaged enough by agricultural practices or off-road vehicle traffic that they could no longer be identified as knapped lithic material.

SDI-8641

Site SDI-8641 was also first recorded by Steven A. Apple in 1980 as a prehistoric lithic scatter consisting of an undiagnostic tool fragment, several cores, a scraper, and several flakes within a plowed field. K. J. Peter (1985) of Scientific Resource Surveys (SRS) attempted to re-locate SDI-8641 but was unable to identify the site, along with SDI-10522. Peter concluded that these sites were originally mismapped and were a part of site SDI-10523. These sites were also not re-located during the surveys and evaluation efforts of BFSA in 2004 and 2005.

During the current survey, the location of the site as represented in the GIS data from the SCIC was revisited. The area appears to be within a previously plowed area as reported by Apple in 1980 (Figure 6). One possible fine-grained basalt flake was located in the center of the site but did not exhibit an obvious striking platform or bulb of percussion and is likely a result of modern tractor breakage. No other debitage was noted on the surface.

SDI-8642

First recorded by Apple in 1980 as a badly disturbed surface scatter of lithic artifacts, SDI-8642 at one time consisted of cores, scrapers, and flakes. The site was evaluated in 1989 by J. R. Cook of ASM and recommended as ineligible for listing in the Nation Register of Historic Places (NRHP). Just 10 surface artifacts and six subsurface flakes were recovered from the site. The site was revisited by Guerrero and Gallegos of Gallegos and Associates in 2003, and no change to the site was recorded. In the BFSA 2005 evaluation report, the site was not re-located, and it was assumed this was a result of the site having been tested earlier and surface artifacts having been collected.

During the current survey, the site area was noted as extremely disturbed by earth movement (Figure 7). No artifacts were identified with the site boundaries.

SDI-8643

SDI-8643 was also initially recorded by Apple in 1980. He identified just four artifacts associated with the site, including one core, two flakes, and one scraper. In 1989, the site was evaluated by ASM. Two test units were excavated, and only one flake was found in subsurface deposits. The artifacts recorded by Apple on the surface were re-located and collected, and the site was deemed insignificant. The site was not re-located by Smith and Meier (2004, 2005) or Smith during the

2010 cultural resource update, as the artifacts previously recorded were collected during the evaluation effort.

The site location was revisited during the current investigation. Suitable material for lithic tool manufacture was noted in the area, but no artifacts were identified. The entirety of the site has at one time been subject to agricultural plowing (Figure 8).

SDI-8644

Only a small segment of the northern portion of SDI-8644 intersects the current project APE. The site was evaluated by Cook of ASM in 1988 and identified as not significant. The original site record by Apple from 1980 lists several scrapers, eight cores, three hammerstones, and five undiagnostic tools, as well as flakes and debitage associated with the site. Gallegos & Associates revisted the site in 2003 and found it to be in the same condition as previously recorded.

The portion of the site intersecting the current project APE was assessed for this investigation and was found to be completely disturbed by earth movement to create the berm bordering the APE (Figure 9). Some raw material suitable for tool manufacture was noted, but no artifacts were observed.

SDI-8645

SDI-8645 is located near the southeastern corner of the current project area. It was recorded in 1980 by Apple, who listed it as being a prehistoric site consisting of 12 artifacts including one hammerstone, 10 cores, and one flake. The site was then evaluated in 1988 by ASM through a surface collection and the excavation of two units. The site was recommended as not significant. Gallegos & Associates revisted the site in 2003 and noted that no changes had occurred in the site's condition, and therefore no further work was recommended. However, Smith and Meier (2004) noted artifacts outside the site boundary, and the site was again evaluated via a surface collection, eight STPs, and one test unit. A total of 37 artifacts were collected from the surface, seven flakes were recovered from the STPs, and seven flakes from the test unit. The site was again deemed not significant.

The site was revisited during the current investigation, and while suitable material for tool manufacture was identified in the area within and near the previous site boundary, no artifacts were identified. Visibility was limited in the northern portion of the site due to vegetation, and the southern portion of the site was heavily disturbed by earth movement to create the berm along the edge of the APE (Figure 10)

SDI-9541

The southwestern corner of SDI-9541 intersects northeastern corner of the current project APE. The site was originally identified in 1982 by Jay Thesken as a temporary prehistoric campsite consisting of one chopping tool, two scrapers, three hammerstones, eight bifacial manos, one possible metate fragment, and over 100 flakes and pieces of debitage. Smith and Meier (2004) evaluated the site with a surface collection, a series of STPs, and one test unit. A total of 112 artifacts were collected from the surface of the site. A total of 11 artifacts were recovered from the 12 STPs excavated. The test unit yielded 15 artifacts in 50 cm of deposition, but the integrity of the deposit was questionable. The site was deemed as not significant.

During the current investigation, the portion of the site intersecting the current APE was assessed. Much of the area was extremely disturbed by earth movement and modern trash dumping (Figure 11). No cultural materials were identified.

SDI-10522

This light lithic scatter was recorded by K. J. Peter of SRS in 1985. The site was recorded as consisting of one scraper, one core, and 13 flakes. The site was evaluated by ASM in 1989 with two test units excavated to 20 cmbs. The test units yielded just two flakes, and 19 artifacts were collected from the surface.

The site was revisited during the current investigation and is located near the southwestern corner of the project APE on the sloping edge of the Moody Canyon (Figure 12). An off-road vehicle trail loops through the west half of the site. One piece of fine-grained volcanic was identified within the site boundary, but it appears to be a natural spall rather than an intentionally produced flake (Figure 13). However, one isolated fine-grained volcanic flake was located just north of the site boundary (Figure 14).

SDI-10523

Site SDI-10523 straddles a portion of the southern boundary of the APE. The site was first recorded by Peter of SRS as a low-density lithic scatter consisting of two scrapers, two cores, and 13 flakes. The site was revisited in 2003 by Gallegos & Associates and no change in the site condition was noted. The site was then evaluated by BFSA in 2004 (Smith and Meier 2004, 2005). At the time of evaluation the southern and western borders of the site had been graded to create the berm along the edge of the APE. A total of 54 artifacts were collected from the surface of the site during the evaluation. Fourteen STPs were also excavated across the site, two of which yielded at total of four artifacts. One test unit was also excavated near one of the positive STPs and yielded 12 artifacts within 20 cmbs. The site was determined to be not significant.

The site location was revisited during the current project, and the portion of the site intersecting the current APE was found to be completely disturbed by grading and agricultural activity (Figure 15). No artifacts were located within or immediately surrounding the site boundary.

Recommendations

After reviewing the previous work done within the project area, along with the present condition assessment of all previously recorded sites within the project APE, there do not appear to be any sites within the APE that contain any significant cultural resources under CEQA and the City of San Diego guidelines. Nor do any of the sites within the APE qualify as eligible for listing in the NRHP. While all sites within the APE have been evaluated as not significant, isolate finds were noted in the western portion of the APE. Thus ASM agrees with the previous recommendation of Smith and Meier (2004, 2005) and Smith (2010) that the potential does exist for buried or masked elements of more focused prehistoric activity. ASM recommends that an archaeological monitoring program be established during all future ground-disturbing activities within the APE to mitigate any unforeseen impacts to any subsurface deposits not yet identified.

If you have any question regarding the results of this investigation or the cultural resources within the Candlelight Villas APE, please feel free to contact me.

Sincerely,

James T. Daniels, Jr.

James T. Daniels, Jr., M.A., RPA

Attachments: Figures 1-16
Confidential Appendix A: SCIC Records Search Results
Appendix B: NAHC Correspondence
Confidential Appendix C: Detailed Photograph Record

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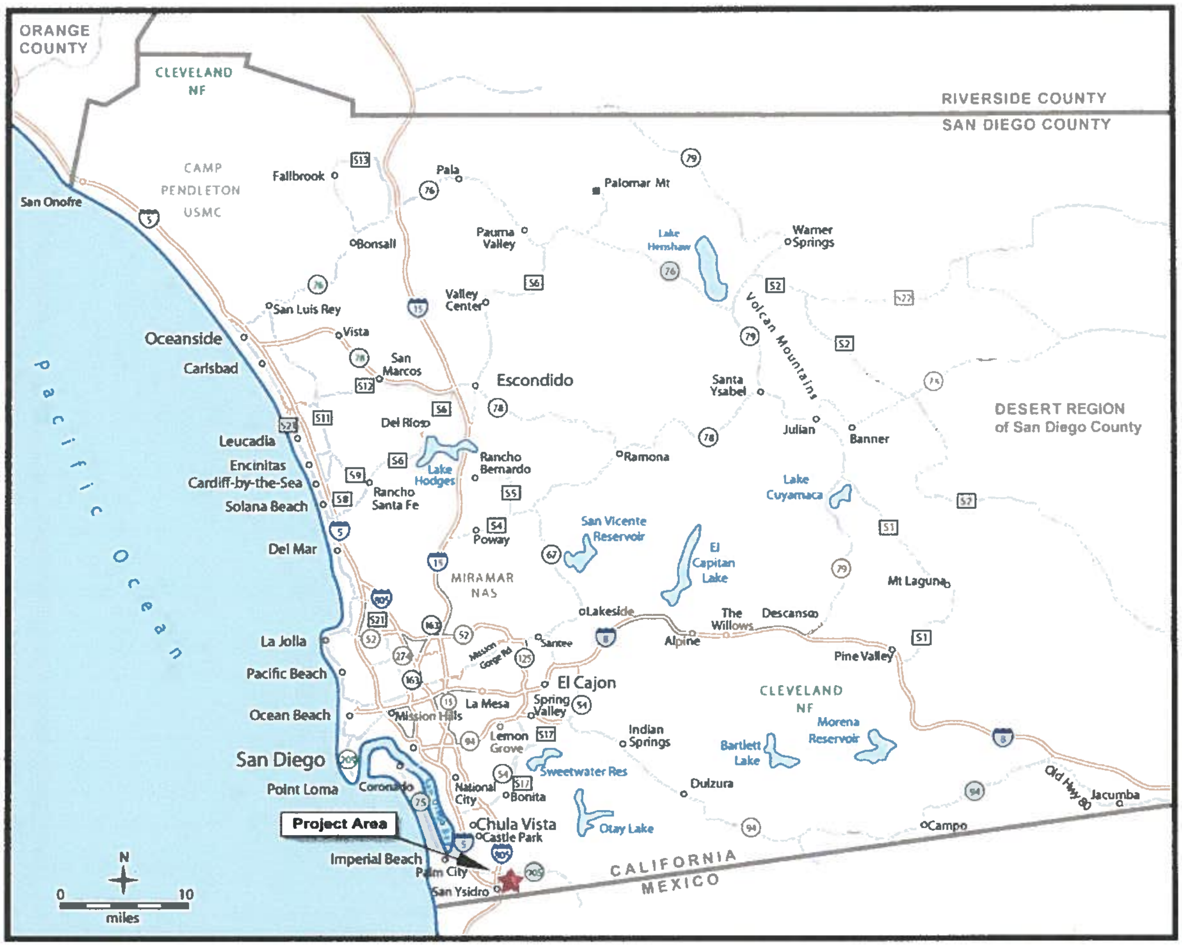

Figure 1. Candlelight Villas Project vicinity.

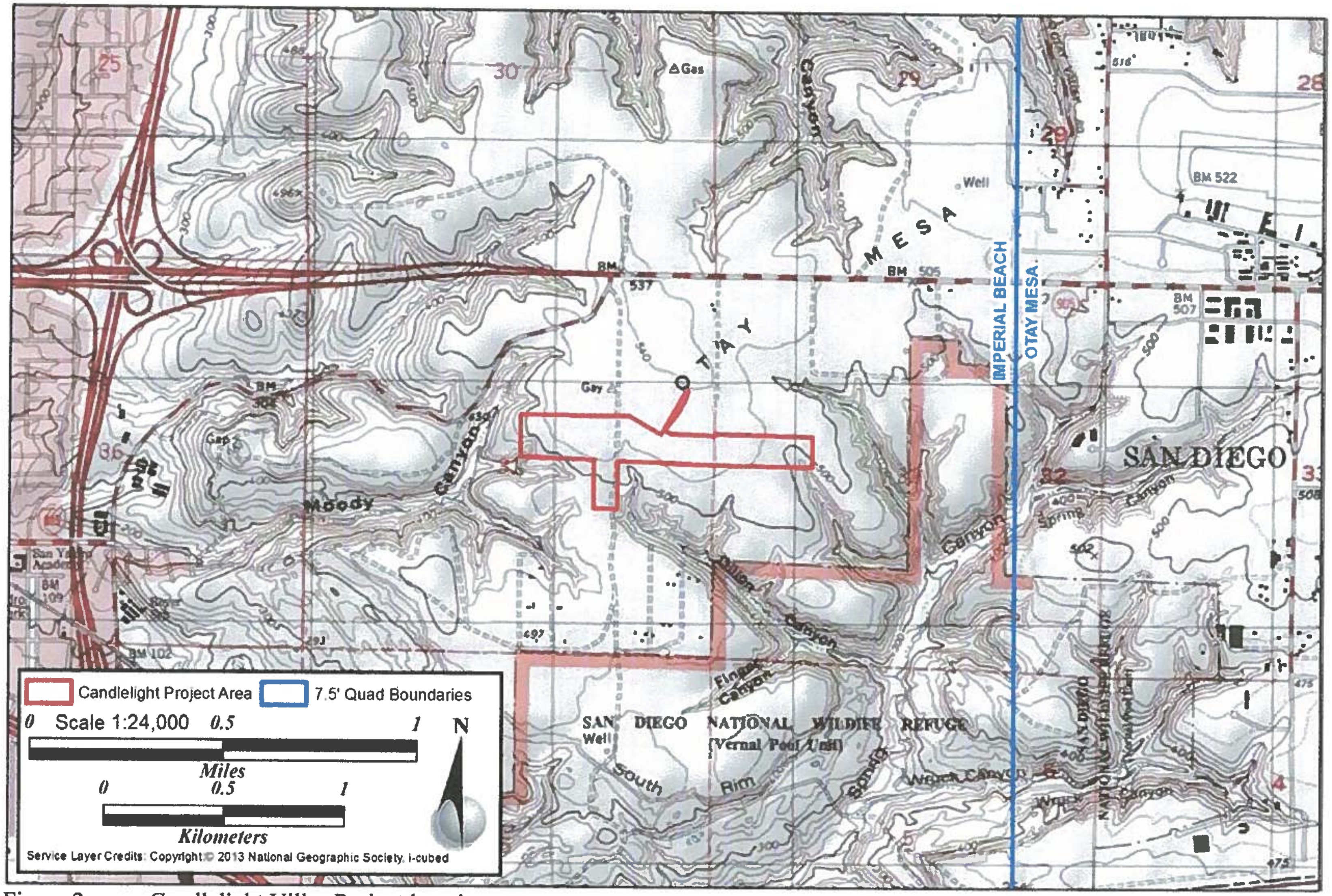

Figure 2. Candlelight Villas Project location map.

Confidential Figure Not for Public Review

Confidential Figure 3. Location of sites within or intersecting the Candlelight Villas APE updated during the current investigation.

Figure 4. Northwest-facing overview of portion of SDI-8640 within project APE from eastern edge of the site.

Figure 5. Fine-grained volcanic flake located just east of SDI-8640 site boundary.

Figure 6. West-facing overview of SDI-8641 from eastern edge of site boundary, depicting old crop furrows.

Figure 7. Southeast-facing overview of SDI-8642 depicting disturbed nature of site surface.

Figure 8. West-facing overview of SDI-8643 from atop berm just east of the eastern edge of the site, depicting grading disturbance in foreground and agricultural disturbance in western portion of the site.

Figure 9. East-facing overview of small section of SDI-8644 intersecting current project APE depicting grading and resulting berm along edge of APE.

Figure 10. East-facing overview of SDI-8645 showing majority of site covered by low dry grass formerly under cultivation and southern portion of site graded with some desert scrub regrowth along side berm.

Figure 11. Northeast-facing overview of portion of SDI-9541 that intersects the project APE depicting trash and construction dumping and evidence of earth movement.

Figure 12. South-facing overview of SDI-10522 along the edge of Moody Canyon.

Figure 13. Fine-grained volcanic material found within the boundaries of SDI-10522 demonstrating characteristics of natural spalling rather than intentional flaking.

Figure 14. Isolated fine-grained volcanic flake identified just north of the site boundary of SDI-10522.

Figure 15. Southwest-facing overview of SDI-10523 showing grading disturbance and berm created along the edge of the APE.

APPENDIX A

Confidential Record Search Results

APPENDIX B

NAHC Correspondence

ASM
affiliates
archaeology
history
ethnography
architectural history

13 July, 2015

Ms. Katy Sanchez
California Native American Heritage Commission
1550 Harbor Blvd, Suite 100
West Sacramento, CA 95691

Re: Sacred Lands File & Native American Contacts List Request for Archaeological Record Search Update and Additional Archaeological Survey for Candlelight Villas Project, San Diego County, California

Dear Ms. Sanchez,

ASM Affiliates, Inc. (ASM) is conducting a cultural resource study for the Army Corps of Engineers need to fulfill their 404 process for the Candlelight Villas Project. Our work will include an updated assessment of all previously recorded site within the project area. ASM is currently conducting a records search update with the South Coastal Information Center (SCIC) at the San Diego State University. I am writing to inquire if you have registered any cultural resources, traditional cultural properties, or areas of heritage sensitivity within this proposed project area.

We also request that you send along a listing of the appropriate individual contacts that may have concerns regarding the above mentioned project. Please submit your response to me at our Carlsbad office, listed below. Feel free to call, write, or e-mail if you have any questions.

Sincerely,

James T. Daniels, Jr.

James T. Daniels, Jr., M.A., RPA
Senior Archaeologist
jdaniels@asmaffiliates.com

Attachment: Figure 1. Map of the project area'

Your Requested Information: County - San Diego
USGS Quads – Imperial Beach
Township 18 South, Range 1W, Section 31 and 31

Corporate: 2034 Corte Del Nogal, Carlsbad, CA 92011 • (760) 804-5757 • Fax: (760) 804-5755
Office Locations: Pasadena & Tehachapi, CA • Boise, ID • Reno & Las Vegas, NV • Salt Lake City, UT
Stanwood & Spokane, WA • Cheyenne, WY • Hilo, HI
www.asmaffiliates.com

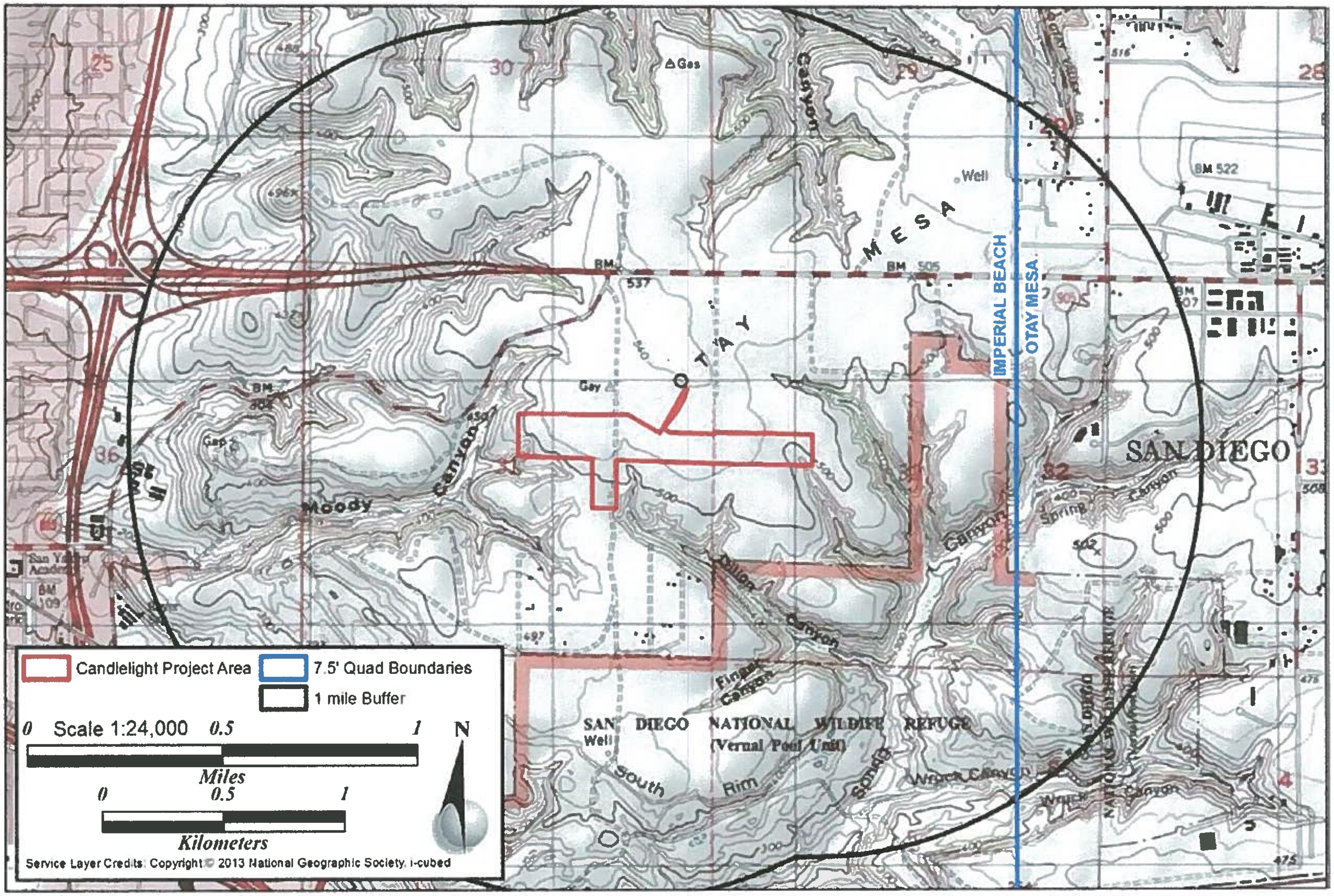

Figure 1. Project location map at 1:24,000 scale.

Brian F. Smith and Associates, Inc.
Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

CULTURAL RESOURCE LETTER REPORT FOR THE CANDLELIGHT VILLAS UPDATE PROJECT

October 6, 2010

Report Prepared for:	**Report Prepared By:**
Helix Environmental Planning, Inc. 7578 El Cajon Boulevard, St 200 La Mesa, California 91941 (619) 462-0552	Brain F. Smith & Associates Inc. 14010 Poway Road, Suite A Poway, CA 92064 (858) 484-0915

INTRODUCTION

This cultural resource study was conducted to provide a cultural resource study update for the Candlelight Villas Project (Smith and Meier 2004, 2005) in order to identify any previously unidentified cultural resources and review the status of previously recorded cultural resources within the 49-acre Candlelight Villas project area. As part of this study, a field survey, a record search update, and literature review update were completed for the Candlelight Villas project area. The Candlelight Villas Project is located in the Otay Mesa area in San Diego, California (Figure 1). Specifically, the project is situated within the Otay Mesa Community Plan area of the City of San Diego, south of Otay Mesa Road and east of Interstate 805, as shown on the USGS *Imperial Beach* Topographic Quadrangle (Figure 2). The proposed project consists of construction of multi-family attached homes, open space, and road improvements making up the approximately 49 acre Area of Potential Effect (APE).

ENVIRONMENTAL SETTING

The project is situated within the Otay Mesa Community Plan area of the City of San Diego, south of Otay Mesa Road and east of Interstate 805. The project lies on a coastal mesa capped by the Lindavista Formation, a unit of Pleistocene marine and terrace deposits, which is underlain by the Otay Formation, an Oligocene marine deposit, both of which are fossiliferous sedimentary deposits (Deméré and Walsh 1993). The project area is positioned north and west of Dillon Canyon, with Moody Canyon located to the west. Intermittent streams flow from these canyons and drain this part of the mesa into the Otay River Valley and the Tijuana River Valley. The project area is generally flat and the elevation is approximately 500 feet ASML. Soils in the project area consist of clay mixed with pockets of bentonite and/or cobbles, comprised mostly of granite, basalt, and quartzite. These lithic materials, generally hard and extremely resistant to erosion, were preferred by the prehistoric inhabitants of the San Diego region for the manufacture of flaked tools and grinding implements (Robbins-Wade 1990).

The biological setting of the project area is dominated by non-native vegetation, with small pockets of native coastal sage and mule fat scrub near the edge of Spring Canyon. Additionally, the project area contains numerous, small vernal pools containing San Diego and Riverside Fairy Shrimp. The vernal pools are primarily located along the western and eastern edges of the property, although there are a few isolated pools in the central and northern portion of the project area. The project area also exhibits generally mild temperatures; however, several instances of winter frost, as well as some weeks in the summer with temperatures reaching 100° Fahrenheit, are recorded annually. Precipitation averages between 12 and 16 inches (30 to 40 centimeters) of rainfall annually, mostly between October and May (Beauchamp 1986). These environments tend to support a wide variety of wildlife, particularly birds, small mammals, and reptiles (Beauchamp 1986). The project area, although currently a vacant lot, has been used for farming and grazing for more than 125 years. Modern impacts to the site include the dumping of building debris and trash and off-road vehicle use, as well as the grading of a soil berm that surrounds the project.

RESULTS OF THE LITERATURE REVIEW AND RECORD SEARCH UPDATE

Records searches were obtained for the project as part of the initial survey and during the site-testing programs (Smith and Meier 2004, 2005). The area surrounding the APE, and including the APE, has been subjected to previous archaeological surveys and site testing programs by BFSA. The locations of all cultural resources within one-mile of the APE have been provided on Figure 3 and 4. The literature review and record search update were completed at the South Coastal Information Center (SCIC), San Diego State University (SDSU), and from the research library at BFSA. The updated record search and literature review did not identify any newly recorded cultural resources or new additional studies within the project APE subsequent to the Smith and Meier 2004 and 2005 studies. However, an additional 10 studies, 10 sites, and 7 isolates have been recorded within a mile radius of the project area since 2005 (Table 1 and 2). A list of the updated resources and relevant studies is provided below:

TABLE 1

Updated Archaeological Sites Located within a One-Mile Radius of the Candlelight Villas Project

Sites	Description
SDI–17100	Lithic production waste, lithic tools
SDI–17517	Lithic production waste, lithic tools
SDI–17518	Lithic production waste, lithic tools
SDI–17519	Lithic production waste, lithic tools
SDI–17520	Lithic production waste
SDI–17521	Lithic production waste
SDI–17522	Lithic production waste, lithic tools
SDI–17523	Lithic production waste, lithic tools
SDI–17524	Lithic production waste, lithic tools
SDI–19751	Historic Cattle Pen
P-37-028467	Isolate flake and core
P-37-028468	Isolate flakes
P-37-028469	Isolate flake, metate fragment
P-37-031359	Isolate flakes
P-37-031491	Historic Otay Mesa Road Alignment
P-37-031492	Isolate flake
P-37-031493	Isolate flake

TABLE 2

Updated Studies Conducted within a Mile of the Candlelight Villas Project Area

Bonner, Wayne, Marnie Aislin-Kay, and James Keasling

2008 Cultural Resource Records Search and Site Visit Results for T-Mobile Facility Candidate SD06909A. Unpublished Report on file at South Coastal Information Center, San Diego State University.

Case, Robert P.

2005 Cultural Resources Survey of the Proposed Otay Mesa Southview Subdivision, City of San Diego, California. Unpublished Report on file at South Coastal Information Center, San Diego State University.

2007 Final Cultural Resources Mitigation Monitoring Report for the Otay Water District 30-inch Recycled Water Pipeline, San Diego County, California. Unpublished Report on file at South Coastal Information Center, San Diego State University.

Cooley, Theodore

2005 Site Significance Evaluation of a Portion of Prehistoric Archaeological Site CA-SDI-17668 Located Along the Proposed Otay Water Districts 30-inch Recycled Water Pipeline Route in the Otay River Valley, San Diego County, California. Report on file at South Coastal Information Center, San Diego State University.

McGinnis, Patrick

2007 Cultural Resources Constraint Study for the Beyer Athletic Fields Project. Unpublished Report on file at South Coastal Information Center, San Diego State University.

Guerrero, Monica Gallegos, Dennis R.

2005 Historical Resource Inventory for the Otay Mesa Trunk Sewer Project Otay Mesa, California. Gallegos & Associates. Unpublished Report on file at South Coastal Information Center, San Diego State University.

Guerrero, Monica, Tracy Stropes, Stephen Van Wormer, Susan Walter, and Dennis R. Gallegos.

2005 Historical Resources Report for the Spring Canyon Ranch Project Otay Mesa, California. Unpublished Report on file at South Coastal Information Center, San Diego State University.

Robbins-Wade, Mary

2008 Archaeological Resources Analysis for the Master Stormwater System Maintenance Program, San Diego, California. Unpublished Report on file at South Coastal Information Center, San Diego State University.

Smith, Brian F. , Johnna L. Buysse

2005 Archaeological Mitigation of Impacts to Prehistoric Site CA-SDI-16397 in Spring Canyon, San Diego County. Unpublished Report on file at South Coastal Information Center, San Diego State University.

Unknown

2005 Draft Environmental Impact Report for the Otay Mesa Trunk Sewer Project. Unpublished Report on file at South Coastal Information Center, San Diego State University

SURVEY RESULTS

The archaeological program employed by BFSA consisted of an updated pedestrian survey of the entire 49-acre APE. The survey generally consisted of north-south parallel transects spaced at five to ten meter intervals. All of the previously investigated sites (SDI-8640, -8641, -8642, -8643, -8645, -9541, -10,552, -10,523) within the APE were revisited to update any potential changes to the sites. Using Trimble GEOXT handheld GPS units, all sites were relocated and their current status was assessed. Review of the previous work conducted by BFSA (Smith and Meier 2004, 2005) in comparison to the present status of all sites within the APE revealed that no changes have occurred to the sites since the 2004 (Smith and Meier) and

2005(Smith and Meier) studies. For the current updated survey, no additional sites were identified within the APE.

RECOMMENDATIONS

The analysis of previous studies for the project (Smith and Meier 2004, 2005) and impacts in addition to archaeological information recovered during this study demonstrated that the project area does not contain any significant cultural resources as defined by CEQA (Section 15064.5) and the City of San Diego Guidelines. Nor do any of the sites within the APE qualify as eligible for listing in the National Register of Historic Places. However, archaeological monitoring is recommended during construction grading and excavation activities. The updated survey of the property failed to identify any additional cultural resoureces within the APE. In addition, all sites within the APE have been previously evaluated as not significant. However, as per the recommendations of Smith and Meier (2004, 2005) the potential does exist for buried or masked elements of more focused prehistoric activity. Therefore, archaeological monitoring by an archaeologist and a Native American monitor is recommended during construction grading and excavation activities. In the event that archaeological artifacts and/or features are identified during monitoring, then construction activities should be temporarily halted until a professional archaeologist conducts an evaluation of the resource.

Any buried resources that may be encountered will require testing to determine significance. If the testing determines that a resource is significant, then a data recovery program will be necessary". If required, the data recovery program will be developed in accordance with the measures outlined by the City of San Diego and based on the guidance of the Otay Mesa Management Plan.

If you require any further information about cultural resources in the area of the APE, contact our offices.

Sincerely,

Brian F. Smith
BFSA

Attachments: Figures 1-4

Figure 1

General Location Map

The Candlelight Villas Update Project

USGS San Diego (1:250,000 series)

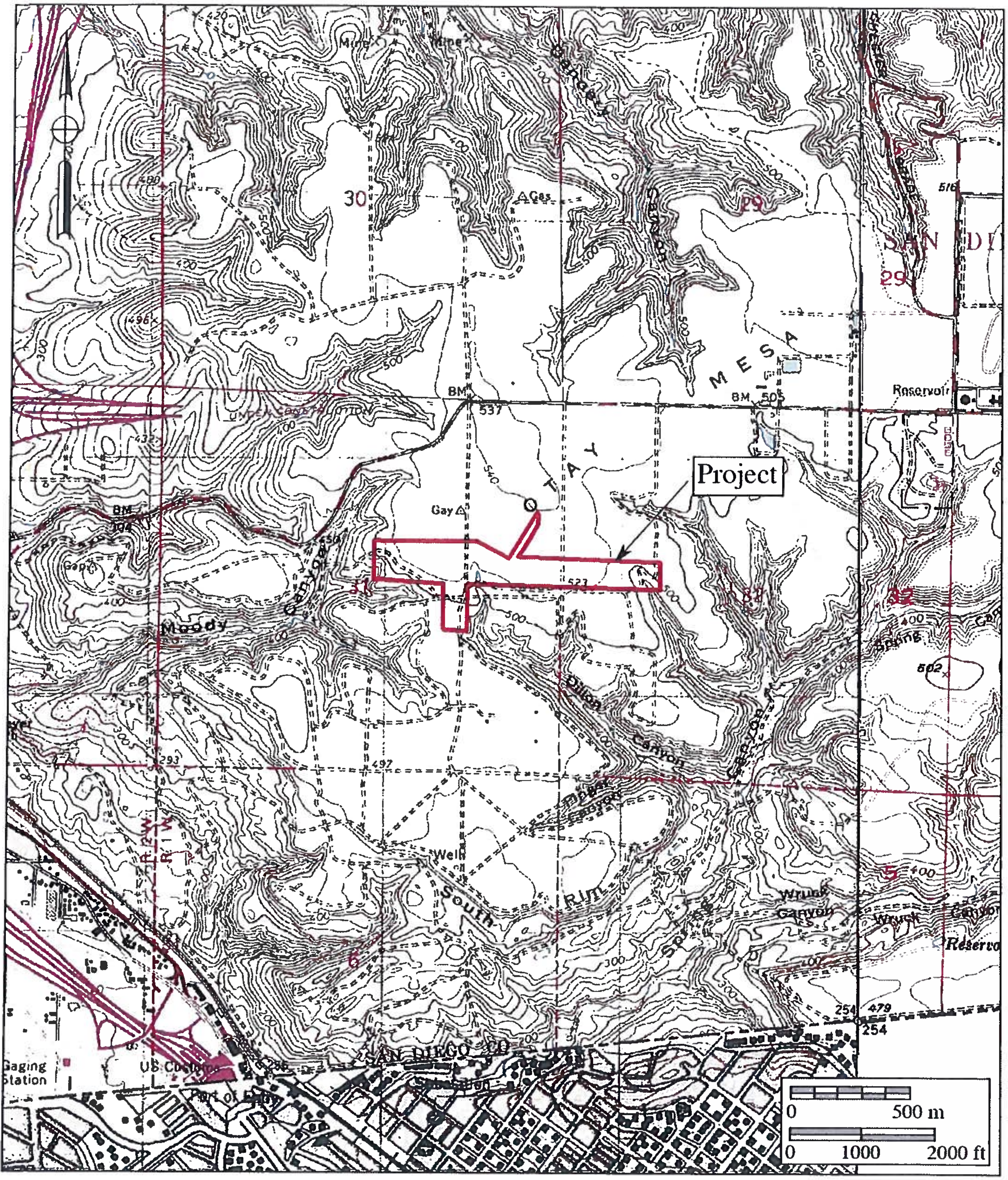

Figure 2

Project Location Map

The Candlelight Villas Update Project

USGS Imperial Beach Quadrangle (7.5 minute series)

AN ARCHAEOLOGICAL SURVEY AND EVALUATION OF CULTURAL RESOURCES FOR THE CANDLELIGHT VILLAS EAST PROJECT

CITY OF SAN DIEGO

Prepared for:

Jeramey Harding
T&B Planning Consultants
17542 East 17th Street, Suite 100
Tustin, California 92780
(714) 505-6360

Prepared by:

Brian F. Smith and K. Harley Meier
Brian F. Smith and Associates
14010 Poway Road, Suite A
Poway, California 92064
(858) 679-8218

May 26, 2004
Revised September 22, 2005

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May 26, 2004
Revised September 22, 2005

National Archaeological Data Base Information

Author(s): Brian F. Smith and K. Harley Meier

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Report Date: May 26, 2004, Revised September 22, 2005

Report Title: "An Archaeological Survey and Evaluation of Cultural Resources for the Candlelight Villas East Project"

Prepared For: Jeramey Harding
T&B Planning Consultants
17542 East 17th Street, Suite 100
Tustin, California 92780

Submitted by: Brian F. Smith and Associates
14010 Poway Road, Suite A
Poway, California 92064

USGS Quadrangle: *Imperial Beach*, California (7.5 minute)

Study Area: 27 acres

Key Words: USGS *Imperial Beach* Quadrangle (7.5 minute); 27 acres; Late Prehistoric; survey and surface collection; light density lithic scatter; testing; SDI-8645; SDI-9541; SDI-8640; SDI-10,523; not significant.

Table of Contents

**Confidential Appendices bound separately.*

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List of Abbreviations

AMSL	above mean sea level
APE	Area of Potential Effect
BFSA	Brian F. Smith and Associates
BMF	bedrock milling feature
Cat no.	catalog number
CEQA	California Environmental Quality Act
CGM	coarse-grained metavolcanic
FGM	fine-grained metavolcanic
LPW	Lithic Production Waste
MGM	medium-grained metavolcanic
SCIC	South Coastal Information Center
STP	Shovel Test Pit
USGS	United States Geological Survey
YBP	years before present

1.0 MANAGEMENT SUMMARY/ABSTRACT

The Candlelight Villas East Project is located in the Otay Mesa area in San Diego County, California (Figure 1.0–1). Specifically, the project is situated within the Otay Mesa Community Plan area of the City of San Diego, south of Otay Mesa Road and east of Interstate 805, as shown on the USGS *Imperial Beach* Topographic Quadrangle (Figure1.0–2). The proposed project consists of construction of between 610 and 732 multi-family attached homes on approximately 24.4 acres at a density of 25 to 30 DU/AC. The remaining 0.9 acre would most likely be devoted to open space, and 1.7 acres would be devoted to the extension of Caliente Avenue through the project. At the time of the archaeological investigation a total of 27 acres made up the Candlelight Villas East Area of Potential Effect (APE). However, the current plans propose to impact an additional eight acres and several small off-site areas that were originally part of the Candlelight Villas West (Phase II) Project (Figure 1.0–3).

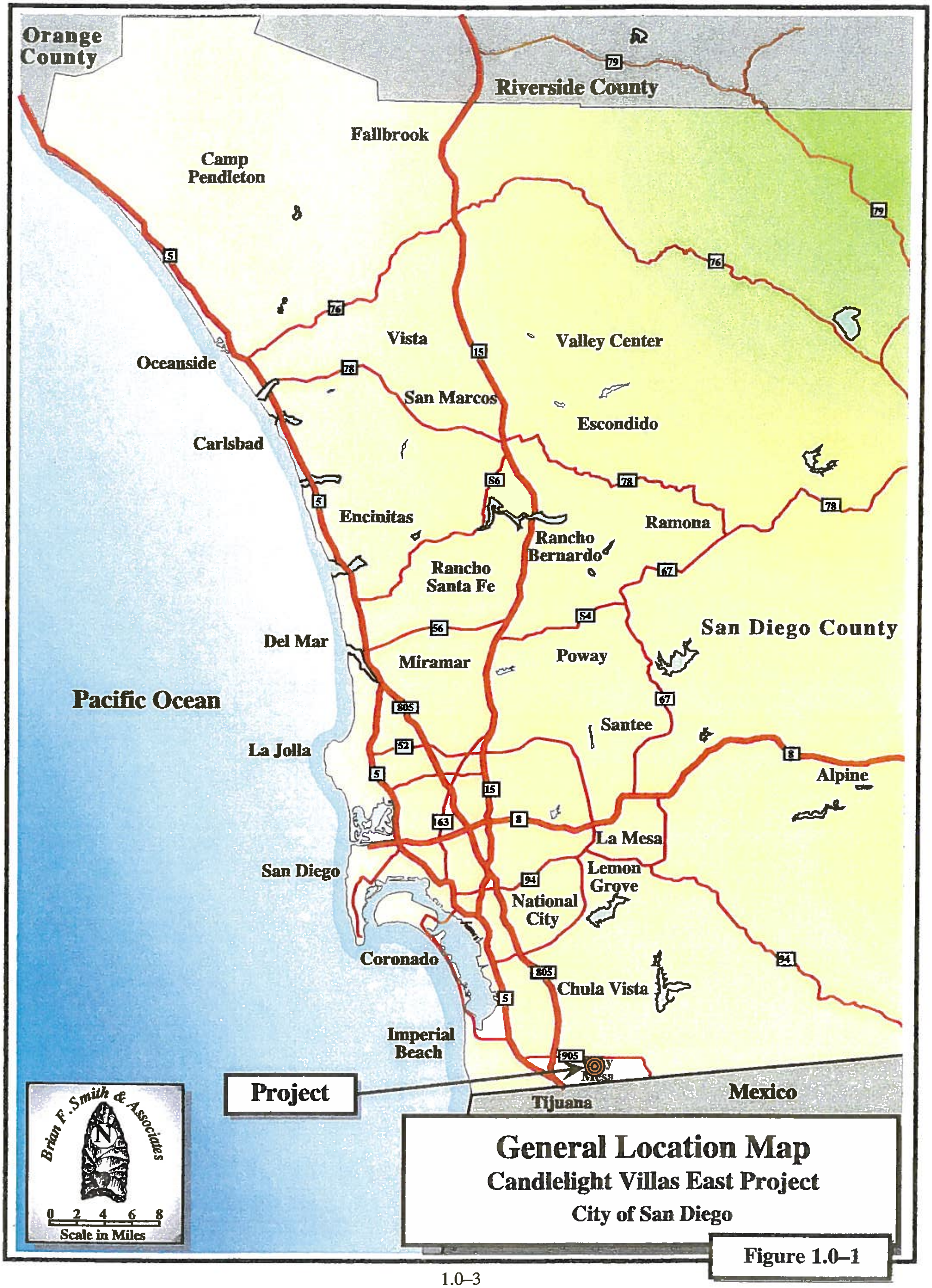
Archaeological investigations were conducted on March 1 and 2, and April 14 and 15, 2004. The property is characterized as very disturbed; the property has been enclosed with a soil berm of one to several feet tall, and the property has been cultivated and contoured. The archaeological survey resulted in the identification of two light to moderate density lithic scatters in the eastern and southeastern portion of the project area. Initially, these two sites were given temporary site designations of C–1 and C–2; however, the sites were eventually linked to recorded sites SDI–8645 and SDI–9541. A detailed map and surface collection was completed for artifacts located within the project boundaries. The surface artifacts from both sites included a wide variety of lithic production waste and lithic tools, supporting the need for subsurface significance testing and evaluation. It appears that one site (Site SDI–9541) extends outside the project's APE; the area outside the boundary was not included in the testing and evaluation.

As part of the current study, BFSA conducted an archaeological records search at the South Coastal Information Center (SCIC) at San Diego State University. The record search showed that at least two prehistoric sites have been registered within the Candlelight East APE (SDI–8645 and SDI–8643). There is one other registered prehistoric site (SDI–9541) that is located on the northeastern boundary of the Candlelight Villas East APE, which was found to extend onto the subject property area. The ambiguity over the location of SDI–9541 resides with mismatched site locations reported by various researchers. Based on this previous research, project site descriptions, and artifact collections, C–1 was determined to be part of SDI–9541. Additionally, based on the same reasons as previously stated, C–2 corresponds to SDI–8645.

Site SDI–8643 was not relocated. This site was included in a research study completed in 1990 by ASM Affiliates. The surface artifacts were collected during their testing phase, therefore evidence of the site's existence would not be readily apparent without subsurface testing. The testing program conducted by BFSA at SDI–8645 and SDI–9541 supplied sufficient information to evaluate the sites as not significant.

During the time of the current archaeological investigations in May and June 2004, BFSA also conducted investigations for the Candlelight Villas West (Phase II) Project located adjacent to the Candlelight Vills East property. Two previously recorded sites, (SDI-8640 and SDI-10,523), were relocated and subjected to testing and evaluation programs. The project plans have since been revised and Site SDI-10,523 will now be impacted by the Candlelight Villas East Project (Figure 1.0–3). Therefore, the results of the investigation of Site SDI-8640 and SDI-10,523 are presented in Section 5.0 of this report as well as in the original technical report for the Candlelight Villas West (Phase II) Project (Smith 2004). The fieldwork for these two sites was completed between March 1 and April 21 2004, and the testing program conducted by BFSA at SDI–8640 and SDI–10,523 supplied sufficient information to evaluate the sites as not significant. Therefore, potential disturbance to cultural resources associated with the development project will not represent a significant adverse impact. This report includes all data relevant to the evaluation of the site and impact analysis.

All cultural materials collected during the archaeoogical survey and testing programs were prepared for permanent curation. The project collections and reports will be curated at the San Diego Archaeological Center. In addition, all notes, photographs, and other materials related to this project will be housed at the BFSA archaeological laboratory in Poway, California. Documentation of each site included updating the site record forms for previously recorded sites and submitting site forms for newly recorded sites to the SCIC at San Diego State University (Appendix II).

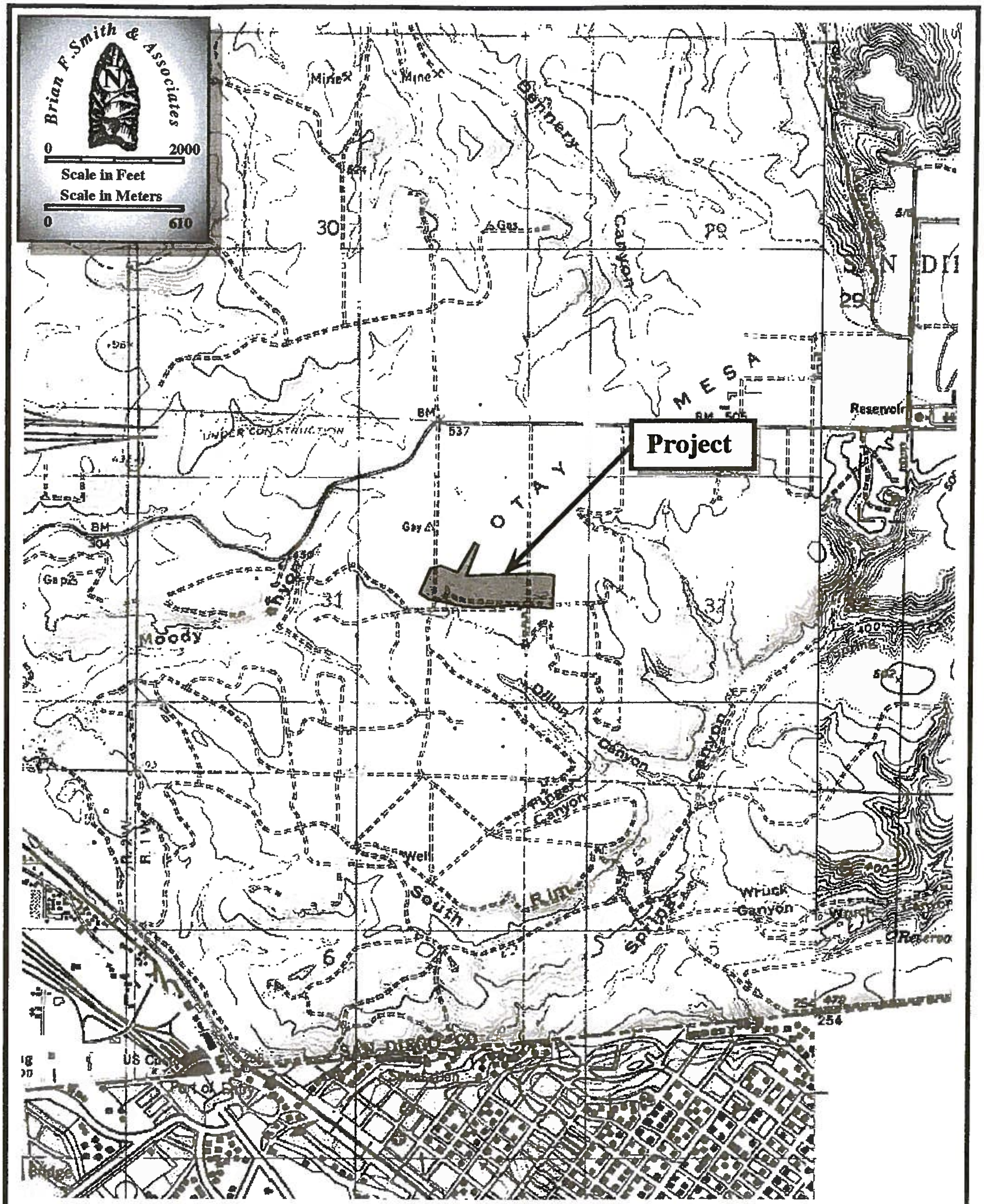


General Location Map

Candlelight Villas East Project

City of San Diego

Figure 1.0–1



Project Location Map

Candlelight Villas East Project

USGS *Imperial Beach* Quadrangle (7.5 minute series)

Figure 1.0–2

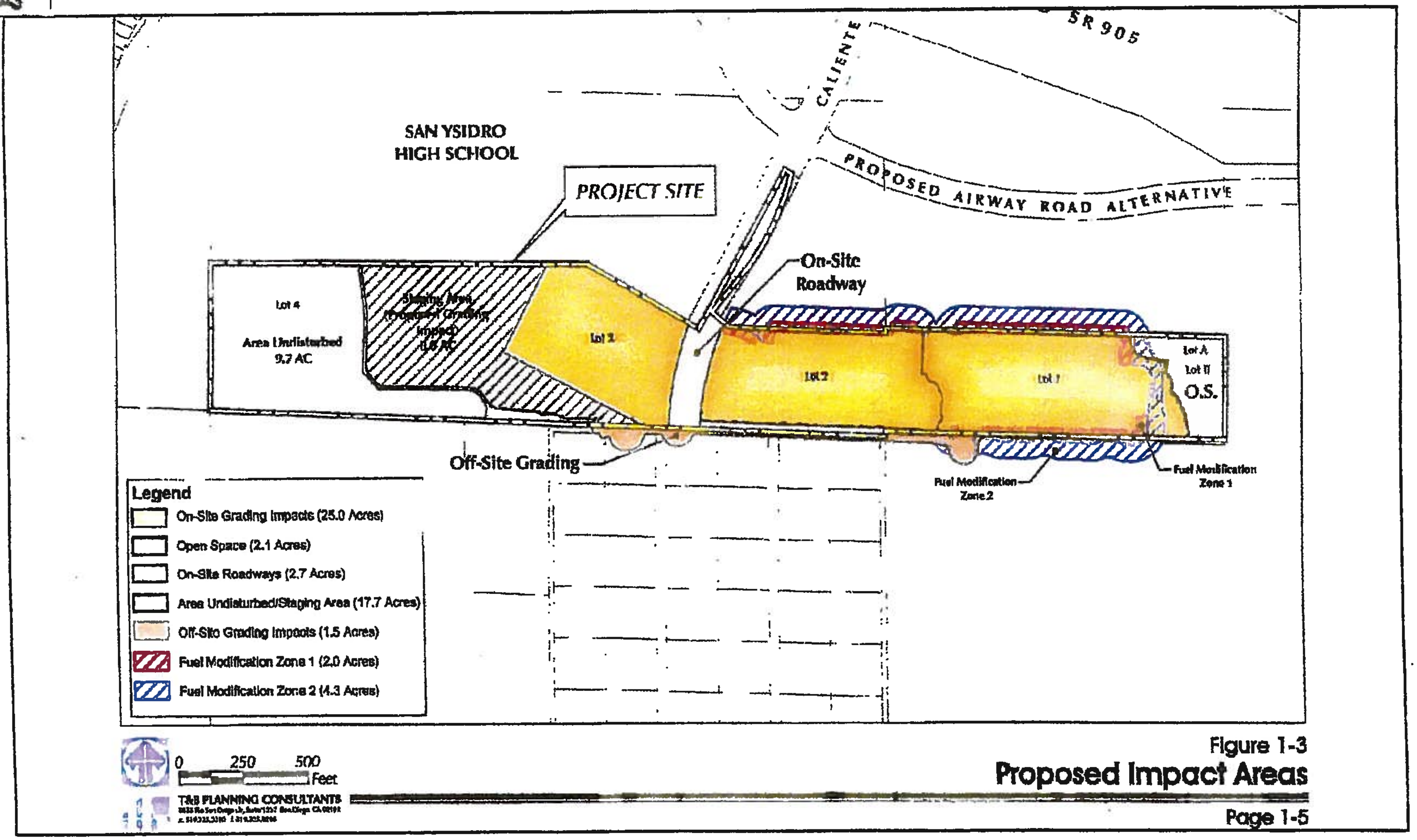


Figure 1.0-3
Project Development Map
The Candlelight Villas East Project

Source: T&B Consultants

2.0 UNDERTAKING INFORMATION/INTRODUCTION

The City of San Diego, as lead agency, required an archaeological survey for the Candlelight Villas East Project. The project is located just north of Dillon Canyon and east of Moody Canyon in the western Otay Mesa area of San Diego County. Specifically, the project area is positioned south of Otay Mesa Road and east of Interstate 805, as shown on the USGS *Imperial Beach* Topographic Quadrangle (Figures 1.0–2). The original proposed project consisted of building between 610 and 732 multi-family attached homes on 24.4 acres out of the 27 acres allotted. An extension of Caliente Avenue will be built through the site in order to provide access to all areas. The proposed project has currently been revised and will impact portions of the area originally part of the Candlelight Villas West (Phase II) Project. The current project plans are shown in Figure 1.0–3.

The archaeological study conformed to specific criteria contained in the California Environmental Quality Act (CEQA) and in the City of San Diego's Historical Resources Guidelines.

Charles Callahan, Chris Powell, Victoria Morgan, and Jason Richards, under the direction of Brian F. Smith, conducted the archaeological survey and the surface collection of Sites SDI-8645 and SDI-9541 on March 1 and 2, 2004, and the significance testing and evaluation on April 14 and 15, 2004. The testing program followed City guidelines and testing protocol, although the program proceeded without City concurrence due to oversight. The archaeological survey identified two prehistoric artifact scatters, one near the eastern boundary and one near the southeastern boundary of the project area. Artifacts collected from both sites consisted primarily of fine- and medium-grained metavolcanic flakes, although core tools, scrapers, manos, and retouched flakes were also identified. The diversity of artifacts collected during the surface evaluation supported the presence of subsurface features and justified further testing and evaluation of these sites. The archaeological survey of Sites SDI-8460 and SDI-10,523 was conducted on March 1 and 2, 2004, and the significance testing and evaluation on April 19-21, 2004. The diversity of artifacts collected during the surface evaluation of these two sites supported the presence of subsurface features and justified further testing and evaluation of these sites. The sites were originally tested and evaluated as part of the Candlelight Villas West (Phase II) Project, and the results of these investigations are included in the current report due to alterations to the proposed project that will impact portions of the Candlelight Villas West (Phase II) project area (Figure 1.0–3).

3.0 SETTING

The project setting includes both physical and biological contexts of the proposed project, as well as the cultural setting of prehistoric and historic human activities in the general area.

3.1 Natural Setting

The project is situated within the Otay Mesa Community Plan area of the City of San Diego, south of Otay Mesa Road and east of Interstate 805. The project lies on a coastal mesa capped by the Lindavista Formation, a unit of Pleistocene marine and terrace deposits, which is underlain by the Otay Formation, an Oligocene marine deposit, both of which are fossiliferous sedimentary deposits (Deméré and Walsh 1993). The project area is positioned north and west of Dillon Canyon, with Moody Canyon located to the west. Intermittent streams flow from these canyons and drain this part of the mesa into the Otay River Valley and the Tijuana River Valley. The project area is generally flat and the elevation is approximately 500 feet ASML.

Soils in the project area consist of clay mixed with pockets of bentonite and/or cobbles, comprised mostly of granite, basalt, and quartzite. These lithic materials, generally hard and extremely resistant to erosion, were preferred by the prehistoric inhabitants of the San Diego region for the manufacture of flaked tools and grinding implements (Robbins-Wade 1990).

The biological setting of the project area is dominated by non-native vegetation, with small pockets of native coastal sage and mule fat scrub near the edge of Dennery Canyon. Additionally, the project area contains numerous, small vernal pools containing San Diego and Riverside Fairy Shrimp. The vernal pools are primarily located along the western and eastern edges of the property, although there are a few isolated pools in the central and northern portion of the project area. The project area also exhibits generally mild temperatures; however, several instances of winter frost, as well as some weeks in the summer with temperatures reaching 100° Fahrenheit, are recorded annually. Precipitation averages between 12 and 16 inches (30 to 40 centimeters) of rainfall annually, mostly between October and May (Beauchamp 1986). These environments tend to support a wide variety of wildlife, particularly birds, small mammals, and reptiles (Beauchamp 1986). The project area, although currently a vacant lot, has been used for farming and grazing for more than 125 years. Modern impacts to the site include the dumping of building debris and trash and off-road vehicle use, as well as the grading of a soil berm that surrounds the project.

3.2 Cultural Setting

The cultures that have been identified in the general vicinity of the project consist of the possible Paleo-Indian manifestation of the San Dieguito Complex, the Archaic and Early Milling Stone Horizons represented by the La Jolla Complex, and the Late Prehistoric Kumeyaay culture. The area was used for ranching and farming following the Hispanic intrusion into the region, and extending into the historic period. A brief discussion of the cultural elements in the project area is provided in the following subsections.

3.2.1 Paleoenvironment

Because of the close relationship between prehistoric settlement and subsistence patterns and the environment, it is necessary to understand the setting in which these systems operated. At the end of the final period of glaciation, approximately 11,000 to 10,000 years before the present (YBP), the sea level was considerably lower than it is now; the coastline at that time would have been two to two and one-half miles west of its present location (Smith and Moriarty 1985a, 1985b). At approximately 7,000 YBP, the sea level rose rapidly, filling in many coastal canyons that had been dry during the glacial period. The period between 7,000 and 4,000 YBP was characterized by conditions that were drier and warmer than previously, followed by a cooler, moister environment, similar to the present-day climate (Robbins-Wade 1990). Changes in sea level and coastal topography are often manifested in archaeological sites in the types of shellfish that were used by prehistoric groups. Different species of shellfish prefer certain types of environments; dated sites that contain shellfish remains reflect the setting that was exploited by the prehistoric occupants.

Unfortunately, pollen studies have not been conducted for this area of San Diego; however, studies in other areas of southern California, such as Santa Barbara, indicate that the coastal plains supported a pine forest between approximately 12,000 and 8,000 YBP (Robbins-Wade 1990). After 8,000 YBP, this environment was replaced by more open habitats, which supported oak and non-arboreal communities. The coastal sage scrub and chaparral environments of today appear to have become dominant after 2,200 YBP (Robbins-Wade 1990).

3.2.2 Prehistory

The San Dieguito Complex peoples occupied sites in this region between 10,000 and 8,000 YBP, and were related to or contemporaneous with the Paleo-Indian groups in the Great Basin area and the Midwest. The artifacts recovered from San Dieguito sites duplicate the typology attributed to the Western Pluvial Lakes Tradition (Moratto 1984; Davis et al. 1969). These artifacts generally consist of scrapers and scraper planes, choppers, and bifacially flaked knives, but few or no milling tools. The absence of grinding or milling stones suggests that cereal grains and nuts were not part of the subsistence pattern. Tools recovered from sites of the San Dieguito Complex and the general pattern of site locations indicate that they were a wandering, hunting and gathering society (Moriarty 1969; Rogers 1966).

The San Dieguito Complex is the least understood of the cultures that have inhabited San Diego County. This is primarily because San Dieguito sites rarely contain stratigraphic information or datable material. There is a current controversy among researchers centering on the relationship of the San Dieguito and the subsequent cultural manifestation in the area, the La

Jolla Complex. Firm evidence has not yet been discovered to indicate whether the San Dieguito "evolved" into the La Jolla Complex, if the La Jolla Complex moved into the area and assimilated the San Dieguito people, or if the San Dieguito retreated from the area because of environmental or cultural pressures. Very little evidence of the San Dieguito Complex has been identified within the project area. It is probable that environmental changes associated with climate affected the subsistence base of the San Dieguito Complex, resulting in their exodus from this area sometime before 9,000 YBP.

The La Jolla Complex

Approximately 9,000 to 8,500 YBP, a second major cultural tradition was established in the San Diego region, primarily along the coast. At that time, the shoreline was located farther west than it is currently, because the sea level was lower during the end of the last Ice Age. Locally, this cultural tradition has been called the La Jolla Complex, and radiocarbon dates from sites attributed to this culture span a period of more than 7,000 years in this region (between 9,000 and 2,000 YBP). The La Jolla Complex is best recognized for its pattern of shell middens, grinding tools closely associated with marine resources, and flexed burials (Shumway, Hubbs and Moriarty 1961; Smith and Moriarty 1985a, 1985b).

The tool typology of the La Jolla Complex displays a wide range of sophisticated lithic manufacturing techniques. Scrapers, the most common type of flaked tool recovered from La Jolla sites, were created by either splitting cobbles or finely flaking quarried material. La Jolla sites also contain large numbers of milling tools (manos and metates) and flakes that appear to have been used to pry open shellfish (Smith and Moriarty 1985a, 1985b). Inland sites of the La Jolla Complex, sometimes called the Pauma Complex, were situated at a distance from marine food resources and generally lack marine-related refuse, but do contain large quantities of milling tools and food bone, suggesting seasonal migration from the coast to the inland valleys (Smith 1986).

The Late Prehistoric Kumeyaay Indians

The last major migration into the coastal zone occurred approximately 1,500 YBP, when Yuman- and Shoshonean-speaking people moved from the Colorado River Basin to the coast in search of a more plentiful food supply (Moriarty 1969). This group is known locally as the Late Prehistoric Diegueño, or Kumeyaay, culture. Fortunately, ethnographic evidence is available from the period of the earliest Spanish contact to the late 1800s, providing a record of the nonmaterial aspects of these groups.

Sites associated with the Kumeyaay are focused in the foothills and mountains, rather than along the coast. Their subsistence pattern was based on the collection of seeds (especially acorns), berries, and bulbs, and the hunting of small game. Artifact collections from late prehistoric occupations include milling tools, ceramics, projectile points, scrapers, planes, beads, shaft straighteners, and hammerstones. Ethnographic information indicates that the culture of the Kumeyaay Indians consisted of a close clan system with definitive religious beliefs and complex trade associations with relatives living in the Colorado River Basin (Kroeber 1925).

The last phase of the Kumeyaay culture began approximately 400 YBP, with the first contact by Europeans (Juan Rodriguez Cabrillo, in 1542). By 1769, the time of the first European settlement in San Diego, at least 20 permanent or semi-permanent villages had been established near the Pueblo of San Diego. These living sites were primarily coastal, although some were located in valleys that were a short distance inland. For the most part, villages were located close to a supply of fresh water and plant foods. Villages that depended on springs for their water supply were usually located some distance from them, so that the animals using them would not be driven off, and also to avoid the insects that frequented the surrounding marshy areas (Moriarty 1961). Historical accounts generally agree that a few villages were located along the bay side of Point Loma, and several were scattered along the shores of Mission Bay. Others were situated in the present area of the City of San Diego and near the mouths of the major streams that emptied into San Diego Bay. Major river valleys, such as the San Diego River Valley, were well populated because of their resources of plant foods and water. Villages were also located in the La Jolla area, in Soledad Canyon, at the mouth of Rose Canyon, and in the inland valleys of the Otay Mesa, east of San Diego. A number of temporary shellfish-gathering and fishing sites were situated on the shores of bays and the ocean.

3.2.3 History

Exploration Period (1530-1769)

The historic period around San Diego Bay began with the landing of Juan Rodriguez Cabrillo and his men in 1542. Sixty years after the Cabrillo expeditions, an expedition under Sebastian Viscaíno made an extensive and thorough exploration of the Pacific Coast. Although the voyage did not extend beyond the northern limits of the Cabrillo track, Viscaíno had the most lasting effect on the nomenclature of the coast. Many of the names he gave to places have survived, whereas practically every one of Cabrillo's has faded from use. Cabrillo gave the name of "San Miguel" to the first port at which he stopped in what is now the United States; 60 years later, Viscaíno changed it to "San Diego" (Rolle 1969).

Spanish Period (1769-1821)

The Spanish occupation of the claimed territory of Alta California took place during the reign of King Carlos III of Spain. The powerful representative of the King in Mexico was Jose de Galvez, who conceived of the plan to colonize Alta California and thereby secure the area for the Spanish crown (Rolle 1969). The effort involved both a military and a religious contingent, with the overall intent of establishing forts and missions to gain control of the land and its native inhabitants through conversion. Actual colonization of the San Diego area began on July 16, 1769, when the first Spanish exploring party, commanded by Gaspar de Portolá (with Father Junípero Serra in charge of religious conversion of the native populations), arrived in San Diego to secure California for the Spanish crown (Palou 1926). The natural attraction of the harbor at San Diego and the establishment of a military presence in the area solidified the importance of San Diego to the Spanish colonization of the region and the growth of the civilian population. Missions were constructed from San Diego to as far north as San Francisco. The mission locations were based on a number of important territorial, military, and religious considerations. Grants of land were given to persons who made applications, but many tracts reverted to the government for lack of use. As an extension of territorial control by the Spanish empire, each mission was placed so as to command as much territory and as large a population as possible. While primary access to California during the Spanish Period was by sea, the route of El Camino Real served as the land route for transportation, commercial, and military activities. This route was considered to be the most direct path between the missions (Rolle 1969). As increasing numbers of Spanish and Mexican people, and later Americans during the Gold Rush, settled in the area, the Indian populations diminished as they were displaced or decimated by disease (Carrico and Taylor 1983).

Mexican Period (1821-1846)

By 1821, Mexico had gained independence from Spain, and the northern territories were subject to political repercussions. By 1834, all the mission lands had been removed from the control of the Franciscan Order under the Acts of Secularization. Without proper maintenance, the missions quickly began to disintegrate, and after 1836, missionaries ceased to make regular visits inland to minister the needs of the Indians (Engelhardt 1921). Large tracts of land continued to be granted to persons who applied for them or to persons who had gained favor with the Mexican government. Grants of land were also made to settle government debts.

Anglo-American Period (1846-Present)

California was invaded by United States troops during the Mexican War of 1846-1848. The acquisition of strategic Pacific ports and California land was one of the principal objectives of the war (Price 1967). At the time, the inhabitants of California were practically defenseless, and they quickly surrendered to the United States Navy in July 1847 (Bancroft 1884).

The cattle ranchers of the "counties" of southern California prospered during the cattle boom of the early 1850s. They were able to "reap windfall profit . . . pay taxes and lawyer's bills. . . and generally live according to custom" (Pitt 1966). Cattle-raising soon declined, however, contributing to the expansion of agriculture. With the passage of the "No Fence Act," San Diego's economy changed from stock-raising to farming (Rolle 1969). The act allowed for the expansion of unfenced farms, which was crucial in an area where fencing material was practically unavailable. Five years after its passage, most of the arable lands in San Diego

County had been patented as either ranchos or homesteads, and growing grain crops replaced raising cattle in many of the county's inland valleys (Blick 1976; Elliott 1883 [1965]). By 1870, farmers had learned to dry-farm and were coping with some of the peculiarities of San Diego County's climate (*San Diego Union*, February 6, 1868; Van Dyke 1886). Between 1869 and 1871, the amount of cultivated acreage in the county rose from less than 5,000 acres to more than 20,000 (*San Diego Union*, January 2, 1872). Of course, droughts continued to hinder the development of agriculture (Crouch 1915; *San Diego Union*, November 10, 1870; Shipek 1977). Large-scale farming in San Diego County was limited by a lack of water and the small size of arable valleys; also, the small urban population and poor roads restricted commercial crop growing. Nevertheless, cattle continued to be grazed in inland San Diego County. For example, in the Otay Mesa area, the "No Fence Act" had little effect, because ranches were still spaced far apart, and natural ridges kept the cattle out of growing crops (Gordinier 1966).

During the first two decades of the twentieth century, the population of San Diego County continued to grow. The population of the inland county declined during the 1890s, but between 1900 and 1910, it rose by about 70 percent. The pioneering efforts were over; the railroads had broken the relative isolation of southern California, and life in San Diego County became similar to other communities throughout the west. After World War I, the history of San Diego County was primarily determined by the growth of San Diego Bay. In 1919, the United States Navy decided to make the bay the home base for the Pacific Fleet (Pourade 1967). During the 1920s, the aircraft industry also established itself at the bay (Heiges 1976). The establishment of these industries led to the growth of the county as a whole; however, most of the growth occurred in the north county coastal areas, where the population almost tripled between 1920 and 1930. During this time period, the history of inland San Diego County was subsidiary to that of the city of San Diego, which became a Navy center and industrial city (Heiges 1976). In inland San Diego County, agriculture became specialized, and recreational areas were established in the mountain and desert areas. Just before World War II, urbanization began to spread to the inland county.

3.3 Review of Previous Archaeological Investigations

As part of the current study, BFSA conducted an archaeological record search at the South Coastal Information Center (SCIC) at San Diego State University. The record search showed that at least two prehistoric sites have been registered within the Candlelight East Area of Potential Effect (APE). There is one other registered prehistoric site that is located on the northeastern boundary of the East APE, and may or may not be located within the project area. The ambiguity over this site's location resides with mismatched reported site locations by various researchers.

MSA, Inc. originally located three sites in 1980; two of the three sites were reexamined in 1990 by ASM Affiliates, Inc. (SDI–8643 and SDI–8645). The third site (SDI–9541) was not included in that study because it was outside the project's APE (Cook 1990). ASM Affiliates, Inc. performed a surface investigation and subsurface testing of the two sites relevant to their study. They mapped and collected all surface artifacts and reported on all surface and subsurface finds. The present Candlelight Villas East Project located one of the three previously recorded sites and identified it as being SDI–8645. The second site located by BFSA, corresponds to SDI–9541, even though the records search shows that SDI–9541 appears to be located just outside the APE. Surface investigation of SDI–9541 shows that it extends eastward outside the APE, though no artifacts were collected from outside the project's boundary. Site SDI–8643 was not relocated during the present study. It is thought that due to the very limited surface presence during the 1990 investigation (four total artifacts), all of which were collected, current surface evidence of a prehistoric presence for this site no longer exists. Since the time of the current archaeological investigation, the proposed Candlelight Villas East Project has been revised and the APE has ben expanded to include portions of the Candlelight Villas West (Phase II) project area. This area was also investigated by BFSA and five prehistoric sites had been registered within the Candlelight Villas West (Phase II) project area. Two of these sites, SDI-8640 and SDI-10,523, were relocted and subjected to a testing and significance evaluation program by BFSA in March and April of 2004.

A total of 59 cultural resources have been recorded within one mile of the Candlelight Villas East boundary (Table 3.0–1). As is typical of Otay Mesa, most of the prehistoric sites are characterized as lithic scatters, varying from two artifacts to a moderately dense scatter of lithic artifacts. In some cases, these sites were identified during surveys and have not been tested, therefore their subsurface characteristics are not known. In other cases, the sites have undergone surface and subsurface testing, sometimes more than once, and surface evidence of their existence may or may not be present due to collection of the artifacts and/or disturbance. A list of previous studies conducted in the area of the Candlelight Villas project is presented in Table 3.0–2. The complete record searches are provided in Appendix I.

TABLE 3.0–1
Archaeological Sites Located within a One-Mile Radius of the Candlelight Villas East Project

Sites	Description
SDI–1077	Isolate tool
SDI–6699 (W–2106)	Lithic production waste, lithic tools
SDI–6941 (W–2143)	Lithic production waste, lithic tools
SDI–7604 (W–2410)	Lithic production waste, lithic tools
SDI–8640 (W–2913)	Lithic production waste, lithic tools, groundstone
SDI–8641 (W–2914)	Lithic production waste, lithic tools
SDI–8642 (W–2915)	Lithic production waste
SDI–8644 (W–2917)	Lithic production waste, lithic tools
SDI–10,187	Lithic production waste, lithic tools
SDI–10,189	Lithic production waste, lithic tools, groundstone, bone
SDI–10,190	Lithic production waste, lithic tools, groundstone, bone, shell
SDI–10,192 (W–3585)	Lithic production waste, lithic tools, shell
SDI–10,193 (W–3586)	Lithic production waste, lithic tools, bone
SDI–10,194 (W–3587)	Lithic production waste, lithic tools, shell
SDI–10,197 (W–3590)	Lithic production waste, lithic tools
SDI–10,198 (W–3591)	Lithic production waste, lithic tools, groundstone, bone, shell
SDI–10,200 (W–3593)	Lithic production waste, shell
SDI–10,207 (W–3600)	Lithic production waste, lithic tools, groundstone, shell
SDI–10,208 (W–3601)	Lithic production waste, lithic tools, bone, shell
SDI–10,285	Lithic production waste, lithic tools
SDI–10,286	Lithic production waste, lithic tools
SDI–10,511	Lithic production waste, lithic tools, shell
SDI–10,512	Lithic production waste, lithic tools
SDI–10,513	Lithic production waste, lithic tools
SDI–10,514	Lithic production waste, lithic tools
SDI–10,515	Lithic production waste, lithic tools
SDI–10,516	Lithic production waste, lithic tools
SDI–10,517	Lithic production waste
SDI–10,518	Lithic production waste, lithic tools
SDI–10,519	Lithic production waste, lithic tools

Sites	Description
SDI–10,520	Lithic production waste, lithic tools
SDI–10,521	Lithic production waste, lithic tools
SDI–10,522	Lithic production waste
SDI–10,523	Lithic production waste, lithic tools
SDI–10,524	Lithic production waste, lithic tools
SDI–10,525	Lithic production waste, lithic tools
SDI–10,526	Lithic production waste, lithic tools
SDI–10,527	Lithic production waste, lithic tools, shell
SDI–10,802	Lithic production waste, lithic tools
SDI–10,803	Lithic production waste, lithic tools
SDI–10,805	Lithic production waste, lithic tools
SDI–10,810	Lithic production waste, lithic tools
SDI–11,680	Lithic production waste
SDI–14,084 (P–014285)	Lithic production waste
SDI–14,085 (P–014286)	Lithic production waste, lithic tools, Historic materials including metal, brick, plaster, glass, and ceramic
SDI–14,088 (P–014289)	Lithic production waste
SDI–14,091 (P–014292)	Lithic production waste, lithic tools, portable BMF
SDI–16,704 (P–37025212)	Lithic production waste, lithic tools
SDI–16,705 (P–37025213)	Lithic production waste, lithic tools, metate
SDI–16,706 (P–37025214)	Lithic production waste
SDI–I–100 (P–014798)	Isolate flake
SDI–I–99 (P–014797)	Isolate flake
SDI–I–268 (P–014966)	Isolate flake
SDI–I–269 (P–014967)	Isolate flake
SDI–I–270 (P–014968)	Isolate core and flake
SDI–I–271 (P–014969)	Isolate scraper
SDI–I–272 (P–014970)	Isolate core and mano
P–37025298	Isolate flake
P–014297	Isolate flake

TABLE 3.0–2

Previous Studies Conducted in the Candlelight Villas Project Area

Apple, Stephen A. and Keith R. Olmo

1980 "An Archaeological Reconnaissance of Candlelight Park, San Diego, California." MSA, Inc. Report on file at South Coastal Information Center, San Diego Sate University.

Carrico, Richard

1974 "Archaeological Survey of the Proposed Otay Mesa International Border Crossing." WESTEC Services, Inc. Report on file at South Coastal Information Center, San Diego State University.

Cheever, Dayle

1987 "Test and Evaluation for Twelve Archaeological Sites Within the Proposed Spring Canyon Development Otay Mesa Region, San Diego, California." WESTEC. Report on file at South Coastal Information Center, San Diego State University.

1999 "Results of a Cultural Resource East Survey of the Ostrow Property, Otay Mesa, City of San Diego." Report on file at South Coastal Information Center, San Diego State University.

Cheever, Dayle and Dennis Gallegos

1988 "Cultural Resource Inventory for Hidden Trails: Otay Mesa, San Diego, California." WESTEC Services, Inc. Report on file at South Coastal Information Center, San Diego State University.

City of San Diego

1998 "D.E.I.R. for Hidden Trails Community Plan Amendment." Unpublished report on file at South Coastal Information Center, San Diego State University.

1999 "Recirculated Environmental Impact Report: Hidden Trails Precise Plan Vesting Tentative Maps." Unpublished report on file at South Coastal Information Center, San Diego State University.

2000 "Draft EIR for Hidden Trails, Otay Mesa Community Plan." Unpublished report on file at South Coastal Information Center, San Diego State University.

Cook, John

1988 "Archaeological Testing and Significance Evaluation Program for the Santee Investigations Precise Plan." ASM Affiliates, Inc. Report on file at South Coastal Information Center, San Diego State University.

Gallegos and Associates

2002 "Cultural Resource Letter Report for the Handler Property, Otay Mesa, California." Report on file at South Coastal Information Center, San Diego State University.

Kyle, Carolyn, James Eighmey and Dennis Gallegos

1994 "Remington Hills Project: Archaeological Testing of Seven Sites Otay Mesa, San Diego, California." Gallegos and Associates. Report on file at South Coastal Information Center, San Diego State University.

Lettieri-McIntyre

1990 "Draft Environmental Impact Report for the Santee Investments Otay Mesa Precise Plan." City of San Diego Planning Department. Report on file at South Coastal Information Center, San Diego State University.

Multi Systems, Inc.

1980 "Candlelight Park Units 1-6 Otay Mesa East Community Plan Area City of San Diego EAD #80-06-52." Report on file at South Coastal Information Center, San Diego State University.

Robbins-Wade, Mary and G. Timothy Gross

1990 "Historic Properties Inventory for the Southeast Otay Mesa Sludge Processing Facilities and Pipeline, San Diego, California." Butler/Roach Group. Report on file at South Coastal Information Center, San Diego State University.

Rosen, Martin

2002 "Historical Resources Compliance Report for Filing Completion of PRC5024 Responsibilities for the SR-905 Wall-Hudson Biological Mitigation Parcel." CALTRANS. Report on file at South Coastal Information Center, San Diego State University.

Scientific Resource Surveys, Inc.

1984 "Cultural Resources Survey of the El Mirador Property Otay Mesa, San Diego County." Report on file at South Coastal Information Center, San Diego State University.

Wade, Sue A. and Susan M. Hector

1991 "An Archaeological Indexing Program and Preservation Plan for Site SDI-10,198, Otay Corporate Center, North Otay Mesa." RECON. Report on file at South Coastal Information Center, San Diego State University.

4.0 METHODOLOGY

The archaeological investigation for the Candlelight Villas East Project consisted of an institutional records search, and an intensive field reconnaissance of the entire property and subsequent subsurface investigations at sites located within the project. Areas of high cultural probability and with dense vegetation were given extra care in order to accurately identify any resources. This archaeological study conformed to the City of San Diego Archaeological Guidelines and the statutory requirements of CEQA.

4.1 Institutional Records Searches

Archaeological records searches were conducted at the South Coastal Information Center at San Diego State University. These searches indicate that at least two resources are located within project boundaries (SDI-SDI–8643 and SDI–8645), with one additional resource located at the edge of the project boundary (SDI–9541). Since the time of the current archaeological investigation, the proposed Candlelight Villas East Project has been revised and the APE has been expanded to include portions of the Candlelight Villas West (Phase II) project area. This area was also investigated by BFSA and the records searches indicate that five prehistoric sites had been registered within the Candlelight Villas West (Phase II) project area. Two of these sites, SDI-8640 and SDI-10,523, were relocted by BFSA. Additionally, 59 cultural resources are located within a one-mile radius of the project area (Table 3.0–1).

4.2 Field Methodology

4.2.1 Surface Collection

The archaeological program employed by BFSA consisted of a pedestrian survey, detailed mapping, and collection of surface artifacts. The survey generally consisted of north-south parallel transects spaced at five to ten meter intervals. For the sites located within the APE, testing for significance was initiated with the establishment of a datum. From each site datum, all surface artifacts and excavations were located, using range and azimuth readings. All surface artifacts were collected from the sites tested. Photographs were taken of the sites and project area. All collected artifacts were bagged, labeled, and returned to the BFSA laboratory in Poway for analysis.

4.2.2 Shovel Test Excavations

A series of shovel test pits (STPs) was excavated at each of the sites in order to locate any subsurface deposits. The shovel tests measured 30 by 30 centimeters in size, and extended to a minimum of 30 centimeters in depth. The excavations were continued to a depth that surpassed the level of artifact or ecofact recovery and included at least one level of sterile recovery. All soil was sifted through 1/8-inch mesh hardware cloth, and all recovered artifacts were placed in containers labeled with the provenience information. The shovel tests were excavated in decimeter levels. The locations and number of shovel tests at the sites varied and will be noted in the individual sections that provide testing results for each site. Generally, the placement of the shovel tests was based on the distribution of surface artifacts. All of the artifacts recovered from this testing procedure were returned to the consultant's laboratory for analysis.

4.2.3 Test Unit Excavations

Test unit excavations are used to provide qualitative and quantitative information concerning the subsurface content of a site. At least one standard test unit excavation was conducted at each of the sites. Placement of units was based either on the presence of positive shovel tests or the surface elements of the site (artifacts or quarry areas). Each test unit measured one meter square and was oriented to true north. Vertical control within the test units was maintained by excavating in decimeter levels, and all of the units were excavated to a culturally sterile level unless bedrock was encountered before that depth was achieved. The units were excavated using the contour method. Hand tools were used, and all removed soil was sifted through 1/8-inch mesh hardware cloth. All of the artifacts recovered from the unit levels were placed in containers, labeled with the provenience information, and returned to the consultant's laboratory for analysis. Unit level record sheets, describing the soil types revealed and the materials recovered, were completed after the excavation of each test unit level. At the completion of the excavations, the test units were photographed and sketched. The data obtained from the test units was subsequently subjected to both standard and specialized analysis to evaluate the significance of the cultural deposits.

4.3 Laboratory Methods

In keeping with generally accepted archaeological procedures, the artifacts collected were categorized as to form, mineralogy, and function. Comparative collections curated in the laboratory of BFSA are often helpful in identifying the unusual or highly fragmentary specimens. The cataloging process for the recovered specimens utilized a classification system commonly employed in this region. After cataloging and identification, the collections were marked with the appropriate provenience and catalog information, then packaged for permanent curation. No radiocarbon dating or other specialized studies were conducted as part of this project.

4.4 Curation

After cataloging, identification, and analysis, the collections were marked with the appropriate provenience and catalog information, then packaged for permanent curation. The project collections and reports will be curated at the San Diego Archaeological Center; field notes will be stored at the laboratory office of BFSA in Poway. Documentation of each site included updating the site record forms for previously recorded sites and submitting site forms for newly recorded sites to the SCIC at San Diego State University (Appendix II).

4.5 Native American Consultation

The review of previous studies as well as analysis of site components and artifacts revealed no indication of Native American religious, ritual, or other special activities within the project. No aspect of the project area is located on Native American reservation land. Because the study did not discover any important cultural deposits or features, Native American monitors or representatives were not notified. Native American participation in the project was not required for this study.

5.0 RESULTS

The archaeological survey of the Candlelight Villas East Project area resulted in the identification of two light to moderate density lithic scatters in the eastern (SDI–9541) and southeastern (SDI–8645) portions of the project area (Figure 1.0–3). Site SDI–8645 had not been tested in almost 15 years, and according to the records search, Site SDI–9541 had not been tested at all. In addition to the testing history of the two sites, each site exhibited a light to moderate density lithic scatter containing a variety of tools. Therefore, it was deemed prudent that both sites be tested (or retested in the case of SDI–8645) and evaluated for significance. According to the record search, a third site was located near the western boundary of the project's APE (SDI–8643); however, it was not relocated likely due to the fact that it was tested in 1990 by ASM Affiliates, and all surface artifacts (four total) were collected, leaving no surface evidence of its existance. The current proposed project has been revised and will impact portions of the area originally part of the Candlelight Villas West (Phase II) Project. This area was also investigated by BFSA in 2004 and the results of that investigation are included here. The archaeological survey of the Candlelight Villas West (Phase II) area resulted in the identification of two light- to moderate-density lithic scatters in the southern (SDI–10,523) and western (SDI–8640) portions of the project area (Figure 5.0–1). Site SDI–8640 had not been tested in almost 14 years, and SDI–10,523 had not been previously tested. During the 2004 study, each site exhibited a light- to moderate-density lithic scatter containing a variety of tools, thus supporting the need to test and evaluate both sites for significance. According to the record search, three other sites were located in the Candlelight Villas West (Phase II) APE but were not relocated during this survey (SDI–8641, SDI–8642, and SDI–10,522). This is either due to the sites being tested at an earlier date where surface artifacts were collected and presently no surface expressions exist, or that the sites were not accurately located and instead are one site with many loci.

Testing included the mapping and collection of surface artifacts and a subsurface investigation. The field investigations were conducted using the standard methodologies described in Section 4.0. All artifacts recovered during the field investigations were subjected to the laboratory analysis procedures described in Section 4.0 of this report. Sections 5.1, 5.2, 5.3, and 5.4 provide the field investigation results for Sites SDI–8645, SDI–9541, SDI-8640, and SDI-10,523.

Figure 5.0–1

Archaeological Site Location Map

Deleted from public review; bound separately

5.1 Site SDI–8645

5.1.1 Site Description

Site SDI–8645 is located at the southeastern corner of the property, just west of a southeast running drainage that eventually empties into Spring Canyon (Figure 5.0–1). The other site located in the original Candlelight Villas East, Site SDI–9541, is on the opposite side of this drainage. The surface expression of the site at the time of the survey consisted of a light density lithic scatter. A photograph showing the western view of the site is presented in Plate 5.1–1. A map of the site is shown in Figure 5.1–1.

This site was initially designated Site C–2 prior to testing, although the materials identified have subsequently been merged with SDI–8645. This is an area of proposed development, which will negatively impact the site. Site SDI–8645 was subjected to full testing and significance evaluation, since the expansion of the site beyond previously registered boundaries have increased the size of the site and its potential importance. The boundaries for SDI–8645 will be updated to include the full extent of the lithic scatter documented by the current phase of work.

Steven A. Apple of MSA, originally recorded SDI–8645 in 1980, and listed it as being a prehistoric site with an associated lithic scatter. The records search does not show that Apple performed any testing at the site. In 1988, the site underwent testing by ASM Affiliates, in the form of a surface collection and excavation of two test units. The surface collection produced seven lithics, and the test units produced one lithic. Subsequently, the site was listed as being a low density lithic scatter, and it was registered as not significant. Gallegos & Associates conducted a literature review and field survey of Site SDI–8645 in 2003. They relocated the site and noted that no changes had occurred in the site's condition, and therefore no further work was recommended. As was mentioned earlier, the fact that cultural materials were located beyond the boundaries of the recorded site was justification to conduct testing to determine whether these materials were a new site or a portion of SDI–8645, and to determine significance of the site.

The testing at the site consisted of mapping and collection of surface artifacts, and subsurface investigations, including excavation of a series of shovel tests and one test unit.

5.1.2 Surface Mapping and Recordation

A total of 37 artifacts were observed or collected from surface contexts (Tables 5.1–1 and 5.1–2). These artifacts included lithic production waste, 67.57% (N=25); precision tools, 24.32% (N=9); and one core, one percussion tool, and one multi-use tool, 2.70% each. Based on the surface collection of artifacts, the site measures approximately 318.33 meters (97.02 feet) from north to south and 120.64 meters (395.83 feet) from east to west, covering an area of approximately 10,545.84 square meters (113,473.29 square feet). The locations of the surface artifacts are presented in Figure 5.1–1.

5.1.3 Subsurface Excavation

The potential for subsurface archaeological deposits at SDI-8645 was investigated by excavating a series of eight shovel test pits. The shovel tests were excavated in decimeter levels to at least 30 centimeters or until sterile soil was reached. No artifacts were collected from five of the shovel tests. Three shovel tests (STP 5, STP 6, and STP 8) were positive, producing one flake from STP 5, five flakes in STP 6, and one flake in STP 8. A summary of shovel test recovery is summarized in Table 5.1–3, and a detail provided in Table 5.1–4. The locations of the shovel tests are presented in Figure 5.1–1. Because of the disturbance of surface collection and the positive shovel tests in the northwestern portion of the site, a test unit was placed at the southwestern end of the site next to one of the positive shovel tests and near some of the surface collection. A second test unit was not excavated due to the extensive disturbances near the other positive shovel tests, and the paucity (seven flakes) of the overall shovel test collection. Additional testing was not considered because the site has negligible research potential due to the modern disturbances there and the shallow characteristic of the deposit. Adequate evaluation could be made based on the limited test data in conjunction with the disturbed context of the site.

The test unit measured one meter square and extended 40 centimeters below the surface. Seven flakes were recovered from the unit. The data recovered from this unit is presented in Table 5.1–5. The artifacts recovered from the site are summarized in Table 5.1–6. Tool measurements are presented in Tables 5.1–7.

5.1.4 Summary

The archaeological investigations of Site SDI-8645 have provided the necessary data to conclude this resource is not significant. Based on the surface collection of artifacts, the site measures approximately 318.33 meters (97.02 feet) from north to south and 120.64 meters (395.83 feet) from east to west, covering an area of approximately 10,545.84 square meters (113,473.29 square feet). The subsurface artifact deposit measures approximately 1,101.02 square meters (11,836.24 square feet), as identified by the shovel test pits and the test unit. Based on the limited artifact recovery from the surface and subsurface, the use of the site appears to have been limited, and no further investigation is recommended.

Western View of Site SDI-8645.

Plate 5.1–1

Figure 5.1–1

Data Recovery Map, Site SDI-8645

Deleted from public review; bound separately

TABLE 5.1–1
Summary of Surface Recovery, Site SDI-8645

Artifact Category	Total	Percent
Core Tools:		
Core Tool	1	2.70
Lithic Production Waste:		
Debitage	3	8.11
Flakes	22	59.46
Percussion Tools:		
Hammerstone	1	2.70
Precision Tools:		
Retouched Flakes	4	10.81
Scraper	1	2.70
Utilized Debitage	2	5.41
Utilized Flakes	2	5.41
Multi-Use Tools:		
Hammer/Core	1	2.70
Total	37	100.00

TABLE 5.1–2
Surface Recovery Data, Site SDI-8645

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
1	223°/ 99 Feet	1	Retouched Flake	FGM	1
2	241°/ 79 Feet	1	Utilized Flake	MGM	2
		2	Flakes	MGM	3
		1	Flake	CGM	4
3	118°/ 93 Feet		Not an Artifact		
4	236°/ 160 Feet	1	Hammer/Core	MGM	5
5	230°/ 144 Feet	1	Retouched Flake	MGM	6
6	235°/ 135 Feet	1	Retouched Flake	MGM	7
7	33°/ 165 Feet	1	Utilized Flake	MGM	8
		1	Debitage	MGM	9
		2	Flakes	MGM	10
8	125°/ 220 Feet	1	Retouched Flake	FGM	11
9	198°/ 136 Feet	1	Flake	MGM	12
10	47°/ 110 Feet	1	Utilized Debitage Fragment	FGM	13
11	177°/ 11 Feet	2	Flakes	MGM	14
12	31°/ 176 Feet	1	Flake	FGM	15
13	334°/ 90 Feet	1	Debitage	MGM	16
14	310°/ 205 Feet	1	Flake	MGM	17
15	330°/ 142 Feet	1	Core Tool Fragment	MGM	18
		1	Flake	MGM	19
16	291°/ 167 Feet	1	Flake	MGM	20

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
17	168°/ 79 Feet	1	Flake	MGM	21
18	126°/ 187 Feet		Not an Artifact		
19	146°/ 173 Feet		Not an Artifact		
20	149°/ 164 Feet	1	Utilized Debitage	MGM	22
21	152°/ 142 Feet	1	Debitage	FGM	23
		1	Flake	FGM	24
		1	Flake	MGM	25
22	175°/ 146 Feet	1	Flake	FGM	26
		4	Flakes	MGM	27
23	189°/ 144 Feet	1	Hammerstone Fragment, undetermined	MGM	28
		2	Flakes	MGM	29
24	196°/ 149 Feet	1	Scraper	FGM	30
25	310°/ 137 Feet		Not an Artifact		
26	228°/ 191 Feet		Not an Artifact		

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
7	240°/ 69 Feet	10-20		No Recovery		
		20-30		No Recovery		
8	287°/ 198 Feet	0-10		No Recovery		
		10-20	1	Flake	MGM	35
		20-30		No Recovery		

TABLE 5.1–5
Test Unit Recovery Data, Site SDI-8645

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
1	236°/ 180 Feet	0-10		No Recovery		
		10-20	2	Flakes	FGM	36
			1	Flake	MGM	37
		20-30	4	Flakes	MGM	38
		30-40		No Recovery		

TABLE 5.1–6
Summary of Artifact Recovery, Site SDI-8645

Artifact Category	Surface	Shovel Tests	Test Units	Total	Percent
Core Tools:					
Core Tool	1	-	-	1	1.96
Lithic Production Waste:					
Debitage	3	-	-	3	5.88
Flakes	22	7	7	36	70.59
Percussion Tools:					
Hammerstone	1	-	-	1	1.96
Precision Tools:					
Retouched Flakes	4	-	-	4	7.84
Scraper	1	-	-	1	1.96
Utilized Debitage	2	-	-	2	3.92
Utilized Flakes	2	-	-	2	3.92
Mutli-Use Tools:					
Hammer/Core	1	-	-	1	1.96
Total	37	7	7	51	100.00
Percent	72.55	13.73	13.73	100.00	

TABLE 5.1-7
Tool Measurements, Site SDI-8645

Cat. No.	Tool Description	Dimensions (in centimeters) Length	Width	Thickness	Weight (in grams)	Material
	Core Tools:					
	Core Tools:					
18	Core Tool Fragment	7.4	5.6	4.9	178	MGM
	Percussion Tools:					
	Hammerstones:					
28	Hammerstone Fragment, undetermined	8.7	5.9	3.8	314.4	MGM
	Precision Tools:					
	Retouched Flakes:					
1	Retouched Flake	5.2	3.4	0.8	17.7	FGM
6	Retouched Flake	9.1	6.1	3.4	172.3	MGM
7	Retouched Flake	5.5	4.4	1.5	35.7	MGM
11	Retouched Flake	6.3	5.1	2.9	81.7	FGM
	Scrapers:					
30	Scraper	6.7	6.6	3.0	171.8	FGM
	Utilized Debitage:					
13	Utilized Debitage Fragment	4.2	3.7	1.7	31.0	FGM
22	Utilized Debitage	11.8	5.7	3.1	267.4	MGM
	Utilized Flakes:					
2	Utilized Flake	5.7	4.5	1.3	36.8	MGM
8	Utilized Flake	6.9	5.1	2.1	73.7	MGM
	Multi-Use Tools:					
	Hammer/Cores:					
5	Hammer/Core	8.5	5.8	5.4	314	MGM

5.2 Site SDI–9541

5.2.1 Site Description

Site SDI–9541 is located at the far eastern boundary, near the northern edge of the project's APE (Figure 5.0–1). There is a drainage along the southern portion of the site, extending southeast and eventually arriving at Spring Canyon. The area had been graded within the last 30 years, and the vegetation consisted primarily of thick, dried, non-native grasses, weeds, and bushes, which made ground visibility poor. A moderate amount of modern trash, consisting of household garbage was observed in several areas of the property. Off-road and motor-cross vehicles also used the project area.

The site was originally identified by Thesken in 1982 and listed as a temporary prehistoric campsite composed of a lithic scatter. The records search revealed that the site was noted but testing was not completed nor were reports written about the site. No other research has been completed on this site since then.

The surface expression of the site at the time of the survey consisted solely of a lithic scatter; no bedrock milling features were present. A photograph of the site is presented in Plate 5.2–1. A map of the site is shown in Figure 5.2–1.

Site SDI–9541 was subjected to full testing and significance evaluation, as it is located in an area of proposed development, which will negatively impact the site. The testing at the site consisted of mapping and collection of surface artifacts, and subsurface investigations, which included excavation of a series of shovel tests and a test unit.

5.2.2 Surface Mapping and Recordation

A total of 112 artifacts were observed and collected from surface contexts (Table 5.2–1). Artifacts collected included lithic production waste (LPW), 58.93% (N=66); precision tools 23.21% (N=26); percussion tools, 7.14% (N=8); core tools, 5.36% (N=6); groundstone, 3.57% (N=4); and, multi-use tools, 1.79% (N=2). A summary of surface recovery is presented in Table 5.2–1, and a detail is provided in Table 5.2–2. Based upon the surface scatter, this site measures approximately 132 meters (432 feet) along the north-south axis and 67 meters (220 feet) along the east-west axis, and covers an area of approximately 5,599.24 square meters.

5.2.3 Subsurface Excavation

The potential for subsurface deposits at site SDI–9541 was investigated by excavating a series of shovel test pits. Twelve shovel tests were excavated in decimeter levels to at least 30 centimeters, sterile soil, or until bedrock was encountered; bedrock was not encountered in any of the tests. Four STPs yielded sterile soil in every level and were deemed negative. Eight STPs yielded a total of 11 artifacts, a majority of which was LPW (81.82%, N=9). A summary of shovel test recovery is presented in Table 5.2–3, and a detail is provided in Table 5.2–4. The locations of the shovel tests are presented in Figure 5.2–1.

The test unit excavated at the site was located near the center of the spatial extent of the surface collection and adjacent to a positive shovel test. Thirteen of the fifteen artifacts recovered from the test unit (86.67%) were LPW. The unit was excavated to 50 centimeters, where sterile soil was encountered. A summary of test unit recovery is presented in Table 5.2–5, and a detail is provided in Table 5.2–6. Table 5.2–7 summarizes all artifacts found at this site. Tool measurements are presented in Table 5.2–8.

5.2.4 Summary

The surface expression of the site measures approximately 131.62 meters (431.82 feet) from northwest to southeast and 67.00 meters (219.81 feet) from northeast to southwest, covering an area of approximately 5,599.24 square meters (60,247.78 square feet). The subsurface deposits from the shovel tests and the test unit total an area measuring 2,746.69 square meters (29,554.35 square feet). A photograph of the site is presented in Plate 5.2–1. Based on the recovery, the use of the site appears to have been limited. Although a marginal recovery was present in the subsurface deposit, the level of modern disturbances and landform modification associated with past grading and agricultural uses diminished the integrity of the deposit. No further investigation is necessary.

Northeastern View of Site SDI-9541.

Plate 5.2–1

Figure 5.2–1

Data Recovery Map, Site SDI-9541

Deleted from public review; bound separately

TABLE 5.2–1
Summary of Surface Recovery, Site SDI-9541

Artifact Category	Total	Percent
Core Tools:		
Core Tools	6	5.36
Ground Stone Tools:		
Manos	4	3.57
Lithic Production Waste:		
Core	1	0.89
Debitage	6	5.36
Flakes	59	52.68
Percussion Tools:		
Hammerstones	8	7.14
Precision Tools:		
Retouched Debitage	2	1.79
Retouched Flakes	7	6.25
Scrapers	2	1.79
Utilized Debitage	2	1.79
Utilized Flakes	13	11.61
Multi-Use Tools:		
Mano/Pestle	1	0.89
Scraper/Hammerstone	1	0.89
Total	112	100.00

TABLE 5.2–2
Surface Recovery Data, Site SDI-9541

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
1	39°/ 91 Feet	1	Retouched Debitage	FGM	1
		1	Domed Scraper	MGM	2
2	16°/ 80 Feet	1	Core Tool Fragment	MGM	3
		1	Retouched Flake	MGM	4
		1	Utilized Flake Fragment	MGM	5
		1	Utilized Flake	MGM	6
		1	Debitage	MGM	7
		1	Flake	MGM	8
3	9°/ 92 Feet	1	Retouched Flake	FGM	9
		1	Retouched Flake	MGM	10
		2	Flakes	MGM	11
4	12°/ 63 Feet	1	Flake	FGM	12
		1	Core Tool	MGM	13
5	25°/ 52 Feet	1	Retouched Flake	FGM	14
		1	Flake	FGM	15
6	289°/ 66 Feet	1	Mano, Biface, light	Granite	16
		1	Mano, Biface, light	Granite	17
		1	Mano Fragment, Biface, polished, light	Granite	18
7	57°/ 32 Feet	1	Mano Fragment, Biface, polished, burned, light	Granite	19
		1	Hammerstone, spherical	FGM	20
		1	Debitage	FGM	21
		5	Flakes	FGM	22
		1	Flake	MGM	23
8	39°/ 45 Feet	1	Hammerstone, spherical	FGM	24
		1	Flake	FGM	25
		1	Flake	MGM	26
9	13°/ 35 Feet	1	Utilized Flake	MGM	27

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
10	20°/ 14 Feet	1	Flake	MGM	28
11	318°/ 121 Feet	1	Flake	MGM	29
12	280°/ 55 Feet	1	Utilized Flake	FGM	30
13	284°/ 91 Feet	1	Hammerstone Fragment, undetermined	MGM	31
14	290°/ 107 Feet	1	Retouched Debitage	FGM	32
15	274°/ 126 Feet	1	Debitage	FGM	33
16	259°/ 109 Feet	1	Flake	MGM	34
17	245°/ 101 Feet	1	Scraper/Hammerstone	FGM	35
		1	Retouched Flake	MGM	36
18	215°/ 41 Feet	1	Utilized Flake	FGM	37
19	170°/ 33 Feet	1	Utilized Flake	MGM	38
20	143°/ 59 Feet	1	Hammerstone, spherical	FGM	39
		1	Utilized Flake	FGM	40
		1	Flake	FGM	41
21	64°/ 55 Feet	1	Utilized Flake	FGM	42
		2	Flakes	FGM	43
		1	Utilized Flake	MGM	44
		1	Debitage	MGM	45
		3	Flakes	MGM	46
22	86°/ 45 Feet	1	Flake	FGM	47
		2	Flakes	MGM	48
23	100°/ 51 Feet	1	Flake	FGM	49
		1	Flake	MGM	50
24	135°/ 121 Feet	3	Flakes	FGM	51
		1	Flake	MGM	52
25	142°/ 172 Feet	1	Mano/Pestle, Biface, light	MGM	53

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
26	146°/ 156 Feet	1	Utilized Flake	FGM	54
		1	Hammerstone Fragment, undetermined	MGM	55
27	153°/ 96 Feet	1	Core Tool	MGM	56
28	201°/ 90 Feet	1	Utilized Debitage Fragment	FGM	57
		1	Core	MGM	58
29	149°/ 154 Feet	1	Flake	MGM	59
30	29°/ 71 Feet	1	Utilized Flake	FGM	60
		1	Core Tool	MGM	61
		1	Retouched Flake	MGM	62
31	148°/ 77 Feet	1	Flake	FGM	63
		1	Core Tool	MGM	64
		1	Flake	MGM	65
32	179°/ 127 Feet	1	Retouched Flake	FGM	66
		1	Flake	FGM	67
		1	Flake Scraper	MGM	68
33	185°/ 116 Feet	1	Utilized Flake	MGM	69
		1	Flake	MGM	70
34	195°/ 108 Feet	2	Flakes	MGM	71
35	216°/ 105 Feet	1	Hammerstone, spherical	FGM	72
		1	Utilized Flake	FGM	73
		1	Flake	FGM	74
		1	Hammerstone, spherical	MGM	75
		1	Hammerstone, spherical	MGM	76
		2	Flakes	MGM	77
36	149°/ 164 Feet		Not an Artifact		
37	149°/ 208 Feet	1	Flake	FGM	78
		1	Flake	MGM	79
38	152°/ 260 Feet	1	Flake	MGM	80

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
39	153°/ 269 Feet	1	Flake	MGM	81
40	150°/ 194 Feet	1	Flake	MGM	82
41	152°/ 188 Feet	1	Flake	MGM	83
42	168°/ 68 Feet	1	Flake	MGM	84
43	199°/ 76 Feet	1	Flake	FGM	85
44	223°/ 86 Feet	2	Flakes	FGM	86
45	205°/ 119 Feet	1	Utilized Debitage	FGM	87
46	197°/ 136 Feet	1	Flake	MGM	88
47	168°/ 149 Feet	4	Flakes	MGM	89
48	162°/ 153 Feet	1	Flake	FGM	90
		2	Debitage	FGM	91
49	156°/ 195 Feet	1	Flake	MGM	92
50	151°/ 289 Feet		Not an Artifact		
51	156°/ 174 Feet	1	Flake	FGM	93
		1	Core Tool Fragment	MGM	94

TABLE 5.2–3
Summary of Shovel Test Recovery, Site SDI-9541

Artifact Category	Total	Percent
Lithic Production Waste:		
Flakes	9	81.82
Precision Tools:		
Retouched Flake	1	9.09
Utilized Flake	1	9.09
Total:	11	100.00

TABLE 5.2-4
Shovel Tests Recovery Data, Site SDI-9541

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
1	16°/ 48 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
2	146°/ 58 Feet	0-10	1	Flake	MGM	95
		10-20		No Recovery		
		20-30		No Recovery		
3	152°/ 192 Feet	0-10	2	Flakes	MGM	96
		10-20		No Recovery		
		20-30	1	Flake	MGM	97
4	193°/ 92 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
5	234°/ 28 Feet	0-10		No Recovery		
		10-20	1	Flake	MGM	98
		20-30	1	Retouched Flake	MGM	99
		30-40		No Recovery		
6	236°/ 92 Feet	0-10	1	Flake	MGM	100
		10-20		No Recovery		
		20-30		No Recovery		
		30-40		No Recovery		

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
7	288°/ 92 Feet	0-10	1	Flake	MGM	101
		10-20		No Recovery		
		20-30		No Recovery		
		30-40		No Recovery		
8	154°/ 282 Feet	0-10	1	Flake	MGM	102
		10-20		No Recovery		
9	164°/ 158 Feet	0-10		No Recovery		
		10-20	1	Flake	FGM	103
		20-30		No Recovery		
10	288°/ 123 Feet	0-10		No Recovery		
		10-20	1	Utilized Flake	FGM	104
		20-30		No Recovery		
11	314°/ 88 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
12	290°/ 165 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		

TABLE 5.2–5
Summary of Test Unit Recovery, Site SDI-9541

Artifact Category	0-10	10-20	20-30	30-40	40-50	Total	Percent
Core Tools:							
Core Tool	1	-	-	-	-	1	6.67
Lithic Production Waste:							
Flakes	-	3	4	6	-	13	86.67
Precision Tools:							
Retouched Flake	-	-	1	-	-	1	6.67
Total:	1	3	5	6	0	15	100.00
Percent:	6.67	20.00	33.33	40.00	0.00	100.00	

TABLE 5.2-6
Test Unit Recovery Data, Site SDI-9541

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
1	240°/ 24 Feet	0-10	1	Core Tool	FGM	105
		10-20	3	Flakes	FGM	106
		20-30	1	Retouched Flake	FGM	107
			1	Flake	FGM	108
			3	Flakes	MGM	109
		30-40	6	Flakes	MGM	110
		40-50		No Recovery		

TABLE 5.2 –7
Summary of Artifact Recovery, Site SDI-9541

Artifact Category	Surface	Shovel Tests	Test Units	Total	Percent
Core Tools:					
Core Tools	6	-	1	7	5.07
Ground Stone Tools:					
Manos	4	-	-	4	2.90
Lithic Production Waste:					
Core	1	-	-	1	0.72
Debitage	6	-	-	6	4.35
Flakes	59	9	13	81	58.70
Percussion Tools:					
Hammerstones	8	-	-	8	5.80
Precision Tools:					
Retouched Debitage	2	-	-	2	1.45
Retouched Flakes	7	1	1	9	6.52
Scrapers	2	-	-	2	1.45
Utilized Debitage	2	-	-	2	1.45
Utilized Flakes	13	1	-	14	10.14
Multi-Use Tools:					
Mano/Pestle	1	-	-	1	0.72
Scraper/Hammerstone	1	-	-	1	0.72
Total	112	11	15	138	100.00
Percent	81.16	7.97	10.87	100.00	

TABLE 5.2–8
Tool Measurements, SDI-9541

Cat. No.	Tool Description	Dimensions (in centimeters) Length	Width	Thickness	Weight (in grams)	Material
Core Tools:						
	Core Tools:					
3	Core Tool Fragment	5.5	4.1	2.2	55.2	MGM
13	Core Tool	9.5	7.9	5.0	410.6	MGM
56	Core Tool	12.9	8.4	7.9	930.5	MGM
61	Core Tool	6.7	6.0	3.1	166.1	MGM
64	Core Tool	5.3	3.7	3.0	62.3	MGM
94	Core Tool Fragment	13.6	11.1	8.5	1470.9	MGM
105	Core Tool	6.8	5.2	2.3	86.8	FGM
Ground Stone Tools:						
	Manos:					
16	Mano, Biface, light	9.6	8.8	4.0	492.5	Granite
17	Mano, Biface, light	11.8	9.2	4.8	803.3	Granite
18	Mano Fragment, Biface, polished, light	9.8	9.8	4.0	587.2	Granite
19	Mano Fragment, Biface, polished, burned, light	10.3	9.5	4.1	592.3	Granite
Percussion Tools:						
	Hammerstones:					
20	Hammerstone, spherical	7.0	5.9	3.7	191.7	FGM
24	Hammerstone, spherical	7.0	6.7	3.5	221.0	FGM
31	Hammerstone Fragment, undetermined	3.6	3.3	2.8	32.1	MGM
39	Hammerstone, spherical	8.1	4.8	4.0	130.1	FGM
55	Hammerstone Fragment, undetermined	12.1	10.4	2.9	433.8	MGM
72	Hammerstone, spherical	5.9	4.5	2.9	116.2	FGM
75	Hammerstone, spherical	9.4	5.4	4.9	268.8	MGM
76	Hammerstone, spherical	6.7	5.2	3.6	165.4	MGM
Precision Tools:						
	Retouched Debitage:					
1	Retouched Debitage	6.0	3.1	2.4	41.5	FGM
32	Retouched Debitage	6.1	3.3	3.0	63.5	FGM

Cat. No.	Tool Description	Dimensions (in centimeters) Length	Width	Thickness	Weight (in grams)	Material
Precision Tools (cont.):						
Retouched Flakes:						
4	Retouched Flake	3.8	3.7	1.5	23.7	MGM
9	Retouched Flake	5.7	5.1	0.9	22.0	FGM
10	Retouched Flake	3.4	2.3	0.8	7.3	MGM
14	Retouched Flake	5.3	5.0	2.7	49.4	FGM
36	Retouched Flake	3.2	1.8	1.3	7.0	MGM
62	Retouched Flake	4.3	3.2	1.1	17.6	MGM
66	Retouched Flake	3.3	2.2	0.6	6.7	FGM
99	Retouched Flake	5.4	4.1	1.0	27.2	MGM
107	Retouched Flake	6.1	4.5	1.2	31.5	FGM
Scrapers:						
2	Domed Scraper	5.1	4.6	4.4	91.5	MGM
68	Flake Scraper	3.4	3.3	0.9	14.9	MGM
Utilized Debitage:						
57	Utilized Debitage Fragment	3.3	2.6	1.2	13.6	FGM
87	Utilized Debitage	11.3	7.8	3.6	325.7	FGM
Utilized Flakes:						
5	Utilized Flake Fragment	3.0	2.6	1.3	4.8	MGM
6	Utilized Flake	6.3	2.2	1.7	20.5	MGM
27	Utilized Flake	4.2	3.8	0.9	18.2	MGM
30	Utilized Flake	2.7	1.7	0.4	1.9	FGM
37	Utilized Flake	4.8	4.0	1.1	18.0	FGM
38	Utilized Flake	4.4	2.8	1.2	10.5	MGM
40	Utilized Flake	2.7	2.5	0.7	4.9	FGM
42	Utilized Flake	5.3	3.8	1.4	28.7	FGM
44	Utilized Flake	5.0	4.1	1.6	32.3	MGM
54	Utilized Flake	3.7	3.7	1.3	23.4	FGM
60	Utilized Flake	2.9	2.2	0.6	5.9	FGM
69	Utilized Flake	4.9	2.9	1.3	18.7	MGM
73	Utilized Flake	4.3	3.9	1.1	19.8	FGM
104	Utilized Flake	3.1	2.8	0.9	7.2	FGM
Multi-Use Tools:						
Mano/Pestles:						
53	Mano/Pestle, Biface, light	9.6	6.6	6.0	593.1	MGM

Cat. No.	Tool Description	Dimensions (in centimeters) Length	Width	Thickness	Weight (in grams)	Material
	Multi-Use Tools (cont.):					
	Scraper/Hammerstones:					
35	Scraper/Hammerstone	7.6	5.0	4.9	235.3	FGM

5.3 Site SDI–8640

5.3.1 Site Description

Site SDI–8640 is located at the western edge of the Candlelight Villas West (Phase II) property, just east of Moody Canyon (Figure 5.0–1). The surface expression of the site at the time of the survey consisted of a light-density lithic scatter. Ground disturbance was high and consisted of grading and bulldozing most likely done to create the berm that existed along the western edge of the site. In addition, a dirt road passed through a portion of the site. There were no trees or bedrock outcrops at the site and vegetation consisted of dense non-native grasses making surface visibility less than 10%. A photograph showing the western view of the site is presented in Plate 5.3–1. A map of the site is shown in Figure 5.3–1.

Steven A. Apple of MSA, originally recorded SDI–8640 in 1980, and listed it as being a prehistoric site with an associated lithic scatter. The records search does not show that Apple performed any testing at the site. In 1985, RBR & Associates noted the site as being a "light-density lithic scatter with two areas of concentration (Loci A & B)" (Joines et al. 1985). Their pedestrian survey showed that the site now extended to the west and was larger than Apple thought. The site was examined again by RBR & Associates in 1987, but this time, subsurface testing was completed in the form of shovel tests. The artifacts collected included groundstone, precision tools, percussion tools, and LPW. They listed the site as being disturbed by a dirt road but still retaining a fair amount of integrity. Finally, in 1990, ASM Affiliates tested the site through a surface and subsurface collection. In addition, they noted extensive agricultural disturbance at this time. The fact that the lithic scatter they encountered was considered to be light-density, may be due to the fact that the site had already been surface collected during RBR's 1987 testing. Regardless, due to the limited recovery, ASM deemed the site insignificant.

This site was initially designated Site C–4 prior to testing, although the materials identified have subsequently been merged with Site SDI–8640. During the testing program this was an area of proposed development, which would have negatively impacted the site, but the current plans now have the site in an area within Lot 4 that will not be impacted by any development activities (Figure 1.0–3). Site SDI–8640 was subjected to full testing and significance evaluation, since the expansion of the site beyond previously registered boundaries have increased the size of the site and its potential importance. Archaeological site record continuation forms were prepared and submitted to the SCIC in order to update the boundaries for Site SDI–8640 to include the full extent of the lithic scatter documented by the current phase of work (Appendix II).

The testing at the site consisted of mapping and collection of surface artifacts, and subsurface investigations, including excavation of a series of shovel tests and one test unit.

5.3.2 Surface Mapping and Recordation

A total of 17 artifacts were observed or collected from surface contexts (Tables 5.3–1 and 5.3–2). These artifacts included lithic production waste, 47.06% (N=8) and precision tools, 52.94% (N=9). The locations of the surface artifacts are presented in Figure 5.3–1.

5.3.3 Subsurface Excavation

The potential for subsurface archaeological deposits at SDI–8640 was investigated by excavating a series of eight shovel test pits. The shovel tests were excavated in 10–centimeter levels to at least 30 centimeters or until sterile soil was reached. No artifacts were collected from six of the shovel tests. Two shovel tests (STP 6 and STP 8) were positive, producing 1 flake each in the 10-20 centimeter level. Details of the shovel tests pits are provided in Table 5.3–3. The locations of the shovel tests are presented in Figure 5.3–1. Most of the surface artifacts were clustered to the south, but shovel tests around these artifacts were negative, influencing the decision to place the test unit in the north, near the positive shovel tests.

The test unit measured one meter square and extended 30 centimeters below the surface. Six flakes were recovered from the unit. The data recovered from this unit is presented in Table 5.3–4. Tool measurements are summarized in Tables 5.3–5. The artifacts recovered from the site are summarized in Table 5.3–6.

5.3.4 Summary

The archaeological investigations of Site SDI–8640 have provided the necessary data to conclude this resource is not significant. Based on the surface collection of artifacts, the site measures approximately 37 meters (123 feet) from north to south and 45 meters (149 feet) from east to west, covering an area of approximately 1,426 square meters (15,344 square feet). The subsurface artifact deposit measures approximately 249 square meters (2,675 square feet), as identified by the shovel test pits and the test unit. Based on the limited artifact recovery from the surface and subsurface, the use of the site appears to have been limited and no further investigation is recommended. The changes in the site's dimensions have been submitted to the SCIC.

Western view of Site SDI–8640.

Plate 5.3–1

Figure 5.3–1

Data Recovery Map

Site SDI–8640

Deleted from public review; bound separately

TABLE 5.3–1

Surface Recovery Data
Site SDI–8640

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
1	275°/ 28 Feet	1	Biface, stage 1	FGM	1
2	99°/ 104 Feet	1	Utilized Flake	FGM	2
		1	Flake	MGM	3
3	82°/ 73 Feet	1	Retouched Debitage	FGM	4
4	120°/ 36 Feet	1	Retouched Flake	MGM	5
		1	Flake	MGM	6
5	191°/ 22 Feet	1	Flake	MGM	7
6	109°/ 82 Feet	1	Retouched Flake	FGM	8
		1	Flake	MGM	9
7	334°/ 53 Feet	1	Utilized Debitage	MGM	10
8	72°/ 36 Feet	1	Retouched Flake	MGM	11
9	133°/ 27 Feet	1	Retouched Flake	MGM	12
10	100°/ 46 Feet	1	Utilized Flake	MGM	13
		2	Flakes	MGM	14
11	98°/ 77 Feet	1	Flake	FGM	15
		1	Flake	MGM	16

TABLE 5.3–2
Summary of Surface Recovery
Site SDI–8640

Artifact Category	Total	Percent
Lithic Production Waste:		
Flakes	8	47.06
Precision Tools:		
Biface	1	5.88
Retouched Debitage	1	5.88
Retouched Flakes	4	23.53
Utilized Debitage	1	5.88
Utilized Flakes	2	11.76
Total:	17	100.00

TABLE 5.3–3

Shovel Tests Recovery Data
Site SDI–8640

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
1	314°/ 12 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
2	87°/ 37 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
3	94°/ 89 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
4	341°/ 70 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
5	33°/ 74 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
6	61°/ 100 Feet	0-10		No Recovery		
		10-20	1	Retouched Flake	MGM	17
		20-30		No Recovery		
		30-35		No Recovery		
7	61°/ 124 Feet	0-10		No Recovery		
		10-20		No Recovery		

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
		20-30		No Recovery		
8	47°/ 118 Feet			No Recovery		
		10-20	1	Flake	MGM	18
		20-30		No Recovery		

TABLE 5.3-4
Test Unit Recovery Data
Site SDI–8640

Location	Azimuth/ Range	Depth	Quantity	Recovery	Material	Cat. No.
1	59°/ 95 Feet	0-10	1	Flake	FGM	19
			2	Flakes	MGM	20
		10-20	1	Flake	FGM	21
			2	Flakes	MGM	22
		20-30		No Recovery		

TABLE 5.3–5
Lithic Tool Measurements
Site SDI–8640

Cat. No.	Tool Description	Dimensions (in centimeters) Length	Width	Thickness	Weight (in grams)	Material
	Precision Tools:					
	Bifaces:					
1	Biface, stage 1	5.9	3.6	1.4	27.4	FGM
	Retouched Debitage:					
4	Retouched Debitage	9.2	7.1	4.1	276.7	FGM
	Retouched Flakes:					
5	Retouched Flake	9.0	4.4	1.7	73.0	MGM
8	Retouched Flake	5.8	4.1	1.7	45.3	FGM
11	Retouched Flake	6.1	4.0	2.0	45.0	MGM
12	Retouched Flake	8.0	5.3	1.9	77.2	MGM
17	Retouched Flake	7.5	7.4	2.2	125	MGM
	Utilized Debitage:					
10	Utilized Debitage	5.3	4.1	2.5	66.6	MGM
	Utilized Flakes:					
2	Utilized Flake	4.7	4.4	1.5	24.8	FGM
13	Utilized Flake	5.3	4.1	2.0	39.9	MGM

TABLE 5.3–6
Summary of Artifact Recovery
Site SDI–8640

Artifact Category	Surface	Shovel Tests	Test Units	Total	Percent
Lithic Production Waste					
Flakes	8	1	6	15	60.00
Precision Tools:					
Biface	1	-	-	1	4.00
Retouched Debitage	1	-	-	1	4.00
Retouched Flakes	4	1	-	5	20.00
Utilized Debitage	1	-	-	1	4.00
Utilized Flakes	2	-	-	2	8.00
Total:	17	2	6	25	100.00
Percent:	68.00	8.00	24.00	100.00	

5.4 Site SDI–10,523

5.4.1 Site Description

Site SDI–10,523 is located at the southern edge of the Candlelight Villas West (Phase II) project boundary but will be impacted by the current project (Figures 1.0–3 and 5.0–1). The area along the project's southern and western borders had been graded and a five to six foot berm existed along the edge. The vegetation consisted primarily of thick, dried, non-native grasses, weeds, and bushes, which made ground visibility poor. A moderate amount of modern trash, consisting of household garbage was observed in several areas of the property.

SRS originally identified Site SDI–10,523 in 1985 and recorded the site as a low-density lithic scatter with an unusually high ratio of tools to debitage (Peter 1985). It was also noted that sites SDI–8641 and SDI–10,522 were very close (within 45 meters) to this site. He inspected the areas where the two other sites were supposedly located and did not find them. In the 1985 report, Peter concluded that Sites SDI–8641 and SDI–10,522 were originally mismapped and that all three sites are only one site, which forms a part of a large site complex. Peter did not complete any subsurface testing. In 2003, Gallegos & Associates investigated Site SDI–10,523 and found that no changes had occurred to the site since the time of Peter's report, and concluded that no further investigation was recommended.

Based on the surface artifact assemblage and the fact that subsurface testing was never conducted at this site, Site SDI–10,523 was subjected to full testing and significance evaluation, as it is located in an area of proposed development, which will negatively impact the site. A photograph of the site is presented in Plate 5.4–1. A map of the site is shown in Figure 5.4–1. The testing at the site consisted of mapping and collection of surface artifacts, and subsurface investigations, which included excavation of a series of shovel tests and a test unit.

5.4.2 Surface Mapping and Recordation

A total of 54 artifacts were observed and collected from surface contexts (Table 5.4–1). Artifacts collected included lithic production waste (LPW), 74.08% (N=40); precision tools 14.81% (N=8); percussion tools, 5.56% (N=3); groundstone, 1.85% (N=1); and, multi-use tools, 1.85% (N=1). Table 5.4–1 details this information while Table 5.4–2 provides a summary.

5.4.3 Subsurface Excavation

The potential for subsurface deposits at site SDI–10,523 was investigated by excavating a series of shovel test pits. Fourteen STPs were excavated in 10–centimeter levels to at least 30 centimeters, sterile soil, or until bedrock was encountered; bedrock was not encountered in any of the tests. Twelve STPs yielded sterile soil in every level and were deemed negative. Two STPs yielded a total of 4 artifacts, a majority of which was LPW (75%, N=3). The recovery from the STPs is detailed in Table 5.4–3. The locations of the shovel tests are presented in Figure 5.4–1.

The test unit excavated at the site was located near the southern end of the spatial extent of the surface collection and adjacent to a positive shovel test. A total of 12 artifacts were recovered from the unit, all of which were LPW. Sterile soil was reached at 30 centimeters, where the unit was completed. Table 5.4–4 details the artifact recovery from the test unit. Table 5.4–5 provides a summary of the lithic material recovered at the site. Table 5.4–6 summarizes the tool measurements, while Table 5.4–7 summarizes all artifacts found at this site.

5.4.4 Summary

The surface expression of the site measures approximately 129 meters (423 feet) from north to south and 117 meters (384 feet) from east to west, covering an area of approximately 10,243 square meters (110,224 square feet). The subsurface deposits from the shovel tests and the test unit total an area measuring 1,104 square meters (12,266 square feet). No significant features or subsurface deposits were encountered during the investigation of this site. Based on the recovery, the use of the site appears to have been limited. No further investigation is necessary.

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Western view of Site SDI–10,523.

Plate 5.4–1

Figure 5.4–1
Data Recovery Map
Site SDI–10,523
Deleted from public review; bound separately

TABLE 5.4–1
Surface Recovery Data
Site SDI–10,523

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
1	241°/ 100 Feet	1	Core Tool	MGM	1
2	258°/ 102 Feet	2	Flakes	MGM	2
3	280°/ 121 Feet	1	Utilized Flake	MGM	3
		1	Flake	MGM	4
4	283°/ 133 Feet	1	Hammerstone Fragment, undetermined	MGM	5
		1	Flake	MGM	6
5	277°/ 222 Feet	1	Hammerstone Fragment, undetermined	MGM	7
		1	Flake	MGM	8
6	272°/ 85 Feet	1	Utilized Flake	MGM	9
7	166°/ 231 Feet	1	Scraper/Hammerstone	FGM	10
		1	Flake	FGM	11
		1	Hammerstone Fragment, undetermined	MGM	12
		2	Debitage	MGM	13
		2	Flakes	MGM	14
8	279°/ 248 Feet	1	Retouched Debitage	FGM	15
		1	Utilized Flake	MGM	16
9	290°/ 204 Feet	1	Flake	MGM	17
10	296°/ 284 Feet	1	Core	Quartzite	18
11	86°/ 102 Feet	1	Flake	MGM	19
12	116°/ 111 Feet	1	Flake	MGM	20
13	131°/ 110 Feet	1	Utilized Flake	FGM	21
14	140°/ 121 Feet	1	Utilized Flake	MGM	22

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
15	146°/ 181 Feet	1	Flake	FGM	23
16	159°/ 178 Feet	1	Flake	MGM	24
17	173°/ 203 Feet	1	Retouched Flake Fragment	FGM	25
18	190°/ 209 Feet	1	Flake	MGM	26
19	196°/ 121 Feet	1	Mano, uniface, light	Granite	27
		2	Flakes	MGM	28
20	192°/ 72 Feet	1	Core	MGM	29
21	12°/ 55 Feet	1	Flake	MGM	30
22	37°/ 176 Feet	1	Utilized Flake	MGM	31
		2	Flakes	MGM	32
23	282°/ 58 Feet	1	Core	MGM	33
24	234°/ 60 Feet	1	Flake	MGM	34
25	233°/ 88 Feet		Not an Artifact		
26	225°/ 97 Feet	1	Flake	FGM	35
27	184°/ 28 Feet	1	Flake	MGM	36
28	144°/ 40 Feet		Not an Artifact		
29	154°/ 103 Feet	1	Flake	FGM	37
30	217°/ 153 Feet	1	Debitage	FGM	38
		1	Core	MGM	39
31	214°/ 209 Feet	3	Debitage	FGM	40
		4	Flakes	FGM	41
		1	Flake	MGM	42
32	201°/ 210 Feet		Not an Artifact		

Location	Azimuth/ Range	Quantity	Recovery	Material	Cat. No.
33	201°/ 186 Feet		Not an Artifact		
34	228°/ 102 Feet	2	Flakes	MGM	43

TABLE 5.4–2

Summary of Surface Recovery
Site SDI–10,523

Artifact Category	Total	Percent
Core Tools:		
Core Tool	1	1.85
Groundstone Tools:		
Mano	1	1.85
Lithic Production Waste:		
Cores	4	7.41
Debitage	6	11.11
Flakes	30	55.56
Percussion Tools:		
Hammerstones	3	5.56
Precision Tools:		
Retouched Debitage	1	1.85
Retouched Flakes	1	1.85
Utilized Flakes	6	11.11
Multi-Use Tools:		
Scraper/Hammerstone	1	1.85
Total:	54	100.00

TABLE 5.4–3
Shovel Tests Recovery Data
Site SDI–10,523

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
1	268°/ 81 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
		30-40		No Recovery		
		40-50		No Recovery		
2	163°/ 19 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
3	103°/ 94 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
4	148°/ 136 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
		30-35		No Recovery		
5	177°/ 109 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
6	222°/ 107 Feet	0-10	2	Flakes	FGM	44
		10-20		No Recovery		
		20-30		No Recovery		
7	201°/ 219 Feet	0-10		No Recovery		

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
		10-20		No Recovery		
		20-30		No Recovery		
8	165°/ 218 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30	1	Utilized Flake	FGM	45
			1	Flake	FGM	46
		30-40		No Recovery		
9	46°/ 119 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
		30-40		No Recovery		
10	354°/ 65 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-25		No Recovery		
11	287°/ 150 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
12	283°/ 246 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
13	170°/ 248 Feet	0-10		No Recovery		
		10-20		No Recovery		
		20-30		No Recovery		
14	176°/ 221 Feet	0-10		No Recovery		

Location	Azimuth/ Range	Depth	Quantity/ Weight	Recovery	Material	Cat. No.
		10-20	No Recovery			
		20-30	No Recovery			
		30-40	No Recovery			

TABLE 5.4–4

Test Unit Recovery Data
Site SDI–10,523

Location	Azimuth/ Range	Depth	Quantity	Recovery	Material	Cat. No.
1	166°/ 214 Feet	0-10	3	Flakes	FGM	47
			7	Flakes	MGM	48
		10-20	1	Flake	FGM	49
			1	Flake	MGM	50
		20-30		No Recovery		

TABLE 5.4–5
Summary of Lithic Material
Site SDI–10,523

Artifact Category	FGM	Granite	MGM	Quartzite	Total	Percent
Core Tools:						
Core Tools	-	-	1	-	1	1.43
Ground Stone Tools:						
Mano	-	1	-	-	1	1.43
Lithic Production Waste:						
Cores	-	-	3	1	4	5.71
Debitage	4	-	2	-	6	8.57
Flakes	15	-	30	-	45	64.29
Percussion Tools:						
Hammerstones	-	-	3	-	3	4.29
Precision Tools:						
Retouched Debitage	1	-	-	-	1	1.43
Retouched Flakes	1	-	-	-	1	1.43
Utilized Flakes	2	-	5	-	7	10.00
Multi-Use Tools:						
Scraper/Hammerstone	1	-	-	-	1	1.43
Total:	24	1	44	1	70	100.00
Percent:	34.29	1.43	62.86	1.43	100.00	

TABLE 5.4–6
Lithic Tool Measurements
Site SDI–10,523

Cat. No.	Tool Description	Dimensions (in centimeters) Length	Width	Thickness	Weight (in grams)	Material
Core Tools:						
	Core Tools:					
1	Core Tool	8.3	7.8	4.5	347.6	MGM
Ground Stone Tools:						
	Manos:					
27	Mano, uniface, light	11.9	8.8	3.5	585.6	Granite
Percussion Tools:						
	Hammerstones:					
5	Hammerstone Fragment, undetermined	5.6	2.7	1.3	18.6	MGM
7	Hammerstone Fragment, undetermined	7.9	4.9	3.3	109.5	MGM
12	Hammerstone Fragment, undetermined	6.9	4.1	2.3	57.2	MGM
Precision Tools:						
	Retouched Debitage:					
15	Retouched Debitage	5.7	4.3	1.3	56.5	FGM
	Retouched Flakes:					
25	Retouched Flake Fragment	6.0	5.5	3.1	131.3	FGM
	Utilized Flakes:					
3	Utilized Flake	3.4	3.0	1.0	11.3	MGM
9	Utilized Flake	6.5	5.0	1.9	66.2	MGM
16	Utilized Flake	11.1	4.7	3.2	167.1	MGM
21	Utilized Flake	6.8	4.6	1.2	44.6	FGM
22	Utilized Flake	6.8	5.7	3.2	80.3	MGM
31	Utilized Flake	8.5	7.5	3.0	138.6	MGM
45	Utilized Flake	4.6	3.0	1.2	13.3	FGM
Multi-Use Tools:						
	Scraper/Hammerstones:					
10	Scraper/Hammerstone	14.8	9.8	6.3	977.6	FGM

TABLE 5.4–7
Summary of Artifact Recovery
Site SDI–10,523

Artifact Category	Surface	Shovel Tests	Test Units	Total	Percent
Core Tools:					
Core Tool	1	-	-	1	1.43
Groundstone Tools:					
Mano	1	-	-	1	1.43
Lithic Production Waste:					
Cores	4	-	-	4	5.71
Debitage	6	-	-	6	8.57
Flakes	30	3	12	45	64.29
Percussion Tools:					
Hammerstones	3	-	-	3	4.29
Precision Tools:					
Retouched Debitage	1	-	-	1	1.43
Retouched Flakes	1	-	-	1	1.43
Utilized Flakes	6	1	-	7	10.00
Multi-Use Tools:					
Scraper/Hammerstone	1	-	-	1	1.43
Total:	54	4	12	70	100.00
Percent:	77.14	5.71	17.14	100.00	

6.0 MANAGEMENT CONSIDERATIONS

The records search of the Candlelight Villas East project area resulted in the identification of three previously recorded sites. The archaeological survey resulted in two light to moderate density lithic scatters in the eastern and southeastern portions of the project area. Both lithic scatters correspond to previously recorded sites. The third previously recorded site was not relocated. This is most likely due to the fact that this site was tested during a different project and all surface artifacts were collected, eliminating surface evidence of its existence. Of the two sites identified, one site had been tested previously and deemed insignificant. However, this survey showed that the lithic scatter encountered was located slightly to the north of the preexisting site and there was some discrepancy as to whether the scatter represented a new site, or was an extension of the recorded site. This new site was tested to determine whether it was a portion of the preexisting site and if not, to determine significance. Disturbance from off–road vehicle use and the dumping of modern trash, in combination with the sparse nature of the surface deposit, indicate that neither of the two sites is a significant resource according to criteria set out in CEQA (Section 15064.5). Impacts to either site will not be adverse, and mitigation measures are not necessary.

In addition, the current proposed project has been revised and will impact portions of the area originally part of the Candlelight Villas West (Phase II) Project. This area was also investigated by BFSA in 2004. The records search of the Candlelight Villas West (Phase II) project area resulted in the identification of five previously recorded sites. The archaeological survey resulted in the identification of two light- to moderate-density lithic scatters in the western and southern portions of the project area respectively. These sites were identified as SDI–8640 and SDI–10,523. The other three previously recorded sites were not relocated. This may be due to surface collection conducted during previous studies removing surface evidence of the sites, or the sites may have been originally mismapped.

Site SDI–8640 had been tested previously and was determined to be insignificant. Site SDI–10,523 had not been previously tested or evaluated. The present study determined that both lithic scatters encountered were located in slightly different locations than the preexisting sites, and there was some discrepancy as to whether the scatters represented new sites, or were an extension of the recorded sites. Sites SDI–8640 and SDI–10,523 were tested to determine their significance. Disturbance from grading, bulldozing, agriculture, and off-road vehicle use, in combination with the sparse nature of the surface deposits, indicate that the two sites are not significant resource according to CEQA criteria (Section 15064.5). Impacts to either site will not be adverse, and mitigation measures are not necessary.

6.1 Recommendations

The analysis of previous impacts and archaeological information recovered during this study deterimed that the project area does not contain any significant cultural resources as defined by CEQA (Section 15064.5) and the City of San Diego Guidelines. However, while the survey of the property identified only widely dispersed scatters of artifacts and surface visibility was less than 100% in many areas of the project site, the potential does exist for buried or masked elements of more focused prehistoric activity. Therefore, archaeological monitoring is recommended during construction grading and excavation activities. In the event that archaeological artifacts and/or features are identified during monitoring, construction activities should be temporarily halted until a professional archaeologist conducts an evaluation of the resource.

7.0 PERSONNEL

The archaeological study of the Candlelight Villas East Project was directed by Brian F. Smith, who supervised the survey, site mapping, surface collection, and the preparation of this report. Fieldwork was conducted by Charles Callahan, Chris Powell, Victoria Morgan, and Jason Richards. Kent Smolik identified the artifacts. Graphics were prepared by Robert Hernandez, and Kimberly Wade produced the artifact tables. The report was prepared by K. Harley Meier and Brian Smith. Report production and technical editing was conducted by Kimberly Wade.

8.0 CERTIFICATION

The information provided in this document is correct, to the best of my knowledge, and has been compiled in accordance with the guidelines of the City of San Diego.

Brian F. Smith Principal Investigator	July 21, 2005 Date

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Appendix I

Records Search Results

Deleted from public review; bound separately

Appendix II

Site Form Continuation Sheets

Deleted from public review; bound separately

Appendix III

Confidential Maps

Deleted from public review; bound separately

Appendix G

Paleontological Resources Report
Brian F. Smith and Associates, March 2012

Brian F. Smith and Associates, Inc.
Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

6 March 2012

Ms. Cathy Corvin
Schwerin & Associates
814 Morena Boulevard, Suite 101
San Diego, California 92110

Subject: Updated paleontological resource and monitoring assessment, Candlelight Villas, Otay Mesa Community Plan Area, City of San Diego, San Diego County, California

Dear Ms. Corvin:

Paleontological resource assessments were previously completed for Phase I (East Village) and Phase II (West Village) parts of the Candlelight Villas project area, located east of the Interstate 805 freeway, south of Otay Mesa Road, and north of the head of Dillon Canyon, in the Otay Mesa Community Plan Area of the City of San Diego, San Diego County, California (see index map, Attachment 1). The original two project phases (East and West Villages) together comprise an area of about 50 acres that overlap parts of the midsections of Sections 31 and 32 in Township 18 South, Range 1 West, San Bernardino Base and Meridian, as shown on the USGS 7.5 minute Imperial Beach, Calif.—Baja Calif. Norte topographic quadrangle (1967, photorevised 1975).

Based on a review of published and unpublished geologic reports and maps, the project area is underlain by three geologic formations, the lower Pleistocene (~ 1 million year old) Lindavista Formation (Ql), the middle to upper Pliocene (~ 4 to ~ 2 million year old) San Diego Formation (Tsdss), and the upper Oligocene (~ 29 million year old) Otay Formation (To) (see geologic map, Attachment 2, after Kennedy and Tan, 1977, California Divsion of Mines and Geology Map Sheet 29). The Lindavista Formation unconformably overlies the San Diego Formation, which in turn overlies the Otay Formation. Of the three formations, the San Diego and Otay Formations have both been assigned a "high paleontological resource sensitivity" by T. A. Deméré and S. L. Walsh (1993, Paleontological Resources, County of San Diego) and the City of San Diego (2002, Paleontology Guidelines). The Lindavista Formation has been assigned a "moderate paleontological resource sensitivity" in this area of the city and county. Formations that are assigned a high or moderate level of paleontological sensitivity will require implementation of a Mitigation Monitoring & Reporting Program (MMRP) by the City of San Diego for all mass grading and earthmoving activities (City of San Diego, 2002, Paleontology Guidelines).

A previous collections and records search conducted by the Department of Paleontology at the San Diego Natural History Museum (SDNHM) revealed nearly a dozen fossil localities within a mile

14010 Poway Road, Suite A, Poway, CA 92064; Phone (858) 679-8218 or (951) 681-9950; Fax (858) 679-9896; www.bfsa-ca.com
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radius of the project area and even more to the northwest in the same geologic formations. The Lindavista Formation is rarely fossiliferous, and although the only published fauna from the formation is from the Tierrasanta area, many miles to the north in San Diego, rock-boring clam burrows, some with enclosed internal and external molds, are known from other localities, including from within a few hundred yards of the project site (SDNHM collection records). Marine sediments of the San Diego Formation are often abundantly fossiliferous, especially in much of the southwestern part of the county where they underlie a thin cover of the Lindavista Formation. These southern exposures of the San Diego Formation continue to yield important assemblages of marine invertebrates (mainly mollusks), as well as important vertebrate fossils, such as sharks and rays, bony fish, extinct diving birds, and bones of marine mammals (including but not limited to those of sea lions, dolphins, manatees, walruses and whales) as well as terrestrial mammals (*e.g.*, extinct horse, camel, sheep) (SDNHM collection records). Fossil mollusks and other invertebrates (*e.g.*, sponges, corals, polychaete worms, brachiopods, decapod crustaceans [crabs, etc.], barnacles, sand dollars and sea urchins, etc.) also continue to be recovered from these southern exposures of the San Diego Formation, and even extending farther to the south and into northern Baja California. The Otay Formation is variously fossiliferous and in eastern Chula Vista (for example in the EastLake community) has yielded the greatest diversity of Oligocene terrestrial mammals known from California (T. A. Deméré, 1986, Environment Southwest, no. 515, pp. 9-13). There are, however, no recorded fossil localities in the Otay Formation in the immediate vicinity of the Candlelight Villas project area (SDNHM collection records).

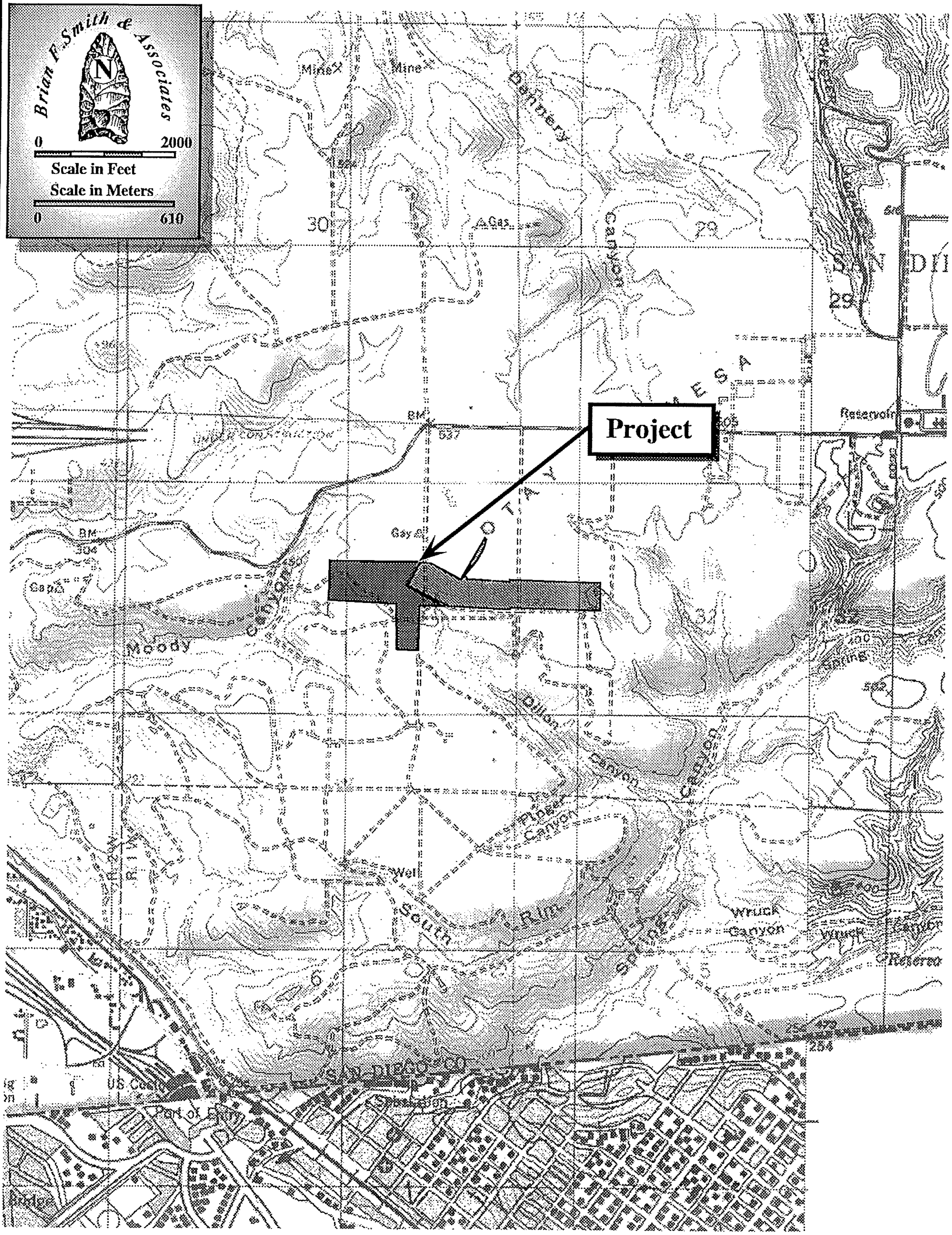
Based on our current review of the paleontological sensitivity of the area of the Candlelight Villas project site, the documented fossil record of the Pleistocene Lindavista Formation sediments and those of the underlying Pliocene San Diego Formation in this area, it is likely that any mass grading, excavation, and/or trenching activities will encounter both of these formations and would thus likely adversely affect paleontological resources (*i.e.*, fossils) in the project area. The Environmental Analysis Section of the Land Development Review Division of the City of San Diego will certainly require that a Mitigation, Monitoring and Reporting Program (MMRP) be implemented for this project in order to reduce the negative impacts to these nonrenewable fossil resources to a level below significance (City of San Diego, 2002, Paleontology Guidelines)..

If you have any questions concerning this evaluation, please feel free to contact us at our Poway address.

Sincerely,

George L. Kennedy, Ph.D.
Senior Paleontologist

Attachments: Index map, geologic map

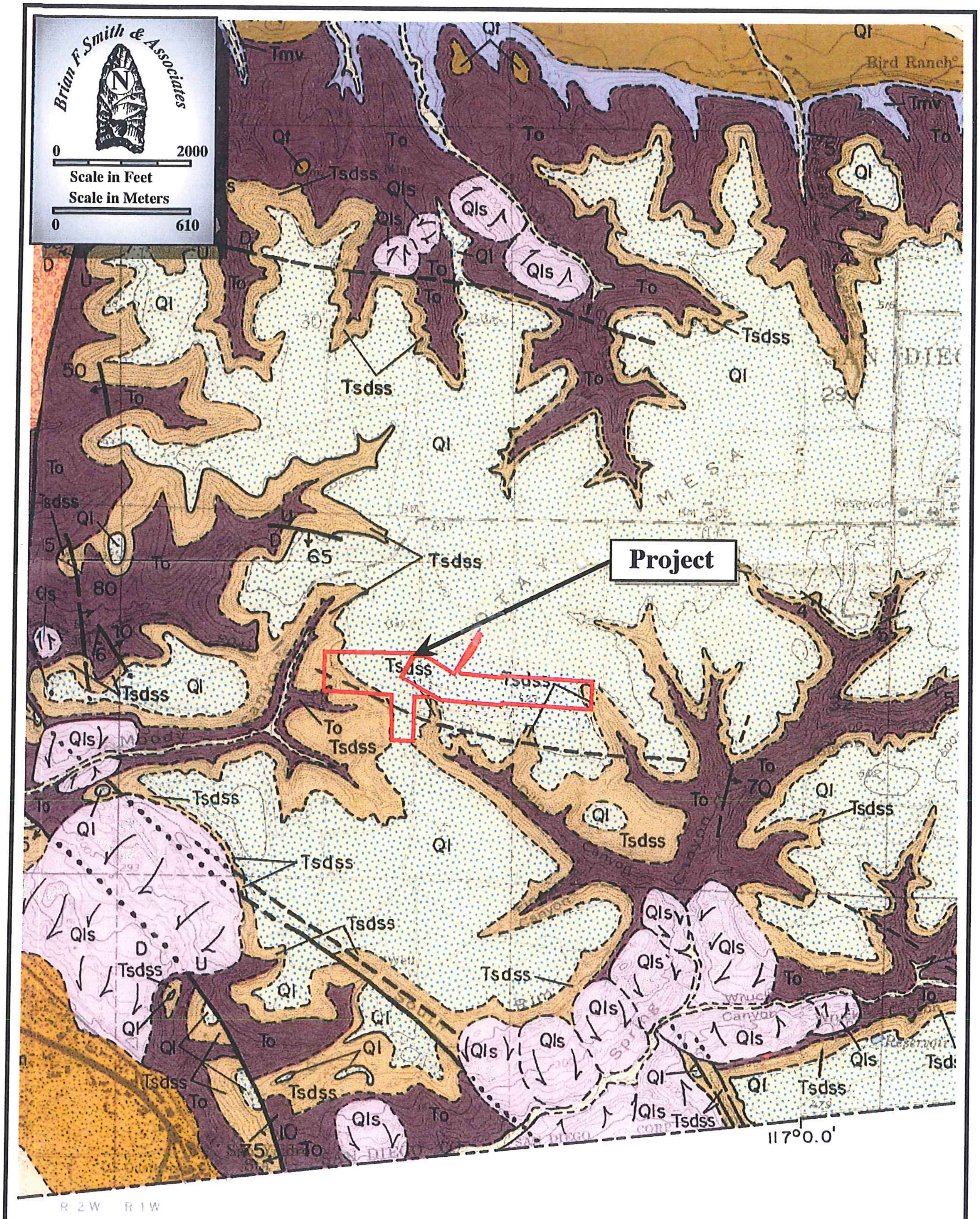


Project Location Map

The Candlelight Villas Project, Phase II

USGS Imperial Beach Quadrangle (7.5 minute series)

Attachment 1



Geologic Map

The Candlelight Villas Project, Phase II

Geology of Imperial Beach Quadrangle after Kennedy and Tan (1977)

Attachment 2

Appendix H

Drainage Study
Schwerin & Associates, Aug. 2013
Drainage Study Addendum
SB&O, Sept. 2017

SB&O INC.
PLANNING ENGINEERING SURVEYING

Addendum #1

DRAINAGE STUDY - PRELIMINARY

FOR

CANDLELIGHT

(Schwerin & Associates, August 2013)

City of San Diego TM/SDP/PDP 114999
Project No.40329

Prepared for:
CANDLELIGHT, LLC
8015 North La Jolla Scenic Drive
La Jolla, CA 92037
Telephone: 858-455-5055

Prepared by:
SB&O, Inc.
3990 Ruffin Road, Suite 120
San Diego, CA 92123
858-560-1141 x 102
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SB&O Job No. 66900.60

REGISTERED PROFESSIONAL ENGINEER
ALLEN L. BUTCHER
No. 47107
Exp. 12-31-17
CIVIL
STATE OF CALIFORNIA

Allen L. Butcher PE C47107

September 30, 2017

TABLE OF CONTENTS

EXHIBITS

SCOPE OF REPORT

The preliminary Technical Reports for Water Quality & Drainage (prepared by Schwerin & Associates 2013) were reviewed as part of the discretionary process.

An Storm Water Quality Management Plan (SWQMP) is being prepared in accordance with the current post-construction water quality requirements of the City of San Diego Storm Water Standards Manual and MS-4 Permit (SDRWQCB Order No. R9-2013-0001, as amended by R9-2015-0001 and R9-2015-0100).

This addendum to the Preliminary Drainage Report is prepared to document changes to the project storm drain system required by the Water Quality permit update. The primary changes to the storm drain system include additional inlets to intercept and direct surface runoff from Caliente Avenue and Public Street "A" to the treatment and HMP control basins. This includes the 10' wide paving of Public Street "A" located south of the project boundary. A fourth treatment and HMP control facility was added to the project.

Curb inlets will be added to Caliente Ave at the northerly boundary/limits of the existing cul-de-sac paving. These inlets will be part of the "bypass" storm drain system that will convey runoff from the High School beyond the project site, avoiding the treatment BMP, HMP and Detention facilities.

OVERVIEW

Correction: The hydrology calculations for the Detention Basin are based upon the County of San Diego Rational Method, and the Rational Method Hydrograph, not the SCS methodology. These calculations were part of the Water Quality Report. The detention calculations are included in SWQMP Attachment 2.

METHODOLOGY

The hydrology calculations in the original preliminary drainage study were based upon the Rational Method, in accordance with the City of San Diego Drainage Manual.

BYPASS STORM DRAIN SYSTEM

The original report described multiple storm drain systems and provided hydrology calculations and pipe sizes. "System 1 Waters from High School" and "Caliente Ave" estimated runoff tributary to the Bypass Storm Drain system, which will intercept and convey runoff from the northerly boundary at Caliente Ave through the site (estimated at 43.1 cfs). This 27" storm drain at 2% system is separate from the project storm drain system, and does not include any runoff from the Candlelight development.

No changes are proposed the Bypass System.

ADDITIONAL STORM DRAIN

As described in the scope of the report, the primary purpose of the addendum is to document the storm drain changes and additions. In order to intercept street runoff for Caliente, Public Street "A" and the 10' interim pavement adjacent to the south project boundary, several curb inlets will be required, located as follows;

West Site (To Biofiltration #4/ HMP #4)
Public Street A East of Caliente (Offsite Strip)
Public Street A East of Caliente
Caliente @ Street A (East Return)
Caliente @ Street A (West Return)

West Site (To Biofiltration #1/ HMP #1)
Public Street "A" West of Caliente
Public Street "A" West of Caliente (Offsite Strip)
Public Street "A" West Cul-De-Sac

East Site (To Biofiltration #3)
Public Street "A" East Cul-De-Sac

Detailed inlet Sizing, Hydrology Calculations and Pipe Selection are included in Exhibit "A".

CONCLUSION

The storm drain additions or changes further define the prior drainage concept, primarily to provide treatment and HMP controls for the street flows (Caliente and Public Street "A", and the interim offsite improvements located south of the boundary (10'pavement strip along the southerly boundary and the easterly cul-de-sac).

Note: The street and offsite areas tributary to the treatment BMPs and HMP facilities were previously included in the detention analyses (included in SWQMP Attachment 2).

EXHIBIT A

Inlet Calculations
Hydrology Calculations
Pipe Selection /Capacity Check

Project Name **Candlelight**

Attachment 1B
DMA Summary

West Portion of Site

DMA	Treatment / Type	Imper (%)	Imperv (sf)	Pervious (sf)	Total (sf)	Total (ac)
ST1	Drains to Biofiltration 4	90%	41,814	4,646	46,460	1.07
ST2	Drains to Biofiltration 4	90%	22,164	2,463	24,627	0.57
CAL3	Drains to Biofiltration 4	90%	3,925	436	4,361	0.10
OFF2	Drains to Biofiltration 4	95%	8,989	473	9,462	0.22
CAL 2	Drains to Biofiltration 4	95%	4,508	237	4,745	0.11
CAL 4	Drains to Biofiltration 4	90%	1,203	134	1,337	0.03
To Biofiltration 4	To HMP 4		82,603	8,389	90,992	2.09
ST4	Drains to Biofiltration 1	90%	33,044	3,672	36,715	0.84
OFF1	Drains to Biofiltration 1	100%	7,526	-	7,526	0.17
Lot 1	Drains to Biofiltration 1	71%	214,315	88,427	302,742	6.95
To Biofiltration 1	To HMP 1	73%	254,885	92,098	346,983	7.97
Lot 2	Drains to Biofiltration 2 To HMP 2	73%	228,690	82,764	311,454	7.15
Total to Detention West		73%	483,575	174,862	658,437	17.20

East Portion of Site

DMA	Type	Imper (%)	Imperv (sf)	Pervious (sf)	Total (sf)	Total (ac)
Lot 3	Drains to Biofiltration 3	75%	270,072	88,427	358,499	8.23
ST3	Drains to Biofiltration 3	60%	443	295	738	0.02
OFF 3	Drains to Biofiltration 3	85%	14,035	2,477	16,512	0.38
To Biofiltraton 3	Drains to Biofiltration 3	76%	284,550	91,199	375,749	8.63
Trail 6' Wide	Self Treating			27,878	27,878	0.64
Total to HMP 3/ Detention East		70%	284,550	119,077	403,627	9.27
Total - East & West		72%	768,125	293,940	1,062,064	26.47

<u>Remainder Areas</u>

Detention West / Access - Self Treating				5,064	5,064	0.12
Lot 4	Open Space - Self Treating					15.76
Lot 5	Open Space - Self Treating					2.10
CAL 1 (Exist Street)	Bypass SD	100%	28,397		28,397	0.65
Project Total						45.10
Deduct Offsite Street Areas (Streets)						0.91
Project Total						44.19

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Project Name **Candlelight** Prelim 30-Sep-17

Inlet Areas - West Side (Caliente @ Street A)

Inlet	**OFF 2**		**Inlet**	**ST 2**		**Inlet**	**ST-1 (East)**		**Inlet**	**ST-1 (West)**	
OFF 1			Area ST 2			Area CAL3+CAL4+ Por ST1			Area CAL2 + Por ST1		
A =	0.22	ac	A =	0.57	ac	A =	0.67	ac	A =	0.63	ac
Lo =	11	ft	Lo =	22	ft	Lo =	45	ft	Lo =	45	ft
C =	0.95	Table 2	C =	0.9	Table 2	C =	0.9	Table 2	C =	0.9	Table 2
S =	2.2	%	S =	2.2	%	S =	2.75	%	S =	2.75	%
Ti =	0.7	min	Ti =	1.3	min	Ti =	1.7	min	To =	1.7	min
Lg =	750	ft	Lg =	775	ft	Lg =	590	ft	Lg =	600	ft
Sg =	0.9	%	Sg =	0.9	%	Sg =	2.7	%	Sg =	2.7	%
Vg	2	fps	Vg	2.2	fps	Vg	3.5	fps	Vg	3.5	fps
Tg =	6.3	min	Tg =	5.9	min	Tg =	2.8	min	Tg =	2.9	min
Lp =		ft	Lp =		ft	Lp =	0	ft	Lp =	0	ft
Sp =		%	Sp =		%	Sp =	0	%	Sp =	0	%
Vp			Vp			Vp	0		Vp	-	
Tp =		min	Tp =		min	Tp =	0.0	min	Tp =	0.0	min
Ti=	6.9	min	Ti=	7.2	min	Ti=	4.5	min	Ti=	4.6	min
I100=	4.00	in/hr	I100=	3.96	in/hr	I100=	4.40	in/hr	I100=	4.40	in/hr
Q100=	0.84	cfs	Q100=	2.03	cfs	Q100=	2.65	cfs	Q100=	2.49	cfs
Pasing Grade			Pasing Grade			Pasing Grade			Pasing Grade		
Depth	0.24		Depth	0.29		Depth	0.26		Depth	0.26	
Length	5	A Inlet	Length	7	B-1 Inlet	Length	10	B-1 Inlet	Length	9	B-1 Inlet
Assume 6" Curb Face for Temp Inlet											
To ST 2			**To ST 1 (East)**			**To ST 1 (West)**			**To BIO 4**		

Project Name **Candlelight** Prelim 30-Sep-17

Inlet Areas - West Side (Street A)

Inlet	**ST-4 Cul-De-Sac**	
Portion ST 4		
A =	0.64	ac
Lo =	26	ft
C =	0.9	Table 2
S =	2.1	%
Ti =	1.4	min
Lg =	310	ft
Sg =	0.9	%
Vg	2.2	
Tg =	2.3	min
Lp =		ft
Sp =		%
Vp		
Tp =		min
Ti=	3.8	min
I100=	4.40	in/hr
Q100=	2.53	cfs
Sump Condition - B Inlet		
Opening (h)	6.2	in
Curb face (H)	10	in
Ratio (H/h)	1.61	
Q / L =	1.70	cfs / ft
Length	5	B Inlet
To BIO 1		

Inlet	**ST-4**	
Portion ST-4		
A =	0.2	ac
Lo =	26	ft
C =	0.9	Table 2
S =	2.1	%
Ti =	1.4	min
Lg =	470	ft
Sg =	0.9	%
Vg	2.2	fps
Tg =	3.6	min
Lp =		ft
Sp =		%
Vp		
Tp =		min
Ti=	5.0	min
I100=	4.40	in/hr
Q100=	0.79	cfs
Pasing Grade		
Depth	0.24	
Length	5	B Inlet
To BIO 1		

Inlet	**OFF 1**	
OFF 1		
A =	0.17	ac
Lo =	11	ft
C =	0.95	Table 2
S =	2.1	%
Ti =	0.7	min
Lg =	520	ft
Sg =	1	%
Vg	1.9	
Tg =	4.6	min
Lp =		ft
Sp =		%
Vp		
Tp =		min
Ti=	5.3	min
I100=	4.35	in/hr
Q100=	0.70	cfs
Sump Condition - B Inlet		
Opening (h)	2.2	in
Curb face (H'	6	in
Ratio (H/h)	2.73	
Q / L =	0.40	cfs / ft
Length	5	A Inlet
Assume 6" Curb Face for Temp Inlet		
To BIO 1		

Project Name **Candlelight** Prelim 30-Sep-17

Inlet Areas - East Side

Street "A"	**East Cul-De-Sac**	
ST 3 + OFF 3		
A =	0.4	ac
Lo =	20	ft
C =	0.9	Table 2
S =	2	%
Ti =	1.3	min
Lg =	625	ft
Sg =	1	%
Vg	2.3	
Tg =	4.5	min
Lp =		ft
Sp =		%
Vp		
Tp =		min
Ti=	5.8	min
I100=	4.25	in/hr
Q100=	**1.53**	cfs
Sump Condition - B Inlet		
Opening (h)	6.2	in
Curb face (H)	10	in
Ratio (H/h)	1.61	
Q / L =	1.70	cfs / ft
Length	5	B Inlet

Project Name **Candlelight** Prelim 30-Sep-17

Storm Drain - West Streets

DMA ID	Area (ac)	C	Cumm C x A (ac)	Tc (min)	I100 (in/hr)	Q100 (cfs)	Pipe Dia / Capacity
OFF 2	0.22	0.95	0.21	6.9	4.00	0.84	18" @ 0.6% Capacity = 8.7 cfs
ST 2	0.57	0.9	0.72	7.2	3.96	2.86	18" @ 0.6% Capacity = 8.7 cfs
ST 1 East	0.67	0.9	1.33	7.2	3.96	5.25	18" @ 0.6% Capacity = 8.7 cfs
ST 1 West	0.63	0.9	1.89	7.2	3.96	7.49	18" @ 0.6% Capacity = 8.7 cfs
	2.09	**To BIO 4**	0.91				

Storm Drain - West Streets

DMA ID	Area (ac)	C	Cumm C x A (ac)	Tc (min)	I100 (in/hr)	Q100 (cfs)	Pipe Dia / Capacity
OFF 1	0.17	0.95	0.16	5.3	4.2	0.68	18" @ 0.6% Capacity = 8.7 cfs
ST 4 East	0.2	0.9	0.18	5.0	4.40	0.79	18" @ 0.6% Capacity = 8.7 cfs
ST 4 West	0.64	0.9	0.58	3.8	4.40	2.53	18" @ 0.6% Capacity = 8.7 cfs
	1.01	**To BIO 1**					

Storm Drain - East Streets

DMA ID	Area (ac)	C	Cumm C x A (ac)	Tc (min)	I100 (in/hr)	Q100 (cfs)	Pipe Dia / Capacity
OFF 3 & ST 3	0.4	0.9	0.36	5.8	4.25	1.53	18" @ 0.6% Capacity = 8.7 cfs
		To BIO 3					

Project Name **Candlelight** Prelim 30-Sep-17

Storm Drain - Street "A"

	Area (ac)	Tc (min)	I100 (in/hr)	C	Q100 (cfs)	Pipe Dia / Capacity
HMP 2 Outflow	7.15	9.0	3.6	0.78	20.1	24" @ 0.8% Capacity = 21.7 cfs
HMP 4 Outflow	2.09	8.0	3.8	0.91	7.2	18" @ 0.6% Capacity = 8.7 cfs
	9.24	9.0	3.6	0.81	26.88	24" @ 1.25% Capacity = 27.2 cfs

Note: Tc for HMP 2 is 9 minutes per original report.

	Area (ac)	Tc (min)	I100 (in/hr)	C	Q100 (cfs)	Pipe Dia / Capacity
HMP 1 Outflow						
Lot 1	6.95	9		0.75		
Streets	1.01	5.3		0.9		
	7.97	9	3.6	0.77	22.0	24" @ 0.9% Capacity = 23.1 cfs

Note: Tc = 9 minutes per original report.

To Detention West 17.20

Detention West Outflow (From Detention Analysis) Q100= 19.1 24" @ 0.7% Capacity = 20.4 cfs

Storm Drain - BIO 3 to HMP 3/Detention East

	Area (ac)	Tc (min)	I100 (in/hr)	C	Q100 (cfs)	Pipe Dia / Capacity
Lot 3	8.23	9.0		0.78		
Street	0.4	5.8		0.9		
	8.63	9.0	3.6	0.79	24.41	24" @ 1.25% Capacity = 27.2 cfs

Note: Tc = 9 minutes per original report.

Developed Total 25.83

Detention East Outflow (From Detention Analysis) Q100= 9.2 18" @ 1.0% Capacity = 11.3 cfs

DRAINAGE EXHIBIT FOR:
CANDLELIGHT

WEST PORTION OF SITE

TO BIOFILTRATION 4

DMA	TREATMENT
OFF 2	DRAINS TO BIOFILTRATION 4
ST 2	DRAINS TO BIOFILTRATION 4
CAL 3	DRAINS TO BIOFILTRATION 4
CAL 4	DRAINS TO BIOFILTRATION 4
CAL 2	DRAINS TO BIOFILTRATION 4
ST 1	DRAINS TO BIOFILTRATION 4
TO BIOFILTRATION 4 / HMP 4	

TO BIOFILTRATION 1

DMA	TREATMENT
ST 4	DRAINS TO BIOFILTRATION 1
OFF 1	DRAINS TO BIOFILTRATION 1
LOT 1	DRAINS TO BIOFILTRATION 1
TO BIOFILTRATION 1 TO HMP 1	

TO BIOFILTRATION 2

DMA	TREATMENT
LOT 2	DRAINS TO BIOFILTRATION 2 TO HMP 2

EAST PORTION OF SITE

DMA	TREATMENT/TYPE
OFF 3	DRAINS TO BIOFILTRATION 3
ST 3	DRAINS TO BIOFILTRATION 3
LOT 3	DRAINS TO BIOFILTRATION 3
TO BIOFILTRATION 3 TO HMP 3	

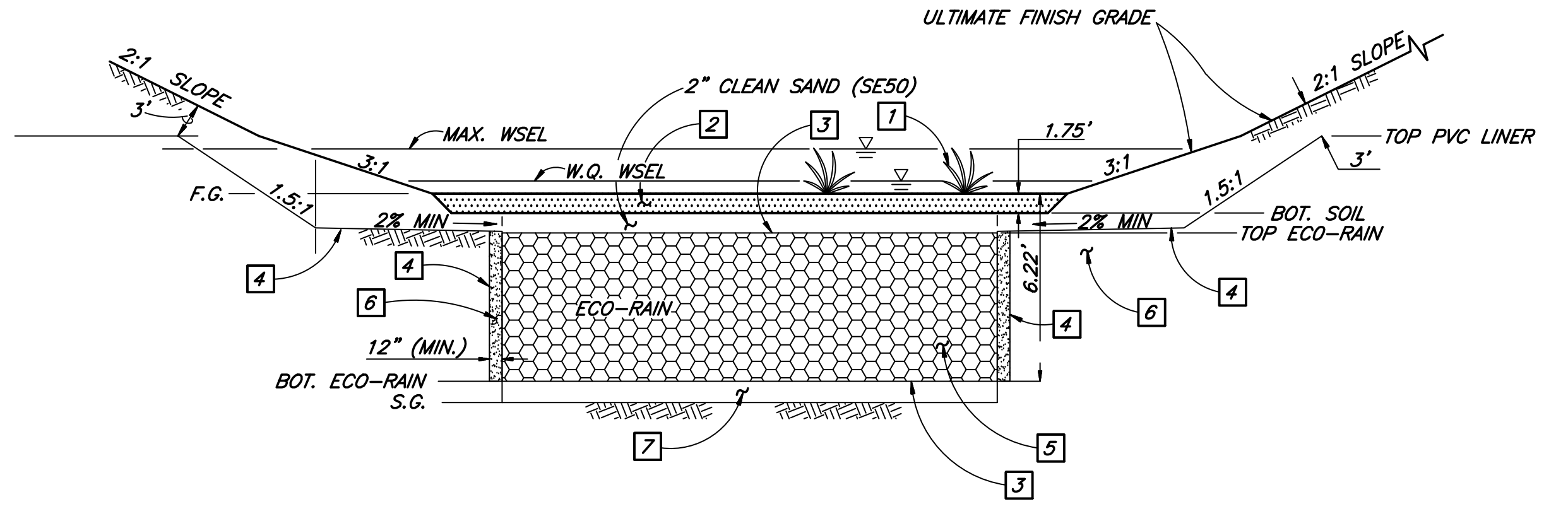
REMAINDER AREAS

DMA	TREATMENT/TYPE
DETENTION WEST/ACCESS – SELF TREATING	
LOT 4	OPEN SPACE – SELF TREATING
LOT 5	OPEN SPACE – SELF TREATING
CAL 1 EXIST. STREET BYPASS STORM DRAIN (NOT A PART)	

LEGEND

- SUBDIVISION BOUNDARY
- BYPASS STORM DRAIN
- PROPOSED STORM DRAIN
- DIRECTION OF DRAINAGE
- DRAINAGE LIMITS
- DETENTION (VAULT)
- HMP (VAULT)
- BIOFILTRATION BASIN
- 395 EXISTING CONTOUR
- 🟥 BIOFILTRATION (PARTIAL RETENTION) BASIN
- 🟩 UNDERGROUND HMP STORAGE
- ⬚ UNDERGROUND HMP/DETENTION STORAGE
- ▨ UNDERGROUND DETENTION STORAGE

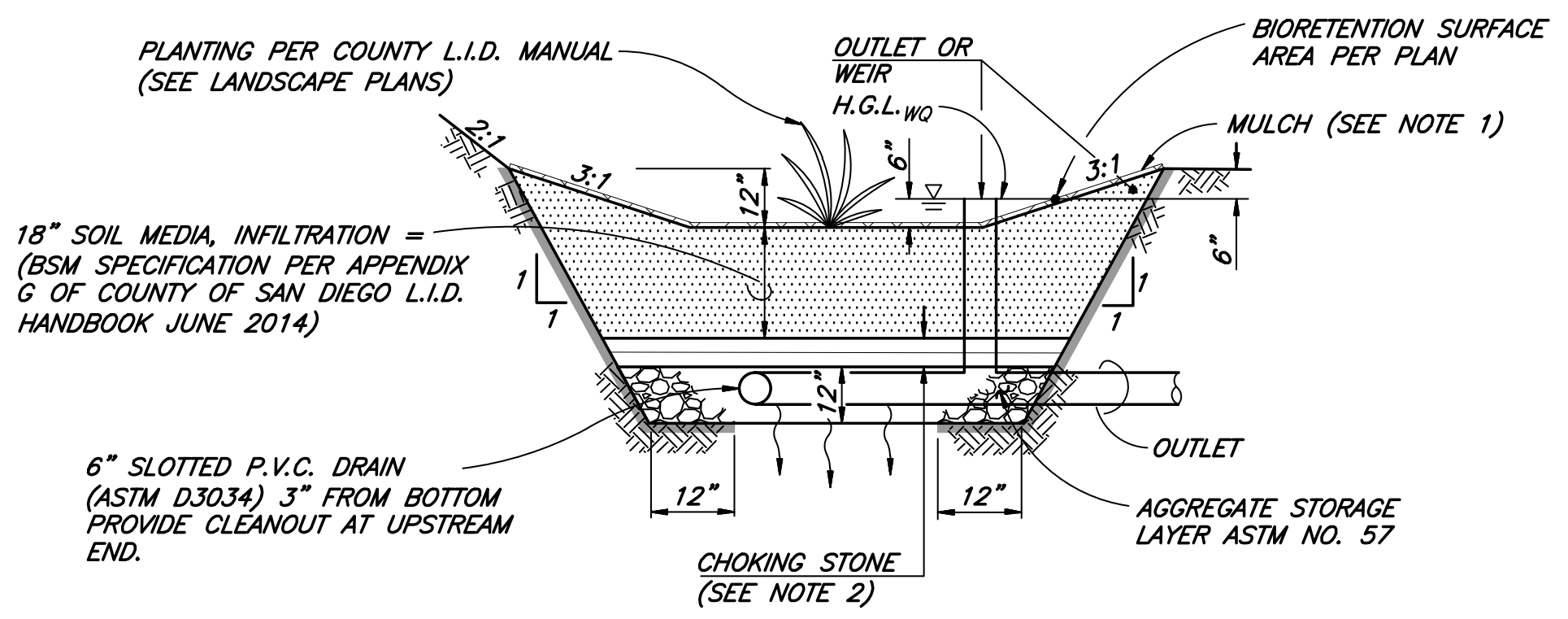
DRAINAGE STUDY ADDENDUM #1



NOTES

1. PLANTING PALETTE PER COUNTY L.I.D. MANUAL (SEE LANDSCAPE CONSTRUCTION DRAWINGS.
2. 18" SOIL MEDIA (BSM SPECIFICATION PER APPENDIX G OF COUNTY OF SAN DIEGO L.I.D. HANDBOOK JUNE 2014)
3. "ECORAIN" STORAGE SYSTEM SHALL BE FULLY WRAPPED WITH PERMEABLE GOEFABRIC MIRAFI 140N, PER MANUFACTURER'S RECOMMENDATIONS.
4. 30 MIL. P.V.C. LINER SHALL BE FULLY WATER-TIGHT. ALL JOINTS SHALL OVERLAP 12" MIN. AND BE SEALED. LINER SHALL BE SEALED WITH MASTIC TO ALL STRUCTURES. ALL PENETRATIONS SHALL BE SEALED. INSTALL ON SIDES ONLY. BOTTOM SHALL BE UNLINED.
5. "ECO-RAIN" SPACE STORAGE SYSTEM. INSTALL PER MANUFACTURE'S SPECIFICATIONS AND GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.
6. BACKFILL WITH CLEAN SAND OR GRAVEL MATERIALS OR A MIX OF BOTH, FREE FROM LUMPS AND DEBRIS OR SHARP MATERIALS. COMPACT FILL IN LIFTS LESS THAN 12 INCHES TO 85% COMPACTION. SEE MANUFACTURER'S RECOMMENDATIONS.
7. BEDDING PER MANUFACTURER'S RECOMMENDATIONS

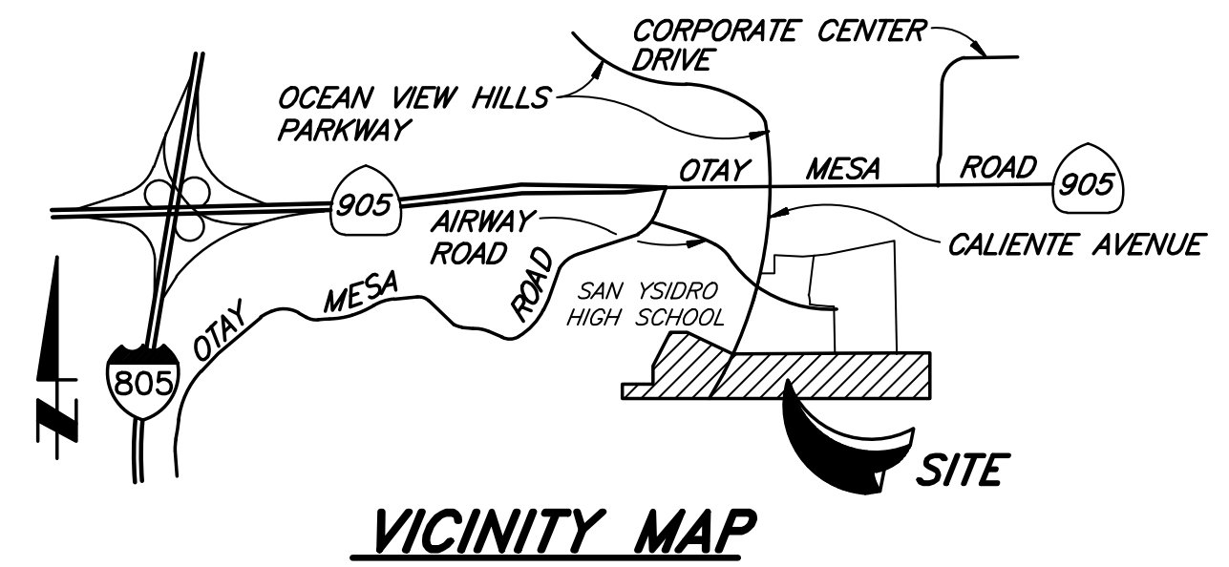
A/1 COMPOSITE BASIN 1, 2 & 4
NOT TO SCALE



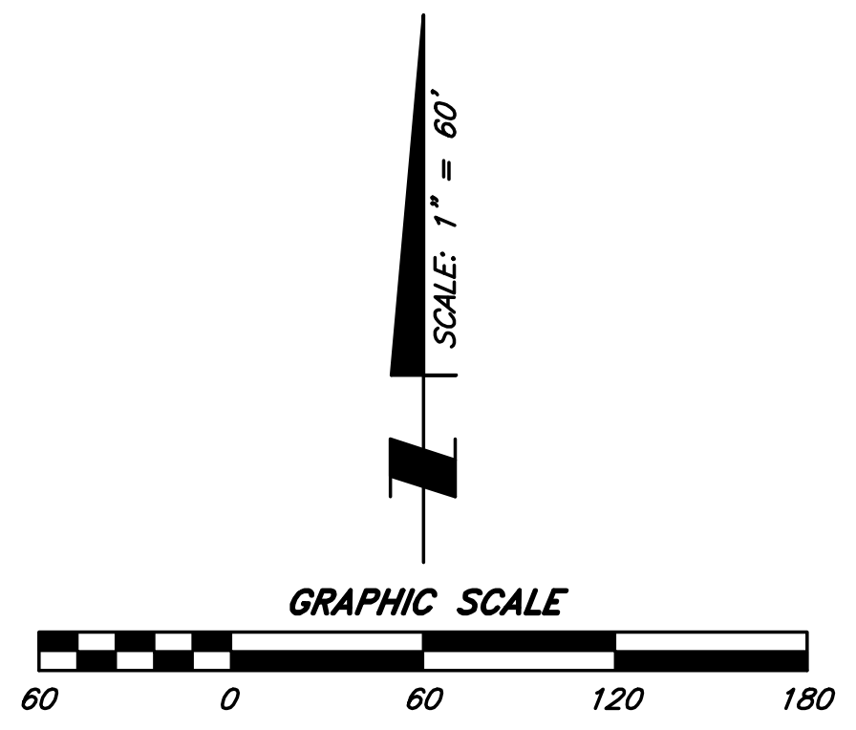
NOTES

1. INSTALL 3" WELL AGED SHREDDED HARDWOOD MULCH THAT HAS BEEN STOCKED PILED OR STORED FOR AT LEAST 12 MONTHS. MULCH MUST BE NON-FLOATING.
2. CHOKING STONE TO BE 3" CLEAN AND WASHED SAND (ASTM NO. 33) OVER 3" LAYER OF ASTM NO. 8 STONE.

B/1 DETAIL ~ BIOFILTRATION BASIN 3
NOT TO SCALE



VICINITY MAP
NOT TO SCALE
THOMAS BROTHERS PG. 1351, GRID A-2
2006 EDITION



DRAINAGE EXHIBIT FOR: CANDLELIGHT

ALLEN L. BUTCHER
No. 47107
Exp. 12-31-17
CIVIL

SB&O INC.
PLANNING ENGINEERING SURVEYING
3990 Ruffin Road, Suite 120
San Diego, Ca. 92123
858-560-1141
858-560-8157 Fax

ALLEN L. BUTCHER DATE

FILE NAME: D:\69902 CANDLELIGHT WQ CONSULT\03 DWG\DX\69902DX04-DRAINAGE EXHIBIT.DWG, PLOTTED BY: TONY PORCIONCULA ON 10/3/2017 9:43 AM

Candlelight Drainage Study

I am a registered Civil Engineer and hereby state that this Drainage Study has been prepared by me or under my supervision.

Walter T.

Walter T. Schwerin, RCE 22139

REGISTERED PROFESSIONAL ENGINEER
WALTER T. SCHWERIN
NO. 22139
EXP. 9/30/13
CIVIL
★ STATE OF CALIFORNIA ★

Candlelight Preliminary Drainage Study

Overview

Candlelight is a 42.28 acre multi-family subdivision in the Otay Mesa area within the incorporated area of the City of San Diego. The property lies approximately one mile below freeway 905, contiguous to San Ysidro High School and abutting Caliente Avenue. There are two environmental preserve areas on the proposed project that will be undisturbed. These are the 15.78 acre Western Preserve and the 2.10 acre Eastern Preserve. Exhibit A illustrates the subdivision boundary, the two preserve areas and both the extension of Caliente Ave. and Public Street A.

The topography of the site is sloping Southwesterly on Lots 1 and 2 at about 2% into a finger of Spring Canyon which slopes Southerly. Lot 3 slopes Southeasterly at about 1% into another finger of Spring Canyon located on the far East of the project.

The goal of this project application is to obtain a Site Development Permit (SDP) and a tentative map. The required construction for this tentative map is the extension of Caliente Blvd. and Public Street A. The only grading proposed by this project is for the aforementioned two public roads. Ultimately multi- family development is proposed for this project. At such time additional grading permits and attendant drainage studies will be required.

Architectural Design Guidelines are being submitted as part of the Candlelight submittal package to satisfy the requirements of the Planned Development Permit. These guidelines have schematics of site plans that may or may not be utilized. For purposes of detention, hydro modification and bio retention these schematic plans were utilized for location of these facilities. The Water Quality Technical Report has exhibits and computations for these facilities.

It is recognized that in the future the location of detention basins and treatment facilities very might be changed for the ultimate development. The sizing however should remain the same.

This drainage study will analyze the handling of treated waters entering into Lot 1 from the adjoining High School to the North, uncollected waters flowing Southerly within Caliente Blvd. and the drainage systems crossing Caliente from Lot 2. It should be noted that waters emanating from the High School are from a detention basin and assumed to be treated. As such these waters plus waters generated from Caliente to the North of the project will be handled separately from on site waters. Exhibit B of this study illustrates the area draining into Candlelight from the high school.

The second part of the study will address waters flowing Southerly on Caliente and the inlet sizing. The drainage system handling waters crossing Caliente from Lot 2 will be analyzed at build out conditions. Exhibit B is the drainage map for this study and illustrates the current disposition of waters. Based on the topography, waters on Lot 3 currently flow Easterly into a finger of Spring Canyon. Construction of the public streets as proposed on this Tentative Map will not change or alter drainage flow of Lot 3.

Please note per Appendix 3 of the San Diego City Design manual, we used the SCS method to design the detention basin. Designing a detention basin requires a runoff hydrograph. The San Diego City Drainage Manual only provides peak flow data, therefore in accordance with Appendix 3 of the City of San Diego Drainage Manual, we used the SCS method which relies on the County rainfall maps and data.

System 1 Waters from High School

Based on topography taken by Hunsaker and Associates, the area from the High School draining into Candlelight is as shown on Exhibit B and is 20.4 acres. The overland flow is 1500' and the elevation differential is 13'.

The time of concentration is 13 minutes based on page 84 of the City's drainage manual.

The corresponding intensity is 3.1 inches per hour.

Coefficient of runoff is used as that for a multi family residence, or 0.70

Q from high school equals 44.27 cfs

Water from the High School enters the Candlelight property through two HDPE 18" pipes as shown on Exhibit B. It should be noted that the High School was built with the only municipal oversight being the State of California. As such construction documents including drainage studies are not available to the general public. Knowledge of the aforementioned 18" pipes is obtained through field review. Based on the attached Flow for Circular Pipe Flowing Full figure attached, the 44.27 cfs coming from the High School will require a 24" storm drain to handle this storm water at a 2.2% slope.

The following is an excerpt from the drainage study for Southview to the North. In particular that portion which addresses Caliente.

Caliente Avenue

Drainage area = 1.66 acres
Street slope = 1.0% at termination of road
Q=cia
C for road is 0.9
Intensity for area using 10 minute duration on 100 year storm
= 3.45 (City of San Diego drainage manual, page 83)
Q = 5.15 cfs
@ 5.15 cfs, slope =1.0%, depth of gutter flow = .37', less than 0.4, therefore ok (pg70a)
Note: Caliente will be extended as part of the Candlelight project, Tentative Map pending

Therefore no permanent solution designed at this time

Caliente waters to be collected at subdivision boundary and added to waters from High School.

Total waters in drain pipe = 32.8 + 5.15 + 5.15(two sides of Caliente) = 43.1 cfs

At an average of 2% gradient a 27" pipe will handle 43.1 cfs flowing full

System 2 Waters from Lot 2

Drainage system for waters from Lot 2 crossing Caliente is designed for ultimate buildout condition even though for purposes of this tentative map that is not the case since no grading is proposed (Other than on public streets) on this tentative map.

Lot 2 area = 7.15 acres
"C" for multi family = 0.7

Length of overland flow = 900'
Elevation difference = 8'
Time of concentration = 9 minutes
Corresponding intensity = 3.45

Q= cia
= 17.3 cfs

At 1.5% gradient assumed use 18" rcp

Note: Lot 3 will flow Easterly

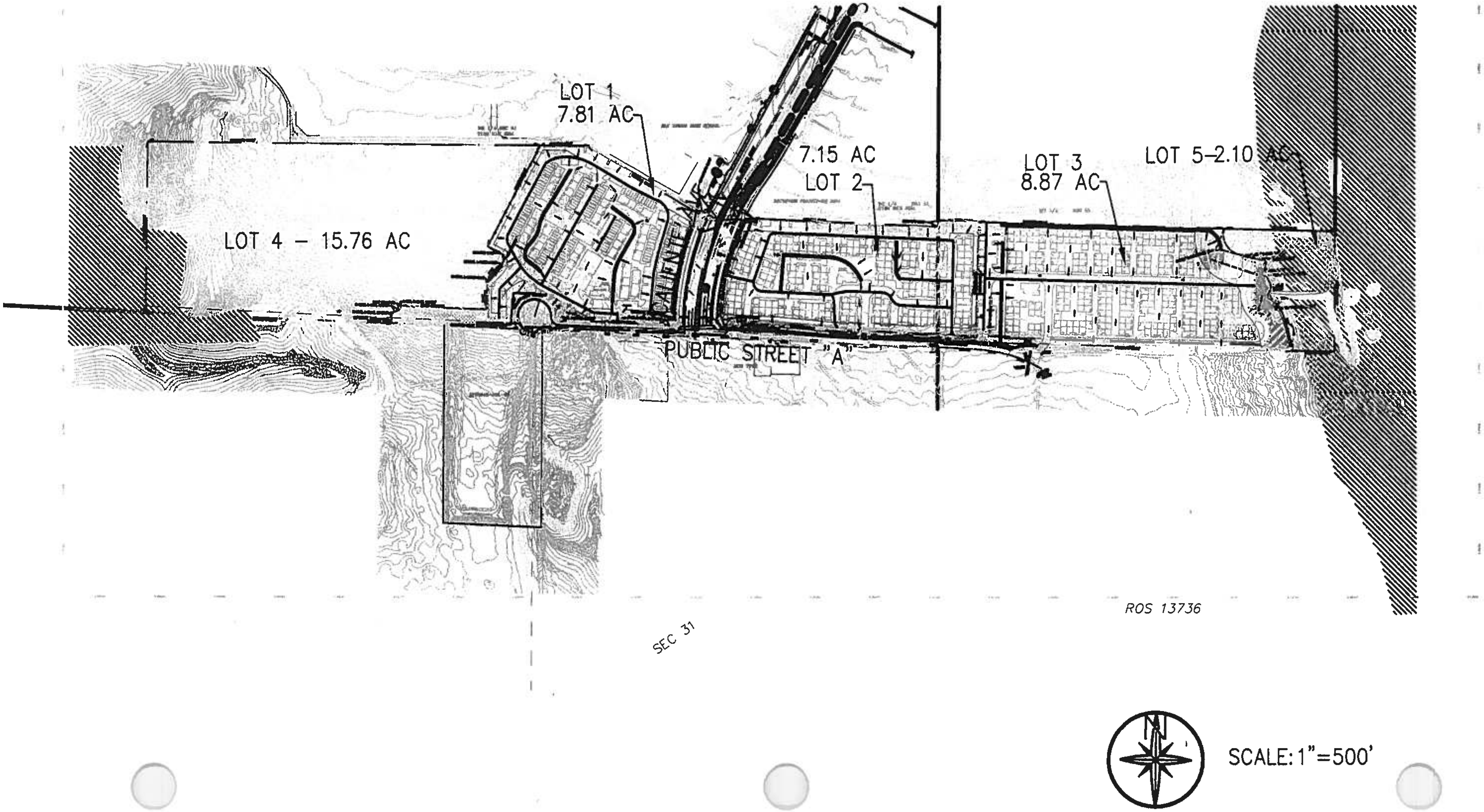
Evaluation of water flow in Caliente from upstream collection point:

Length of road: 380'
Width of road Westerly: 60'
Width of road Easterly: 80'
Area West side of road = 0.52 ac
Area East side of road = 0.70 ac

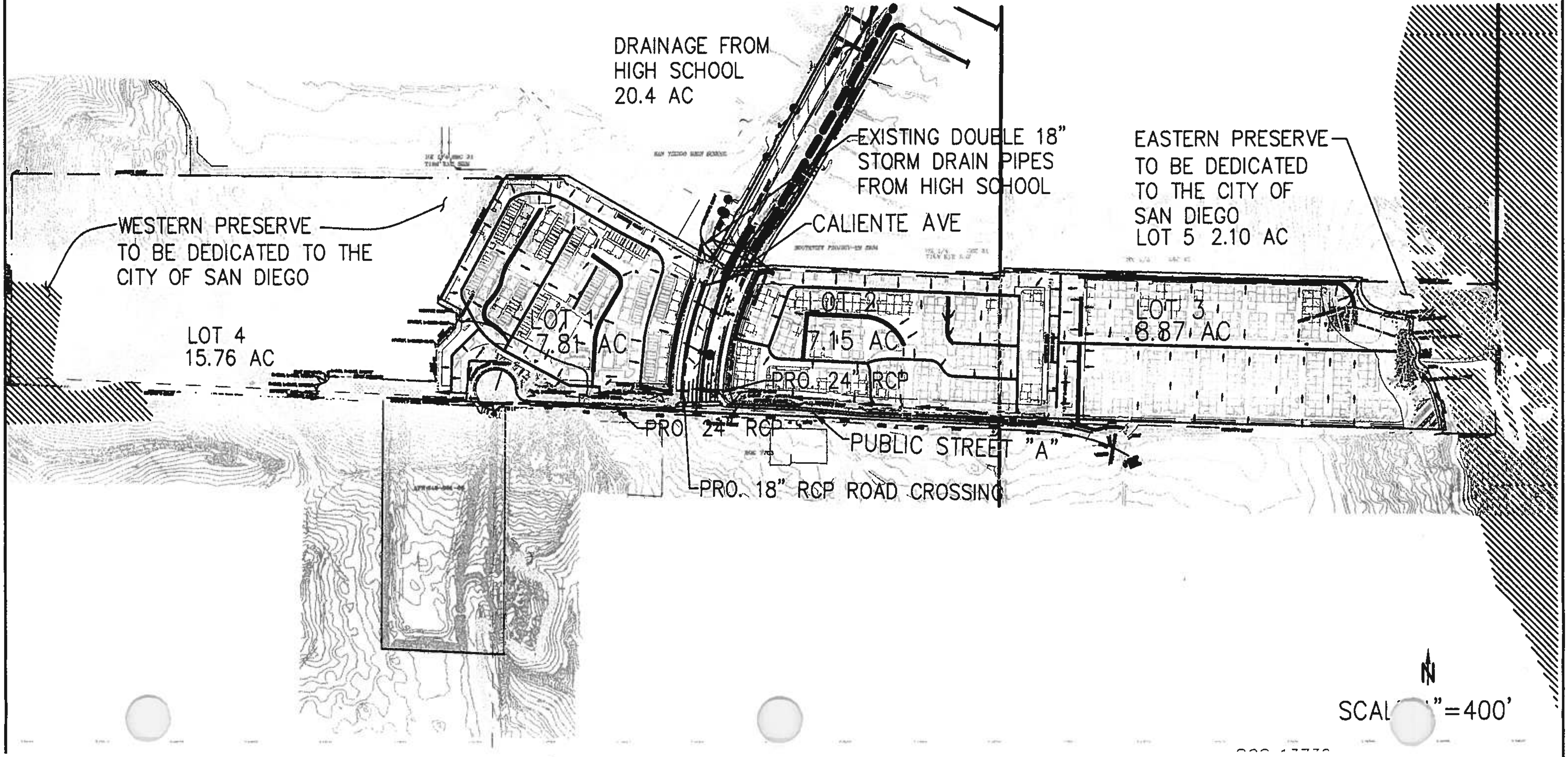
Easterly flow rate, Q
Use 10 min time of concentration for 3.45 "/hr
c= 0.9 for road
Q = 2.17 cfs for East, 1.61 cfs for West

Street grade of Caliente at Southerly terminus: 4.00%
Depth of flow in gutter is 0.24' (Page 70, City Drainage Design Manual)
Less than 0.4', OK

CANDLELIGHT EXHIBIT "A"



CANDLELIGHT
ON-SITE DRAINAGE MAP
EXHIBIT B



Appendix I

Storm Water Quality Management Plan

SB&O, December 2017

~~Technical Report-Drainage Study~~

~~Schwerin & Associates, Aug. 2013~~

The City of San Diego

PRIORITY DEVELOPMENT PROJECT (PDP) STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR

Candlelight
Project #40329
TM 114999

REGISTERED PROFESSIONAL ENGINEER
ALLEN L. BUTCHER
No. 47107
CIVIL
STATE OF CALIFORNIA

ENGINEER OF WORK:

12/1/17

Allen L Butcher, PE C47107
Provide Wet Signature and Stamp Above Line

PREPARED FOR:

Candlelight_,LLC
8015 N. La Jolla Drive
San Diego, CA 92037
(858) 455-5055

PREPARED BY:

SB&O INC.
PLANNING ENGINEERING SURVEYING

SB&O, Inc.
3990 RUFFIN ROAD, SUITE 120
SAN DIEGO, CA 92123
858-560-1141 JN 69900.66

DATE:
December 4, 2017

Approved by: City of San Diego Date

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Project Name: **Candlelight**

TABLE OF CONTENTS

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ACRONYMS

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

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CERTIFICATION PAGE

Project Name: Candlelight
Permit Application Number: 40329

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

Engineer of Work's Signature, PE Number & Expiration Date

Allen L Butcher, PE C47017 Exp 12-31-2017
Print Name

SB&O, Inc.
Company

December 4, 2017
Date

REGISTERED PROFESSIONAL ENGINEER
ALLEN L. BUTCHER
No. 47107
CIVIL
STATE OF CALIFORNIA

Engineer's Stamp

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SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plan check comments is included. When applicable, insert response to plan check comments.

Submittal Number	Date	Project Status	Changes
1	2/28/17	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Initial Submittal
2	6/5/2017	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Second submittal
3	10/5/2017	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Third Submittal
4	12/4/2017	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Fourth Submittal

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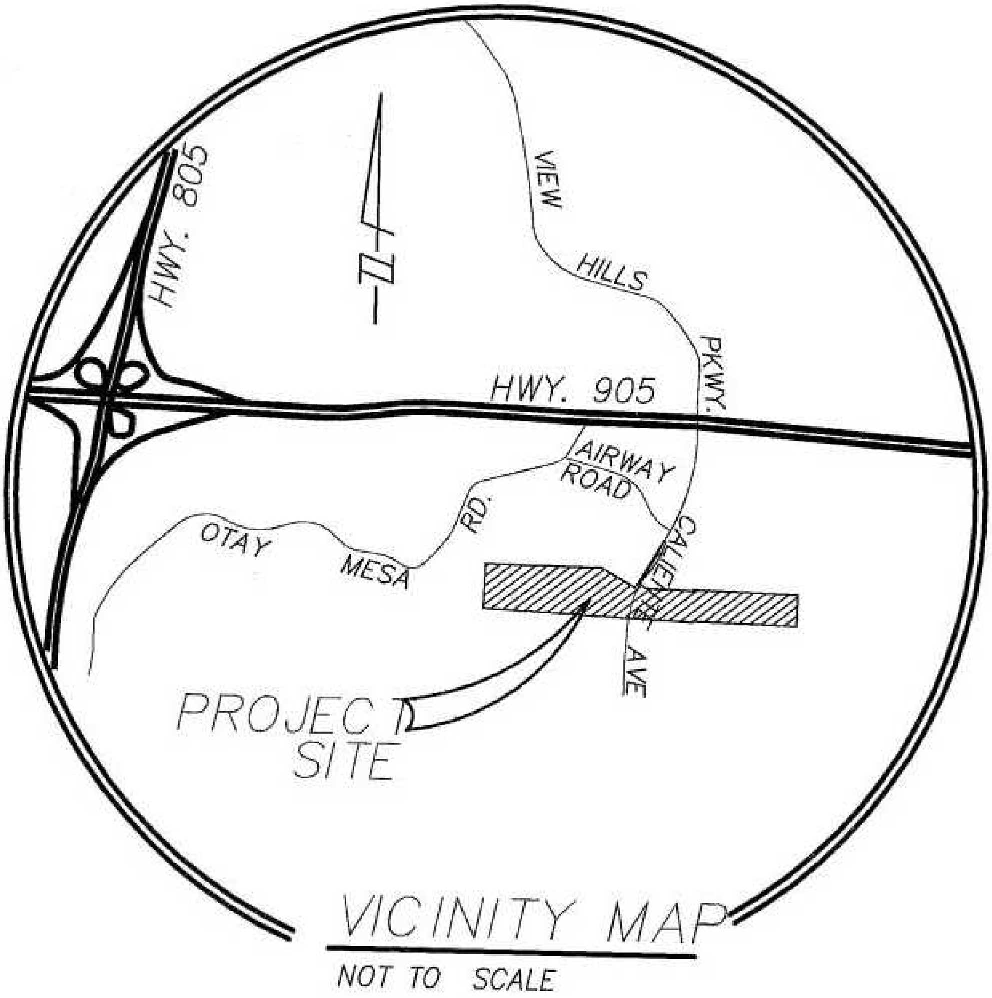
PROJECT VICINITY MAP

Project Name: Candlelight
Permit Application Number: 40329



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City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM DS-560
OCTOBER 2016

Project Address: Caliente Ave - South End

Project Number *(for City Use Only)*: 40329

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1], which is administered by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

☒ Yes; SWPPP required, skip questions 2-4 ☐ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and contact with storm water runoff?

☐ Yes; WPCP required, skip 3-4 ☐ No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

☐ Yes; WPCP required, skip 4 ☐ No; next question

4. Does the project only include the following Permit types listed below?

- Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
- Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
- Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.

☐ Yes; no document required

Check one of the boxes below, and continue to PART B:

☒ If you checked "Yes" for question 1, **a SWPPP is REQUIRED. Continue to PART B**

☐ If you checked "No" for question 1, and checked "Yes" for question 2 or 3, **a WPCP is REQUIRED.** If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

☐ If you checked "No" for all questions 1-3, and checked "Yes" for question 4 PART B **does not apply and no document is required. Continue to Section 2.**

---

[1] More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/index.shtml

Printed on recycled paper. Visit our web site at www.sandiego.gov/development-services.
Upon request, this information is available in alternative formats for persons with disabilities.

PART B: Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ☐ **ASBS**
   a. Projects located in the ASBS watershed.

2. ☐ **High Priority**
   a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.
   b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☒ **Medium Priority**
   a. Projects 1 acre or more but not subject to an ASBS or high priority designation.
   b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☐ **Low Priority**
   a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water? ☐ Yes ☒ No

2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces? ☐ Yes ☒ No

3. Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair). ☐ Yes ☒ No

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was checked for all questions in Part D, continue to Part E.

1. **Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:**
   - **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
   - **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
   - **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

   ☐ Yes; PDP exempt requirements apply ☒ No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

   ☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Development Project".

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☒ Yes ☐ No
2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ☐ Yes ☒ No
3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. ☐ Yes ☒ No
4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ☐ Yes ☒ No
5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ☐ Yes ☒ No
6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ☒ Yes ☐ No

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ☐ Yes ☒ No

8. **New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ☐ Yes ☒ No

9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. ☐ Yes ☒ No

10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. ☐ Yes ☒ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS.** ☐
2. The project is a **STANDARD DEVELOPMENT PROJECT.** Site design and source control BMP requirements apply. See the <u>Storm Water Standards Manual</u> for guidance. ☐
3. The project is **PDP EXEMPT.** Site design and source control BMP requirements apply. See the <u>Storm Water Standards Manual</u> for guidance. ☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT.** Site design, source control, and structural pollutant control BMP requirements apply. See the <u>Storm Water Standards Manual</u> for guidance on determining if project requires a hydromodification plan management ☒

Allen L. Butcher, PE
Name of Owner or Agent *(Please Print)*

Project Engineer, SB&O, Inc
Title

Signature

06/05/2017
Date

<table>
<tr><td colspan="2">Applicability of Permanent, Post-Construction Storm Water BMP Requirements
(Storm Water Intake Form for all Development Permit Applications)</td><td>Form I-1</td></tr>
<tr><td colspan="3">Project Identification</td></tr>
<tr><td colspan="3">Project Name: Candlelight</td></tr>
<tr><td colspan="2">Permit Application Number: 40329</td><td>Date: 12/4/2017</td></tr>
<tr><td colspan="3">Determination of Requirements</td></tr>
<tr><td colspan="3">The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short <u>summary</u> of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.

Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop".
Refer to Part 1 of Storm Water Standards sections and/or separate forms referenced in each step below.</td></tr>
<tr><td>Step</td><td>Answer</td><td>Progression</td></tr>
<tr><td rowspan="2">Step 1: Is the project a "development project"? See Section 1.3 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.</td><td>● Yes</td><td>Go to Step 2.</td></tr>
<tr><td>○ No</td><td>Stop.
Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.</td></tr>
<tr><td colspan="3">Discussion / justification if the project is <u>not</u> a "development project" (e.g., the project includes <u>only</u> interior remodels within an existing building):
Click or tap here to enter text.</td></tr>
<tr><td rowspan="3">Step 2: Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions?
To answer this item, see Section 1.4 of the BMP Design Manual (Part 1 of Storm Water Standards) <u>in its entirety</u> for guidance, AND complete Storm Water Requirements Applicability Checklist.</td><td>○ Standard Project</td><td>Stop.
Standard Project requirements apply.</td></tr>
<tr><td>● PDP</td><td>PDP requirements apply, including PDP SWQMP.
Go to Step 3.</td></tr>
<tr><td>○ PDP Exempt</td><td>Stop.
Standard Project requirements apply. Provide discussion and list any additional requirements below.</td></tr>
</table>

Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable: Click or tap here to enter text.

<table>
<tr><th colspan="3">Form I-1 Page 2</th></tr>
<tr><th>Step</th><th>Answer</th><th>Progression</th></tr>
<tr><td rowspan="2">Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval?
See Section 1.10 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.</td><td>○ Yes</td><td>Consult the City Engineer to determine requirements.
Provide discussion and identify requirements below.
Go to Step 4.</td></tr>
<tr><td>● No</td><td>BMP Design Manual PDP requirements apply.
Go to Step 4.</td></tr>
<tr><td colspan="3">Discussion / justification of prior lawful approval, and identify requirements (<u>not required if prior lawful approval does not apply</u>):
Click or tap here to enter text.</td></tr>
<tr><td rowspan="2">Step 4. Do hydromodification control requirements apply?
See Section 1.6 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.</td><td>● Yes</td><td>PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6).
Go to Step 5.</td></tr>
<tr><td>○ No</td><td>Stop.
PDP structural BMPs required for pollutant control (Chapter 5) only.
Provide brief discussion of exemption to hydromodification control below.</td></tr>
<tr><td colspan="3">Discussion / justification if hydromodification control requirements do <u>not</u> apply:
Click or tap here to enter text.</td></tr>
<tr><td rowspan="2">Step 5. Does protection of critical coarse sediment yield areas apply?
See Section 6.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.</td><td>○ Yes</td><td>Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2).
Stop.</td></tr>
<tr><td>● No</td><td>Management measures not required for protection of critical coarse sediment yield areas.
Provide brief discussion below.
Stop.</td></tr>
</table>

Discussion / justification if protection of critical coarse sediment yield areas does not apply:
The project development is not located within the potential Critical Coarse Sediment Yield Area. The available mapping is incorrect based upon the existing topographic mapping, and the presence of the large earth berm (4'+ tall) and earth swale along the northerly boundary. The available CCSYA limits are shown on Attachment 2A, but should be shifted to the canyons located east of the mapped areas. Impacts to these canyons are being avoided.

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Candlelight
Project Address	Caliente Road (South of Airway)
Assessor's Parcel Number(s) (APN(s))	645-060-32, 35, 38; 645-080-08,
Permit Application Number	Project # 40329
Project Watershed	Select One: ○ San Dieguito River ○ Penasquitos ○ Mission Bay ○ San Diego River ○ San Diego Bay ● Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Water Tanks 911.12
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-	44.45 Acres ([SQFT] Square Feet)
Area to be disturbed by the project (Project Footprint)	24.49 Acres (1,067,077 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	17.63 Acres (768,125 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	6.86 Acres (298,952 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition.	+1,000 %

Project Name: Candlelight

Form I-3B Page 2 of 11

Description of Existing Site Condition and Drainage Patterns

Current Status of the Site (select all that apply):
☐ Existing development
☐ Previously graded but not built out
☐ Agricultural or other non-impervious use
■ Vacant, undeveloped/natural
Description / Additional Information:

Site has some prior disturbance. Disturbance has resulted in an earth berm and swale along the northeast boundary, and earth berms and swales near the west limits of Lot 1.

Existing Land Cover Includes (select all that apply):
■ Vegetative Cover
■ Non-Vegetated Pervious Areas
☐ Impervious Areas
Description / Additional Information:

Impervious Area includes paving along Smythe Avenue and drainage ditches.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):
☐ NRCS Type A
☐ NRCS Type B
☐ NRCS Type C
■ NRCS Type D

Approximate Depth to Groundwater (GW):
○ GW Depth < 5 feet
○ 5 feet < GW Depth < 10 feet
○ 10 feet < GW Depth < 20 feet
● GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):
■ Watercourses
☐ Seeps
☐ Springs
☐ Wetlands
☐ None
Description / Additional Information:

Finger canyons network located west, south and east of the development envelope

Form I-3B Page 3 of 11
Description of Existing Site Topography and Drainage:
How is storm water runoff conveyed from the site? At a minimum, this description should answer: 1. Whether existing drainage conveyance is natural or urban; 2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site; 3. Provide details regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels; 4. Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.
Description / Additional Information:

Existing drainage conveyance is natural and poorly defined; mild mesas with canyons along the east and west boundaries.

Runoff from offsite areas occurs along the northern boundary. The far west includes a natural canyon, which will be part of the Lot 4 preserve, and maintain flows through the site. The northwest includes an existing storm drain discharge from the High School site, which will be extended via bypass storm drain through the site. The existing Caliente Avenue improvements (north-central) and discharge from the adjacent Southview (Lot 2) development will also be extended to the southerly boundary in the bypass storm drain.

The northern limits of the site (east of Caliente Ave) includes a large earth berm with earth swale to direct offsite runoff to the eastern portion the of the site. A depression at a low point in the berm allows surface runoff to enter the site. Runoff from the adjacent developments (Southview and Southview East parcels located south of Caliente) discharge to this location (after treatment, hydromodification management and attenuation). Flows in the most easterly canyon will continue through the site.

The existing site does not include any storm drain systems. The existing earth swale and berm along the north boundary (described above) is the only drainage facility.

Runoff from the site discharges at multiple locations. Runoff is primarily overland flows to the southerly boundary. Flows are directed southwesterly, southerly and southeasterly with finger canyon along the east, south and west margins of the property. There are no downstream storm drain systems or drainage facilities.

The drainage areas and flows are further detailed in the Drainage Study Addendum in Attachment 5.

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:
“Candlelight” will be a multi-family residential project, split east-west of the extension of Caliente Avenue. Several attached product types with surface parking are expected to be constructed (ranging from 70% to 75% imperviousness). The project proposes to maintain the general north to south drainage pattern.

The project proposes multiple biofiltration basins for treatment, followed by subsurface hydromodification tanks. Detention of larger storms will be required (Otay Mesa drainage basin). Runoff from Lots 1 & 2 (plus adjacent streets) will be directed to a detention basin (West) located at the southwestern limits of the development. A second detention basin will be located at the eastern limits (East) to attenuate runoff from Lot 3 plus the adjacent street.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):
Impervious surfaces including public and private street paving, sidewalk, walks, driveways, parking spaces, building roofs, patios/porches

---

List/describe proposed pervious features of the project (e.g., landscape areas):
Landscaped cut and fill slopes, yard areas, recreational areas, and areas adjacent to walkways/sidewalks. The surface of the trail along the southerly and easterly boundary of Lot 3, and ground above the West detention basin will a pervious pavement type (DG or crushed rock).

Does the project include grading and changes to site topography?

☒ Yes

☐ No

Description / Additional Information:
Grading will be required for the streets and Lots 1-3.

Form I-3B Page 5 of 11

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

● Yes

○ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural and constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Description / Additional Information:
The project will continue the general southerly drainage trend. There are no storm drain systems downstream of the site for connection. Runoff will be discharged to the existing canyons located southwest (at cul-de-sac near Lot 1 entry) and at the southeast limits of the development. A bypass storm drain will discharge at the southerly limits of Caliente extension.

The project storm drain system will intercept street runoff via curb inlets to be conveyed to the treatment and HMP facilities. A separate storm drain line is Street A will convey treated runoff to the West Detention basin.

See Project `Drainage Study in Attachment 5 for detailed calculations

Form I-3B Page 6 of 11

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

■ On-site storm drain inlets
☐ Interior floor drains and elevator shaft sump pumps
☐ Interior parking garages
☐ Need for future indoor & structural pest control
■ Landscape/Outdoor Pesticide Use
☐ Pools, spas, ponds, decorative fountains, and other water features
☐ Food service
■ Refuse areas
☐ Industrial processes
☐ Outdoor storage of equipment or materials
☐ Vehicle and Equipment Cleaning
☐ Vehicle/Equipment Repair and Maintenance
☐ Fuel Dispensing Areas
☐ Loading Docks
■ Fire Sprinkler Test Water
☐ Miscellaneous Drain or Wash Water
■ Plazas, sidewalks, and parking lots
☐ Large Trash Generating Facilities
☐ Animal Facilities
☐ Plant Nurseries and Garden Centers
☐ Automotive-related Uses

Description / Additional Information:
Click or tap here to enter text.

Project Name: Candlelight

Form I-3B Page 7 of 11
Identification and Narrative of Receiving Water
Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable) The discharge locations run overland to existing canyons, which trends southeasterly approximately 1.5 miles to the Mexico border, which then returns to the Unites States in the Tijuana River, to the Estuary and then the Pacific Ocean.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations. From the San Diego basin Plan, the existing beneficial uses are REC2, BIOL, WARM, WILD & RARE.
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations. None.
Provide distance from project outfall location to impaired or sensitive receiving waters. Project discharge is approximately 1.5 miles from the border, and approx. 2 miles to the Tijuana River.
Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands Vernal pools are located northeast of the development envelope. See project environmental documents for further details.

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs/ WQIP Highest Priority Pollutant
Tijuana River	Ind Bacteria, Eutrophic, Low	
	Dissolved Oxygen Pesticides,	
	Phosphorous, Trace Elements	
	Trash, Toxicity, Total N,	
	Organics, Surfactants, Solids	
	Selenium, Sediment/Silt	Sedimentation, Siltation
Tijuana River Estuary	Eutrophic …Turbidity	Turbidity
Pacific Ocean	Bacteria, Enter., Coliforms	N/A

Identification of Project Site Pollutants*

***Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs** (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)

Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see BMP Design Manual (Part 1 of Storm Water Standards) Appendix B.6):

Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment	○	○	●
Nutrients	○	○	●
Heavy Metals	○	○	●
Organic Compounds	○	○	●
Trash & Debris	○	○	●
Oxygen Demanding Substances	○	○	●
Oil & Grease	○	○	●
Bacteria & Viruses	○	○	●
Pesticides	○	○	●

Project Name: **Candlelight**

Form I-3B Page 9 of 11

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?

● Yes, hydromodification management flow control structural BMPs required.

☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):
Click or tap here to enter text.

Critical Coarse Sediment Yield Areas*

*This Section only required if hydromodification management requirements apply

Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint?

☐ Yes

● No, No critical coarse sediment yield areas to be protected based on WMAA maps

Discussion / Additional Information:
The nearest Potential CCSY Areas are near the western and eastern development limits. The easterly PCCSYA mapping is in error based upon the location of the existing earth berm along the northern boundary, and the earth channel located immediately south of the berm. The adjusted locations are the existing finger canyon approximately 300 feet southeast of the mapping.

Form I-3B Page 10 of 11

Flow Control for Post-Project Runoff*

*This Section only required if hydromodification management requirements apply

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

Each of the three lots includes a Biofiltration basins with underground HMP control storage vaults (cisterns). A fourth basin and vault will address street runoff only (Caliente extension and Street A). All 4 POCs will discharge to the canyons south of the project, which are tributary to the Tijuana River 911.12. POC comparisons will occur at the discharge locations of the HMP tanks. The pre-development areas are equal to the post-development areas.

West Discharge

POC-1 will be at the southwest corner of Lot 1 (Lot 1 runoff + portion Street A);
POC-4 will be located at the southeast corner of Lot 1 (Caliente + Street A).
POC-2 is the southwest corner of Lot 2 (Lot 2 only).

East Discharge

POC-3 will be at the east end of Lot 3 (Lot 3 + Portion Street A).

See DMA Exhibit in Attachment 1A for HMP facility locations.

Has a geomorphic assessment been performed for the receiving channel(s)?

● No, the low flow threshold is 0.1Q2 (default low flow threshold)
○ Yes, the result is the low flow threshold is 0.1Q2
○ Yes, the result is the low flow threshold is 0.3Q2
○ Yes, the result is the low flow threshold is 0.5Q2

If a geomorphic assessment has been performed, provide title, date, and preparer:
Click or tap here to enter text.

Discussion / Additional Information: (optional)
Click or tap here to enter text.

Form I-3B Page 11 of 11

Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

Primary constraints include Type "D" soils, lack of downstream storm drain or drainage systems, and the environmental areas in the finger canyons located at the western and eastern edges of the development.

Optional Additional Information or Continuation of Previous Sections As Needed

This space provided for additional information or continuation of information from previous sections as needed.

Click or tap here to enter text.

Project Name: **Candlelight**

Source Control BMP Checklist for All Development Projects

Form I-4

Source Control BMPs

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.

Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented: Click or tap here to enter text.			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented: Click or tap here to enter text.			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-3 not implemented: Click or tap here to enter text.			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented: Click or tap here to enter text.			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-5 not implemented: Click or tap here to enter text.			

Form I-4 Page 2 of 2	
Source Control Requirement	Applied?
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)	
On-site storm drain inlets	☒ Yes ☐ No ☐ N/A
Interior floor drains and elevator shaft sump pumps	☐ Yes ☐ No ☒ N/A
Interior parking garages	☐ Yes ☐ No ☒ N/A
Need for future indoor & structural pest control	☐ Yes ☐ No ☒ N/A
Landscape/Outdoor Pesticide Use	☒ Yes ☐ No ☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes ☐ No ☒ N/A
Food service	☐ Yes ☐ No ☒ N/A
Refuse areas	☒ Yes ☐ No ☐ N/A
Industrial processes	☐ Yes ☐ No ☒ N/A
Outdoor storage of equipment or materials	☐ Yes ☐ No ☒ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes ☐ No ☒ N/A
Fuel Dispensing Areas	☐ Yes ☐ No ☒ N/A
Loading Docks	☐ Yes ☐ No ☒ N/A
Fire Sprinkler Test Water	☒ Yes ☐ No ☐ N/A
Miscellaneous Drain or Wash Water	☐ Yes ☐ No ☒ N/A
Plazas, sidewalks, and parking lots	☒ Yes ☐ No ☐ N/A
SC-6A: Large Trash Generating Facilities	☐ Yes ☐ No ☒ N/A
SC-6B: Animal Facilities	☐ Yes ☐ No ☒ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes ☐ No ☒ N/A
SC-6D: Automotive-related Uses	☐ Yes ☐ No ☒ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above. Click or tap here to enter text.	

Project Name: **Candlelight**

Site Design BMP Checklist for All Development Projects	Form I-5

Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

A site map with implemented site design BMPs must be included at the end of this checklist.

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☑ Yes	☐ No	☐ N/A
Discussion / justification if SD-1 not implemented:			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☑ Yes	☐ No	☐ N/A
1-2 Are street trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
1-3 Implemented street trees meet the design criteria in SD-1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☑ N/A
1-4 Is street tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
SD-2 Have natural areas, soils and vegetation been conserved?	☑ Yes	☐ No	☐ N/A

Discussion / justification if SD-2 not implemented:
Natural canyons and environmentally sensitive areas are conserved and/or mitigated.

Form I-5 Page 2 of 4

Site Design Requirement	Applied?		
SD-3 Minimize Impervious Area	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented: The use of private drives with one sided sidewalk, attached residential buildings with 2-story construction reduces the amount of impervious area.			
SD-4 Minimize Soil Compaction	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-4 not implemented: The development of the site will require soil compaction. The type "D" soils limit the opportunity for infiltration. The proposed biofiltration basins will include imported soil media with limited compaction.			
SD-5 Impervious Area Dispersion	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-5 not implemented: The proposed landscaped yard areas are not large enough to provide dispersion of roof runoff.			
5-1 Is the pervious area receiving run-on from impervious area identified on the site map?	☐ Yes	☒ No	
5-2 Does the pervious area satisfy the design criteria in SD-5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☒ No	
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and SD-5 Fact Sheet in Appendix E?	☐ Yes	☒ No	

Project Name: **Candlelight**

Form I-5 Page 3 of 4			
Site Design Requirement	Applied?		
SD-6 Runoff Collection	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-6 not implemented: Green Roofs and Permeable Pavement were not selected. The trail along the southerly boundary of Lot 3 and the ground above the West Detention area will have permeable surface for foot and vehicle traffic.			
6a-1 Are green roofs implemented in accordance with design criteria in SD-6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☒ N/A
6a-2 Is green roof credit volume calculated using Appendix B.2.1.2 and SD-6A Fact Sheet in Appendix E?	☐ Yes	☐ No	☒ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in SD-6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☒ N/A
6b-2 Is permeable pavement credit volume calculated using Appendix B.2.1.3 and SD-6B Fact Sheet in Appendix E?	☐ Yes	☐ No	☒ N/A
SD-7 Landscaping with Native or Drought Tolerant Species	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-7 not implemented: Landscape selection includes native and/or drought tolerant species.			
SD-8 Harvesting and Using Precipitation	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-8 not implemented: Harvest and Re-Use is not warranted. Rain barrels are not implemented - See Form I-7.			
8-1 Are rain barrels implemented in accordance with design criteria in SD-8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☒ N/A
8-2 Is rain barrel credit volume calculated using Appendix B.2.2.2 and SD-8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☒ N/A

Project Name: **Candlelight**

Form I-5 Page 4 of 4
Insert Site Map with all site design BMPs identified:
See DMA Exhibit – Attachment 1A.

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Summary of PDP Structural BMPs	Form I-6
PDP Structural BMPs	
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s). PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual). Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).	

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The Type "D" soils indicate that full infiltration is infeasible. Remedial grading operations are expected to provide some level of infiltration (TBD during final design). The Biofiltration (PR-1) basins have been sized to provide a treatment area equal to 3% of the adjusted impervious area.

In order to allow for construction phasing, each of the 3 development lots will be responsible to provide treatment and HMP controls for site runoff. A fourth treatment basin (Biofiltration #4) and HMP control vault (HMP#4) will be provided on Lot 1 to address runoff from the Caliente Avenue extension and Street "A" partial improvements (including the pavement located south of the boundary).

The north central part of the subdivision boundary includes a portion of Caliente Avenue that has already been constructed and dedicated. Two curb inlets to be located at the current pavement limits will convey runoff along with runoff from the adjacent San Ysidro High School, and the "Southview / Vista Del Sur" development. Runoff in the bypass storm drain will discharge at the southerly limits of Street "A". The remaining portion of the Caliente Avenue improvements to be constructed (including pavement located south of the project boundary) will be included in the design for Biofiltration #4 / HMP #4 and the West detention facility.

The project is subject to the Otay Mesa runoff control / detention policy. The site topography, existing canyons, and the extension of the public street improvements results in the need to provide two structural detention facilities systems located at the southwest (Lot 1) and southeast (Lot 3) limits of development. The West detention facility will control runoff from Lot 1, Caliente Avenue extension, Street A and Lot 2. The East detention facility will provide mitigation for Lot 3, and the east limits of Street A..

Lot 4 & Lot 5 will be open space lots and will preserve the existing soil and vegetation and will be self-mitigating. The trail (Lot 3) and the West Detention basin (Lot 1) will have permeable paving surfaces and be self-retaining. Any exterior slopes along the development limits will include soil amendment to be self-mitigating.

Biofiltration basins 1, 2 & 3 have tributary areas greater than 5 acres (7 to 8.5 acres). These basins have the following features to minimize the potential for short circuiting or bypass of treatment.

1. Flows entering the basins will occur at multiple locations, with energy dissipaters
2. Basins have shallow depth, with level bottoms.
3. Surface area is greater than minimum 3% of the adjusted impervious area.
4. Overflow is to the underground HMP storage facility.

Form I-6 Page 2 of 20
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from page 1) Click or tap here to enter text.

Project Name: **Candlelight**

Form I-6 Page 3 of 20

Structural BMP Summary Information

Structural BMP ID No. **BIO 1**

Construction Plan Sheet No. N/A

Type of structural BMP:

○ Retention by harvest and use (HU-1)

○ Retention by infiltration basin (INF-1)

○ Retention by bioretention (INF-2)

○ Retention by permeable pavement (INF-3)

☒ Partial retention by biofiltration with partial retention (PR-1)

● Biofiltration (BF-1)

○ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)

○ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

○ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion

○ Detention pond or vault for hydromodification management

○ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only

○ Hydromodification control only

○ Combined pollutant control and hydromodification control

○ Pre-treatment/forebay for another structural BMP

○ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Engineer of Work
Who will be the final owner of this BMP?	Project HOA
Who will maintain this BMP into perpetuity?	Project HOA
What is the funding mechanism for maintenance?	HOA monthly association fees.

Project Name: Candlelight

Form I-6 Page 4 of 20

Structural BMP ID No. **BIO 1**

Construction Plan Sheet No. N/A

Discussion (as needed):
Treatment for Lot 1 runoff, portions of Street A and west cul-de-sac
Discharges to **HMP 1**

Project Name: Candlelight

Form I-6 Page 5 of 20

Structural BMP Summary Information

Structural BMP ID No. **HMP 1**

Construction Plan Sheet No. N/A

Type of structural BMP:

☐ Retention by harvest and use (HU-1)

☐ Retention by infiltration basin (INF-1)

☐ Retention by bioretention (INF-2)

☐ Retention by permeable pavement (INF-3)

☐ Partial retention by biofiltration with partial retention (PR-1)

☐ Biofiltration (BF-1)

☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)

☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion

☒ Detention pond or vault for hydromodification management

☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only

☒ Hydromodification control only

☐ Combined pollutant control and hydromodification control

☐ Pre-treatment/forebay for another structural BMP

☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Engineer of Work
Who will be the final owner of this BMP?	Project HOA
Who will maintain this BMP into perpetuity?	Project HOA
What is the funding mechanism for maintenance?	HOA monthly association fees.

Project Name: **Candlelight**

Form I-6 Page 6 of 20
Structural BMP ID No. **HMP 1**
Construction Plan Sheet No. N/A
Discussion (as needed): HMP control for Lot 1 runoff, street and west cul-de-sac of Street A. **Discharges to Detention West**

Form I-6 Page 7 of 20

Structural BMP Summary Information

Structural BMP ID No. **BIO 2**

Construction Plan Sheet No. N/A

Type of structural BMP:

☐ Retention by harvest and use (HU-1)

☐ Retention by infiltration basin (INF-1)

☐ Retention by bioretention (INF-2)

☐ Retention by permeable pavement (INF-3)

☒ Partial retention by biofiltration with partial retention (PR-1)

☐ Biofiltration (BF-1)

☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)

☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion

☐ Detention pond or vault for hydromodification management

☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only

☐ Hydromodification control only

☐ Combined pollutant control and hydromodification control

☐ Pre-treatment/forebay for another structural BMP

☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Engineer of Work
Who will be the final owner of this BMP?	Project HOA
Who will maintain this BMP into perpetuity?	Project HOA
What is the funding mechanism for maintenance?	HOA monthly association fees.

Project Name: **Candlelight**

Form I-6 Page 8 of 20
Structural BMP ID No. **BIO 2**
Construction Plan Sheet No. N/A
Discussion (as needed): Treatment for Lot 2 runoff. Discharges to **HMP 2**

Form I-6 Page 9 of 20

Structural BMP Summary Information

Structural BMP ID No. **HMP 2**

Construction Plan Sheet No. N/A

Type of structural BMP:

☐ Retention by harvest and use (HU-1)

☐ Retention by infiltration basin (INF-1)

☐ Retention by bioretention (INF-2)

☐ Retention by permeable pavement (INF-3)

☐ Partial retention by biofiltration with partial retention (PR-1)

☐ Biofiltration (BF-1)

☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)

☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion

☒ Detention pond or vault for hydromodification management

☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only

☒ Hydromodification control only

☐ Combined pollutant control and hydromodification control

☐ Pre-treatment/forebay for another structural BMP

☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Engineer of Work
Who will be the final owner of this BMP?	Project HOA
Who will maintain this BMP into perpetuity?	Project HOA
What is the funding mechanism for maintenance?	HOA monthly association fees.

Form I-6 Page 10 of 20
Structural BMP ID No. **HMP 2**
Construction Plan Sheet No. N/A
Discussion (as needed): HMP control for Lot 2 runoff. **Discharges to Detention West**

Form I-6 Page 11 of 20

Structural BMP Summary Information

Structural BMP ID No. **BIO 3**

Construction Plan Sheet No. N/A

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☐ Retention by permeable pavement (INF-3)
☒ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☒ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Engineer of Work
Who will be the final owner of this BMP?	Project HOA
Who will maintain this BMP into perpetuity?	Project HOA
What is the funding mechanism for maintenance?	HOA monthly association fees.

Form I-6 Page 12 of 20
Structural BMP ID No. **BIO 3**
Construction Plan Sheet No. N/A
Discussion (as needed): Treatment for Lot 3 runoff, and east cul-de-sac of Street A. Discharges to **HMP 3 / Detention East**

Form I-6 Page 13 of 20

Structural BMP Summary Information

Structural BMP ID No. **HMP 3** / Detention East

Construction Plan Sheet No. N/A

Type of structural BMP:

☐ Retention by harvest and use (HU-1)

☐ Retention by infiltration basin (INF-1)

☐ Retention by bioretention (INF-2)

☐ Retention by permeable pavement (INF-3)

☐ Partial retention by biofiltration with partial retention (PR-1)

☐ Biofiltration (BF-1)

☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)

☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion

☒ Detention pond or vault for hydromodification management

☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only

☐ Hydromodification control only

☐ Combined pollutant control and hydromodification control

☐ Pre-treatment/forebay for another structural BMP

☒ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Engineer of Work
Who will be the final owner of this BMP?	Project HOA
Who will maintain this BMP into perpetuity?	Project HOA
What is the funding mechanism for maintenance?	HOA monthly association fees.

Project Name: **Candlelight**

Form I-6 Page 14 of 20
Structural BMP ID No. **HMP 3 / Detention East**
Construction Plan Sheet No. N/A
Discussion (as needed): HMP control for Lot 3 runoff, and east cul-de-sac of Street A. **This joint facility provides both HMP control and attenuation of larger storms.**

Project Name: Candlelight

Form I-6 Page 15 of 20
Structural BMP Summary Information
Structural BMP ID No. **BIO 4**
Construction Plan Sheet No. N/A
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☒ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below) ☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)
Purpose: ☒ Pollutant control only ☐ Hydromodification control only ☐ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Engineer of Work
Who will be the final owner of this BMP?	Project HOA
Who will maintain this BMP into perpetuity?	Project HOA
What is the funding mechanism for maintenance?	HOA monthly association fees.

Form I-6 Page 16 of 20
Structural BMP ID No. **BIO 4**
Construction Plan Sheet No. N/A
Discussion (as needed): Treatment for Caliente Ave extension and portions of Street A. Discharges to **HMP 4**

Project Name: Candlelight

Form I-6 Page 17 of 20

Structural BMP Summary Information

Structural BMP ID No. **HMP 4**

Construction Plan Sheet No. N/A

Type of structural BMP:

☐ Retention by harvest and use (HU-1)

☐ Retention by infiltration basin (INF-1)

☐ Retention by bioretention (INF-2)

☐ Retention by permeable pavement (INF-3)

☐ Partial retention by biofiltration with partial retention (PR-1)

☐ Biofiltration (BF-1)

☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)

☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion

☒ Detention pond or vault for hydromodification management

☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only

☒ Hydromodification control only

☐ Combined pollutant control and hydromodification control

☐ Pre-treatment/forebay for another structural BMP

☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Engineer of Work
Who will be the final owner of this BMP?	Project HOA
Who will maintain this BMP into perpetuity?	Project HOA
What is the funding mechanism for maintenance?	HOA monthly association fees.

Form I-6 Page 18 of 20
Structural BMP ID No. **HMP 4**
Construction Plan Sheet No. N/A
Discussion (as needed): HMP control for Caliente Ave extension and portions of Street A. **Discharges to Detention West**

Form I-6 Page 19 of 20

Structural BMP Summary Information

Structural BMP ID No. **Detention West**

Construction Plan Sheet No. N/A

Type of structural BMP:

☐ Retention by harvest and use (HU-1)

☐ Retention by infiltration basin (INF-1)

☐ Retention by bioretention (INF-2)

☐ Retention by permeable pavement (INF-3)

☐ Partial retention by biofiltration with partial retention (PR-1)

☐ Biofiltration (BF-1)

☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)

☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion

☐ Detention pond or vault for hydromodification management

☒ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only

☐ Hydromodification control only

☐ Combined pollutant control and hydromodification control

☐ Pre-treatment/forebay for another structural BMP

☒ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	Engineer of Work
Who will be the final owner of this BMP?	Project HOA
Who will maintain this BMP into perpetuity?	Project HOA
What is the funding mechanism for maintenance?	HOA monthly association fees.

Form I-6 Page 20 of 20
Structural BMP ID No. **Detention West**
Construction Plan Sheet No. N/A
Discussion (as needed): Detention for Lots 1 & 2 plus Caliente and portions of Street A. Receives flows from HMP 1, HMP 2 & HMP 4.

City of San Diego
Development Services
1222 First Ave., MD-302
San Diego, CA 92101
(619) 446-5000

Permanent BMP Construction

Self Certification Form

FORM
DS-563
January 2016

Date Prepared: Click here to enter text.

Project No.: Click here to enter text.

Project Applicant: Click here to enter text.

Phone: Click here to enter text.

Project Address: Click here to enter text.

Project Engineer: Click here to enter text.

Phone: Click here to enter text.

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

CERTIFICATION:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and structural BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 of the San Diego Regional Water Quality Control Board.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: ______________________________

Date of Signature: _ Insert Date__

Printed Name: _Click here to enter text._

Title: _Click here to enter text._

Phone No. _Click here to enter text._

Engineer's Stamp

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ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

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Project Name: **Candlelight**

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	■ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	○ Included on DMA Exhibit in Attachment 1a ◉ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	◉ Included ○ Not included because the entire project will use infiltration BMPs
Attachment 1d	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	◉ Included ○ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	■ Included

Project Name: **Candlelight**

Use this checklist to ensure the required information has been included on the DMA Exhibit:

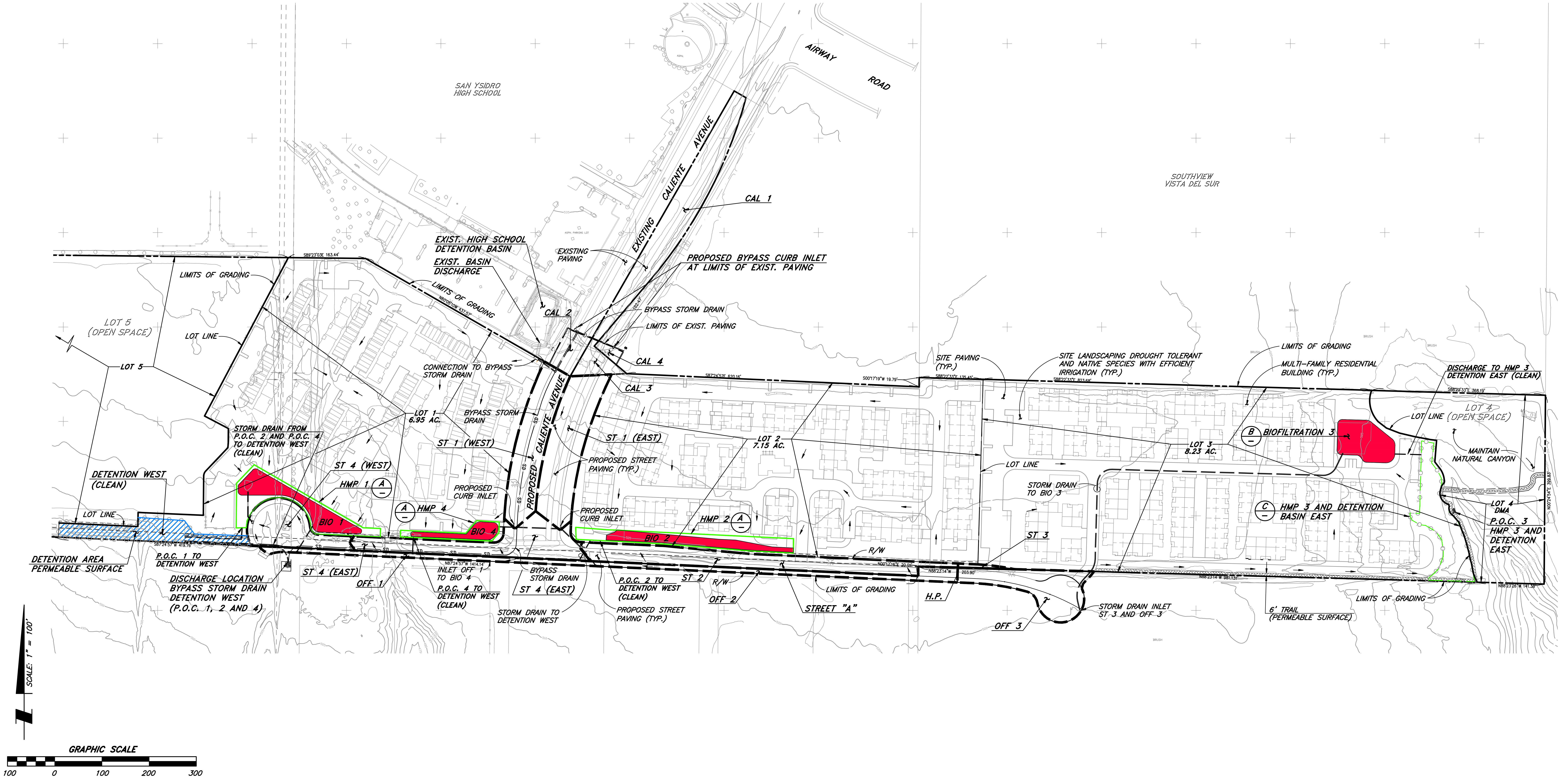
The DMA Exhibit must identify:

☐ Underlying hydrologic soil group
☐ Approximate depth to groundwater
☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☐ Critical coarse sediment yield areas to be protected
☐ Existing topography and impervious areas
☐ Existing and proposed site drainage network and connections to drainage offsite
☐ Proposed grading
☐ Proposed impervious features
☐ Proposed design features and surface treatments used to minimize imperviousness
☐ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☐ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
☐ Structural BMPs (identify location, type of BMP, and size/detail)

SHEET 9 OF 9 SHEETS

PROJECT NO. 40329

CANDLELIGHT



LEGEND

━━━━	SUBDIVISION BOUNDARY
—— SD ——	BYPASS STORM DRAIN
═ ═ ═ ═□	PROPOSED STORM DRAIN
← ← ←	DIRECTION OF DRAINAGE
— — — —	DETENTION (VAULT)
— — — —	HMP (VAULT)
—○—○—○—	BIOFILTRATION BASIN
⌒ 395 ⌒	EXISTING CONTOUR
🟥	BIOFILTRATION (PARTIAL RETENTION) BASIN
▭	UNDERGROUND HMP STORAGE
⬚	UNDERGROUND HMP/DETENTION STORAGE
▨	UNDERGROUND DETENTION STORAGE
▩	6' TRAIL (PERMEABLE SURFACE)

DMA SUMMARY

UNDERLYING HYDROLOGIC SOILS GROUP:	TYPE "D"
APPROXIMATE DEPTH TO GROUNDWATER:	GREATER THAN 15 FEET
EXISTING NATURAL HYDROLOGIC FEATURES:	CANYONS
POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS:	N/A
EXISTING TOPOGRAPHY:	EXISTING CONTOURS SHOWN
EXISTING IMPERVIOUS AREAS:	SEE EXISTING DRAINAGE MAP IN SWQMP ATTACHMENT 5
EXISTING DRAINAGE SYSTEM:	STORM DRAIN OUTFALLS FROM HIGH SCHOOL
PROPOSED DRAINAGE SYSTEM:	STORM DRAIN SHOWN
PROPOSED GRADING:	LIMITS SHOWN
PROPOSED IMPERVIOUS SURFACES:	AS LABELED
DMA AREAS:	SEE DMA SUMMARY IN SWQMP ATTACHMENT 2B
POLLUTANT SOURCES:	PAVEMENT AND LANDSCAPE AREAS
STRUCTURAL SOURCE CONTROL:	SEE BELOW
INLET SIGNAGE:	YES
TRASH ENCLOSURE CONTROLS:	PROVIDED
PET WASTE RECEPTACLE:	YES
TREATMENT BMP:	BIOFILTRATION BASINS 1–4
HYDROMODIFICATION CONTROL:	HMP STORAGE STRUCTURE HMP 1–4
DETENTION:	EAST AND WEST

WEST PORTION OF SITE

TO BIOFILTRATION 4

DMA	TREATMENT
OFF 2	DRAINS TO BIOFILTRATION 4
ST 2	DRAINS TO BIOFILTRATION 4
CAL 3	DRAINS TO BIOFILTRATION 4
CAL 4	DRAINS TO BIOFILTRATION 4
ST 1 EAST	DRAINS TO BIOFILTRATION 4
CAL 2	DRAINS TO BIOFILTRATION 4
ST 1 WEST	DRAINS TO BIOFILTRATION 4
TO HMP 4 TO DETENTIONING	

TO BIOFILTRATION 1

DMA	TREATMENT
ST 4 EAST	DRAINS TO BIOFILTRATION 1
OFF 1	DRAINS TO BIOFILTRATION 1
ST 4 WEST	DRAINS TO BIOFILTRATION 1
LOT 1	DRAINS TO BIOFILTRATION 1
TO HMP 1 TO DETENTION WEST	

TO BIOFILTRATION 2

DMA	TREATMENT
LOT 2	DRAINS TO BIOFILTRATION 2 THEN TO HMP 2 TO DETENTION WEST

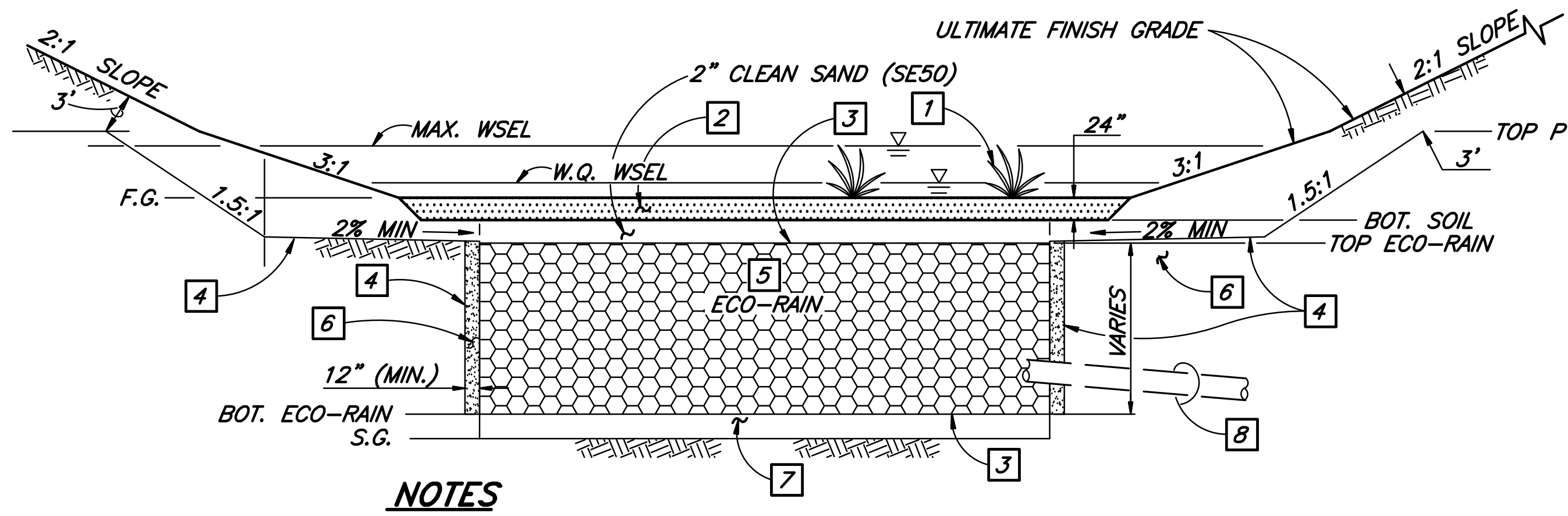
EAST PORTION OF SITE

DMA	TREATMENT/TYPE
ST 3	DRAINS TO BIOFILTRATION 3
OFF 3	DRAINS TO BIOFILTRATION 3
LOT 3	DRAINS TO BIOFILTRATION 3
TO BIOFILTRATION 3	TO HMP 3/DETENTION EAST

REMAINDER AREAS

DMA	TREATMENT/TYPE
DETENTION WEST/ACCESS – SELF RETAINING	
TRAIL (LOT 3)	SELF RETAINING
LOT 4	OPEN SPACE – SELF MITIGATING
LOT 5	OPEN SPACE – SELF MITIGATING
CAL 1 EXIST. STREET BYPASS STORM DRAIN (NOT A PART)	

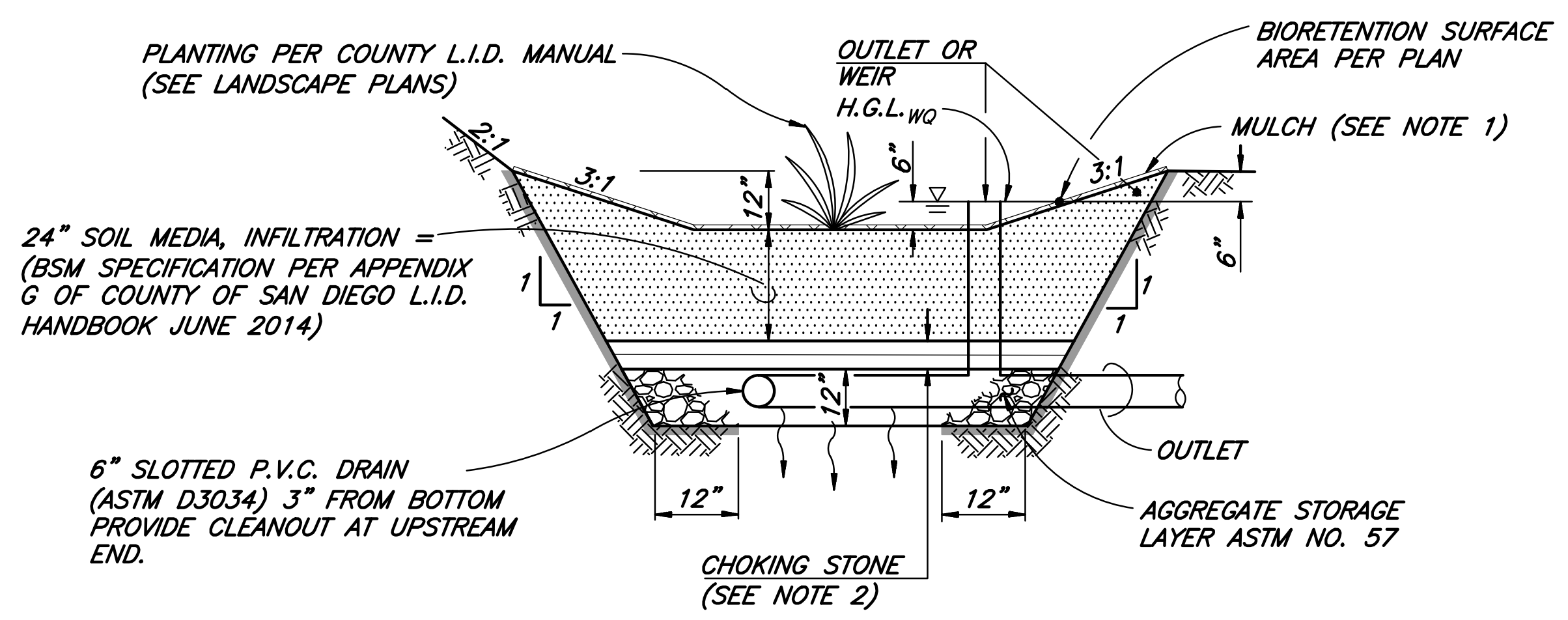
SWQMP ATTACHMENT 1A AND 2A



NOTES

1. PLANTING PALETTE PER COUNTY L.I.D. MANUAL (SEE LANDSCAPE CONSTRUCTION DRAWINGS.
2. 24" SOIL MEDIA (BSM SPECIFICATION PER APPENDIX G OF COUNTY OF SAN DIEGO L.I.D. HANDBOOK JUNE 2014)
3. "ECORAIN" STORAGE SYSTEM SHALL BE FULLY WRAPPED WITH PERMEABLE GEOFABRIC MIRAFI 140N, PER MANUFACTURER'S RECOMMENDATIONS.
4. 30 MIL. P.V.C. LINER SHALL BE FULLY WATER-TIGHT. ALL JOINTS SHALL OVERLAP 12" MIN. AND BE SEALED. LINER SHALL BE SEALED WITH MASTIC TO ALL STRUCTURES. ALL PENETRATIONS SHALL BE SEALED. INSTALL ON SIDES ONLY. BOTTOM SHALL BE UNLINED.
5. "ECO-RAIN" SPACE STORAGE SYSTEM. INSTALL PER MANUFACTURE'S SPECIFICATIONS AND GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.
6. BACKFILL WITH CLEAN SAND OR GRAVEL MATERIALS OR A MIX OF BOTH, FREE FROM LUMPS AND DEBRIS OR SHARP MATERIALS. COMPACT FILL IN LIFTS LESS THAN 12 INCHES TO 85% COMPACTION. SEE MANUFACTURER'S RECOMMENDATIONS.
7. BEDDING PER MANUFACTURER'S RECOMMENDATIONS
8. TO OUTLET CONTROL STRUCTURE.

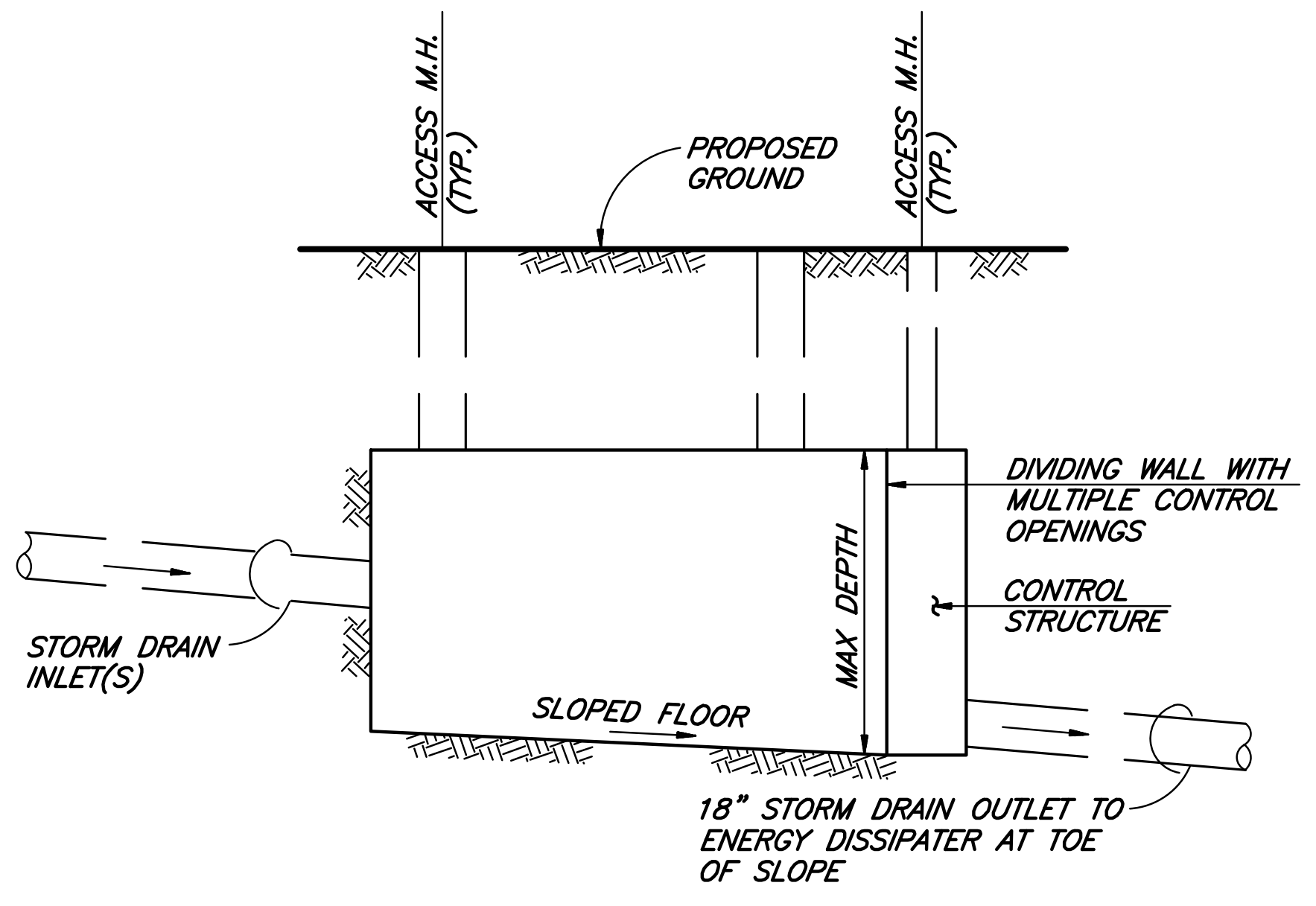
A/– COMPOSITE BASIN 1, 2 & 4
NOT TO SCALE



NOTES

1. INSTALL 3" WELL AGED SHREDDED HARDWOOD MULCH THAT HAS BEEN STOCKED PILED OR STORED FOR AT LEAST 12 MONTHS. MULCH MUST BE NON-FLOATING.
2. CHOKING STONE TO BE 3" CLEAN AND WASHED SAND (ASTM NO. 33) OVER 3" LAYER OF ASTM NO. 8 STONE.

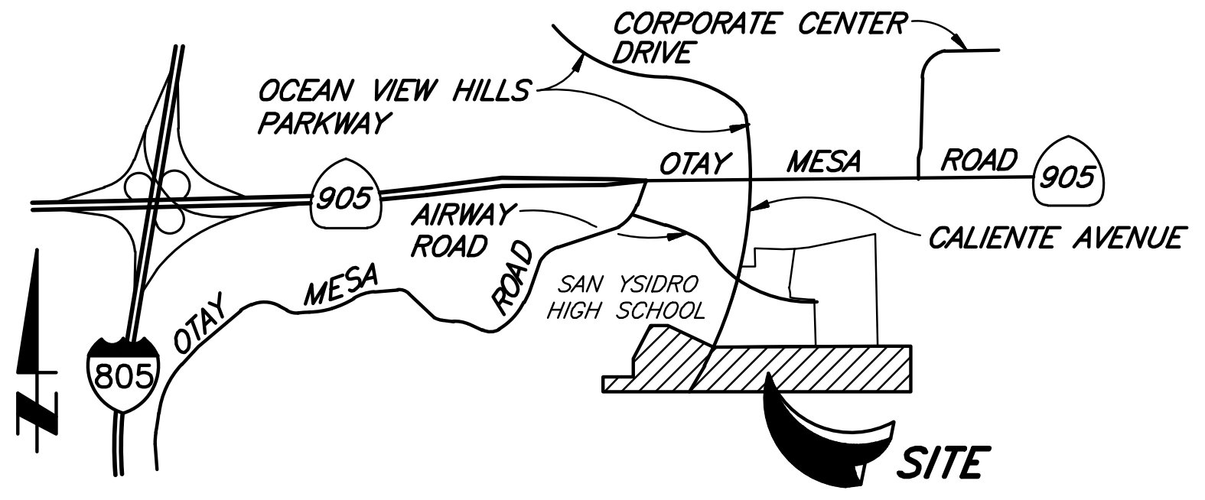
B/– DETAIL ~ BIOFILTRATION BASIN 3
NOT TO SCALE



DETENTION SCHEDULE

STRUCTURE	DETENTION VOLUME (C.F.)	MAX DEPTH (FT.)	HMP VOLUME (C.F.)	HMP DEPTH
EAST	78,000	5.6	76,354	5.5
WEST	82,000	6.0	NONE	N/A

C/– DETAIL ~ UNDERGROUND HMP/DETENTION STRUCTURE
NOT TO SCALE



VICINITY MAP

NOT TO SCALE
THOMAS BROTHERS PG. 1351, GRID A-2
2006 EDITION

DMA AND HMP EXHIBIT FOR:
CANDLELIGHT

REGISTERED PROFESSIONAL ENGINEER
ALLEN L. BUTCHER
No. 47107
Exp. 12-31-17
CIVIL
STATE OF CALIFORNIA

SB&O INC.
PLANNING ENGINEERING SURVEYING
3990 Ruffin Road, Suite 120
San Diego, Ca. 92123
858-560-1141
858-560-8157 Fax

ALLEN L. BUTCHER DATE

FILE NAME: D:\69902 CANDLELIGHT WQ CONSULT\03 DWG\DX\69902DX05-DMA-HMP.DWG, PLOTTED BY: TONY PORCIONCULA ON 12/1/2017 10:52 AM

12-1-17

69902DX05-DMA-HMP.DWG

69900.66

Project Name **Candlelight**

Attachment 1B
DMA Summary

West Portion of Site

DMA	Treatment	Imper (%)	Imperv (sf)	Pervious (sf)	Total (sf)	Total (ac)
Biofiltration 4						
OFF2	Drains to Biofiltration 4	95%	8,989	473	9,462	0.22
ST2	Drains to Biofiltration 4	90%	22,164	2,463	24,627	0.57
CAL3	Drains to Biofiltration 4	90%	3,925	436	4,361	0.10
CAL 4	Drains to Biofiltration 4	90%	1,203	134	1,337	0.03
ST1 East	Drains to Biofiltration 4	90%	21,170	2,352	23,522	0.54
CAL 2	Drains to Biofiltration 4	95%	4,508	237	4,745	0.11
ST 1 West	Drains to Biofiltration 4	90%	20,644	2,294	22,938	0.53
	To HMP 4		82,603	8,389	90,992	2.09
Biofiltration 1						
ST4 East	Drains to Biofiltration 1	90%	7,953	884	8,837	0.20
OFF1	Drains to Biofiltration 1	100%	7,526	-	7,526	0.17
ST4 West	Drains to Biofiltration 1	90%	25,091	2,788	27,878	0.64
Lot 1	Drains to Biofiltration 1	71%	214,315	88,427	302,742	6.95
	To HMP 1	73%	254,885	92,098	346,983	7.97
Biofiltration 2						
Lot 2	Drains to Biofiltration 2	73%	228,690	82,764	311,454	7.15
	To HMP 2					
Total to Detention West		65%	483,575	174,862	749,429	17.20

East Portion of Site

DMA	Type	Imper (%)	Imperv (sf)	Pervious (sf)	Total (sf)	Total (ac)
Lot 3	Drains to Biofiltration 3	8%	27,072	331,427	358,499	8.23
ST3	Drains to Biofiltration 3	60%	443	295	738	0.02
OFF 3	Drains to Biofiltration 3	85%	14,035	2,477	16,512	0.38
Total to HMP 3/ Detention East		11%	41,550	334,199	375,749	8.63
Total - East & West		0.76	525,125	509,061	1,125,178	25.83
Deduct Street Areas Outside Boundary (CAL 2, CAL 4, OFF 1, OFF 2 OFF 3)						(0.91)
Site Area to Detention Basins						24.92
Remaining Site Areas						
Detention West / Access - Self Retaining		0%		5,064	5,064	0.12
Trail 6' Wide	Self-Retaining	0%		27,878	27,878	0.64
Lot 4	Open Space - Self Mitigating			91,476	91,476	2.10
Lot 5	Open Space - Self Mitigating			686,506	686,506	15.76
CAL 1 (Exist Street)	Bypass SD	100%	28,397		28,397	0.65
Subotal						19.27
Grand Total - Site Area Only						44.19

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Harvest and Use Feasibility Checklist — Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☐ Toilet and urinal flushing: **Residential @ 9.3 gallons per person**

☐ Landscape irrigation: **Plant Factor @ Upper Moderate= 0.7/Hydrazone Mod = 1,470 gals in 36 hrs**

☐ Other:_______ **Irrigation Demand = 2.7 x [(0.7 x 1,470)/0.9] x 0.015 =<u>46.3 cf/36-hrs/acre</u>**

Irrigation Demand per Modified ETWU Equation B.3-1 using General Landscape Type Hydazone <u>Moderate from Table B.3.3 and Moderate Plant Water Use – Table B.3.2</u>

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

Candlelight = 475 DU x 3.0 people/du x 9.3 gals = 13,252 gals/day =19,879 gals per 36 hrs
Toilet Flushing Demand: 2,656 cubic-feet / 36 hours
Total <u>Pervious</u> Area to Basins = 6.75 acre x 46.3 cubic-feet =
Landscape Irrigation: 312 cubic feet / 36 hours

3. Calculate the DCV using worksheet B-2.1.

DCV = <u>30,403</u> (cf) 25% = 7,601 cf

3a. Is the 36 hour demand greater than or equal to the DCV? Yes / No ⇨ ⇩	3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV? Yes / No ⇨ ⇩	3c. Is the 36 hour demand less than 0.25DCV? **Yes** ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	**Harvest and use is considered to be <u>infeasible</u>.**

Is harvest and use feasible based on further evaluation?

Yes, refer to Appendix E to select and size harvest and use BMPs.

No, select alternate BMPs.

Categorization of Infiltration Feasibility Condition			Form I-8
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		✓
Provide basis: Type "D" Soils – See Attachment 6 for Geotechnical Reports Updated Geotechnical Letter dated February 28, 2012 Geocon, Inc. Project No. 07177-52-03 Page 2 confirms Hydrologic Soil Group "D" Soil is not conducive to infiltration Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		✓
Provide basis: See answer to Criteria #1 Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Form I-8 Page 2 of 4

Criteria	Screening Question	Yes	No
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	✓	

Provide basis:

No evidence of contamination

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	✓	

Provide basis:

No evidence of downstream impacts to surface waters.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Part 1 Result *	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	**Full Infiltration** **Not feasible**

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by Agency/Jurisdictions to substantiate findings

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X

Provide basis:

See Attachment 6 for Geotechnical Reports
Geotechnical Investigation dated June 2, 2004
Geocon, Inc. Project No. 07177-52-02
Site soils are a mix of Terrance deposits (clays and conglomerate) and alluvium.
Remedial grading operations are likely to improve the infiltration potential.
Additional infiltration testing will be required during the final design phase.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	

Provide basis:

Potential for some infiltration.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Form I-8 Page 4 of 4

Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	✓	

Provide basis:

No evidence of contamination

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

8	**Can infiltration be allowed without violating downstream water rights?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	✓	

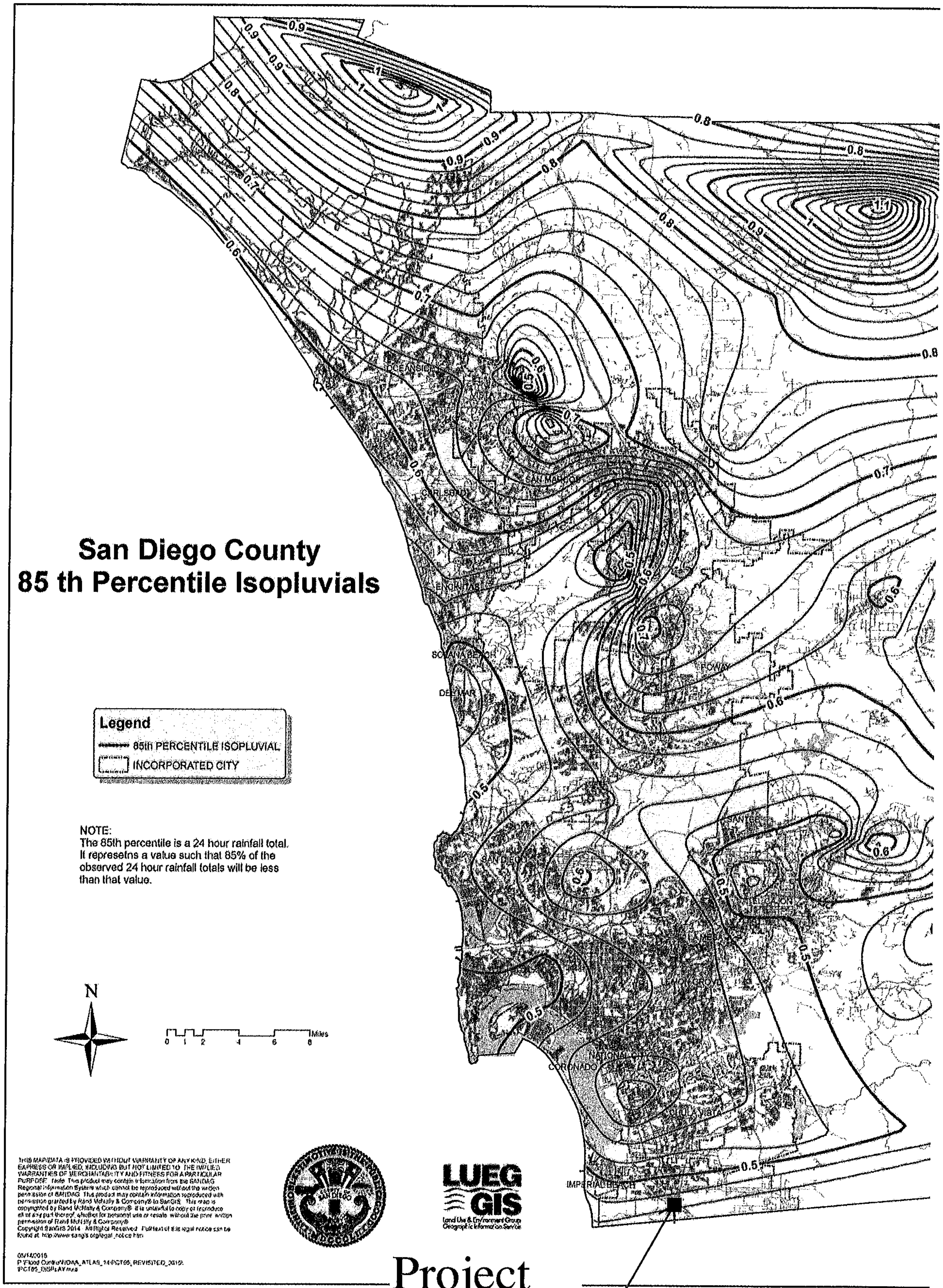
Provide basis:

No evidence of downstream impacts.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	**Partial Infiltration**

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by Agency/Jurisdictions to substantiate findings



Project Site

Figure B.1-1: 85th Percentile 2

Project Name **Candlelight** BMP ID **Biofiltration 1**

Design Capture Volume (DCV)				**Worksheet B-2.1 City SD BMP Manual 2016**	
	Surface	Area (sq-ft)	Area (acres)	Runoff Factor	C x A (acres)
	Imperv (Roof/Paving)	254,885	5.851	0.9	5.266
	Semi Pervious Area	-	0.000	0.2	0.000
	Pervious Area	92,098	2.114	0.1	0.211
A	Total Area	346,983	7.966	0.688	5.478 acre
B	Adjusted Impervious Area				238,606 sq-ft
C	**85th Percentile 24-Hour Storm**				0.46 inches
D	Design Capture Volume (Gross)			DCV =	9,147 cubic-ft
E	Volume Reductions (Street Trees / Rain Barrels)				0 cubic-ft

Simple Sizing Method for Biofiltration BMPs				**Worksheet B-5.1**
1	Remaining DCV after implementing Retention BMPs	**DCV =**	**9,147**	cubic-ft
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible		**0.000**	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain		36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]		0.00	inches
5	Aggregate pore space		0.4	in / in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]		0.00	inches
7	**Assumed surface area of the biofiltration BMP**	2,783 | 3,380 | 7,158	7,200	sq-ft
8	Media retained pore storage (filter/growing media)		0.1	in / in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7		1,260	cubic-ft
10	DCV that requires biofiltration [Line 1 — Line 9]		7,887	cubic-ft
	BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]		12	inches
12	Media Thickness [18 inches minimum] also add mulch layer thickness 3"		21	inches
13	Aggregate Storage above underdrain invert (3" + 3" Transition + 12 inches Stone)		12	inches
14	Freely drained pore storage (filter media + mulch)		0.2	in / in
15	Media filtration rate to be used for sizing (5 in/hr minimum)		5	in/hr
	Baseline Calculations			
16	Allowable Routing Time for sizing		6	hours
17	Depth filtered during storm [Line 15 x Line 16]		30.0	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]		21	inches
19	Total Depth Treated [Line 17 + Line 18]		51.0	inches
Option 1 — Biofilter 1.5 times the DCV				
20	Required biofilter volume [1.5 x Line 10] cubic-feet		11,830	cubic-ft
21	Required Footprint [Line 20/ Line 19] x 12		**2,783**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding				
22	Required Storage (surface + pores) Volume [0.75 x Line 10]		5,915	cubic-ft
23	Required Footprint [Line 22/ Line 18] x 12		**3,380**	sq-ft
Footprint of the BMP				
24	Area draining to the BMP		346,983	sq-ft
25	Adjusted Runoff Factor (Refer to Appendix B.1 and B.2)		0.688	
26	Minimum BMP Sizing Factor = 3% [Alternative Worksheet B.5-2, Line 11]	1.72%	**3%**	
27	Minimum BMP Footprint		**7,158**	sq-ft
28	Footprint of BMP = Maximum (Minimum (Line 21, Line 23), Line 27) Surface Area =		**7,158**	sq-ft
Check for Volume Reduction [Not Applicable for Partial Infiltration Condition]				
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**3.02%**	**0.1378**	
30	Minimum required fraction of DCV retained for partial infiltration condition		**N/A**	
31	Is the DCV > 0.325 ? Increase the footrpint sizing factor on Line 26		ok	

Actual Surface Area provided	3.79%	9,042	sq-ft

Attachment 1E

Project Name **Candlelight** BMP ID **Biofiltration 2**

	Design Capture Volume (DCV)				Worksheet B-2.1 City SD BMP Manual 2016	
	Surface	Area (sq-ft)	Area (acres)	Runoff Factor	C x A (acres)	
	Imperv (Roof/Paving)	228,690	5.250	0.9	4.725	
	Semi Pervious Area	-	0.000	0.2	0.000	
	Pervious Area	82,764	1.900	0.1	0.190	
A	Total Area	311,454	7.150	0.687	4.915	acre
B	Adjusted Impervious Area				214,097	sq-ft
C	**85th Percentile 24-Hour Storm**				0.46	inches
D	Design Capture Volume (Gross)			DCV =	8,207	cubic-ft
E	Volume Reductions (Street Trees / Rain Barrels)				0	cubic-ft

	Simple Sizing Method for Biofiltration BMPs				Worksheet B-5.1	
1	Remaining DCV after implementing Retention BMPs			DCV =	8,207	cubic-ft
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible				0.000	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain				36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]				0.00	inches
5	Aggregate pore space				0.4	in / in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]				0.00	inches
7	**Assumed surface area of the biofiltration BMP**	2,495	3,030	6,423	6,500	sq-ft
8	Media retained pore storage (filter/growing media)				0.1	in / in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7				1,138	cubic-ft
10	DCV that requires biofiltration [Line 1 — Line 9]				7,070	cubic-ft
	BMP Parameters					
11	Surface Ponding [6 inch minimum, 12 inch maximum]				12	inches
12	Media Thickness [18 inches minimum] also add mulch layer thickness 3"				21	inches
13	Aggregate Storage above underdrain invert (3" + 3" Transition + 12 inches Stone)				12	inches
14	Freely drained pore storage (filter media + mulch)				0.2	in / in
15	Media filtration rate to be used for sizing (5 in/hr minimum)				5	in/hr
	Baseline Calculations					
16	Allowable Routing Time for sizing				6	hours
17	Depth filtered during storm [Line 15 x Line 16]				30.0	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]				21	inches
19	Total Depth Treated [Line 17 + Line 18]				51.0	inches
	Option 1 — Biofilter 1.5 times the DCV					
20	Required biofilter volume [1.5 x Line 10] cubic-feet				10,604	cubic-ft
21	Required Footprint [Line 20/ Line 19] x 12				2,495	sq-ft
	Option 2 - Store 0.75 of remaining DCV in pores and ponding					
22	Required Storage (surface + pores) Volume [0.75 x Line 10]				5,302	cubic-ft
23	Required Footprint [Line 22/ Line 18] x 12				3,030	sq-ft
	Footprint of the BMP					
24	Area draining to the BMP				311,454	sq-ft
25	Adjusted Runoff Factor (Refer to Appendix B.1 and B.2)				0.687	
26	Minimum BMP Sizing Factor = 3% [Alternative Worksheet B.5-2, Line 11]			1.72%	3%	
27	Minimum BMP Footprint				6,423	sq-ft
28	Footprint of BMP = Maximum (Minimum (Line 21, Line 23), Line 27) Surface Area =				6,423	sq-ft
	Check for Volume Reduction [Not Applicable for Partial Infiltration Condition]					
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]			3.04%	0.1386	
30	Minimum required fraction of DCV retained for partial infiltration condition				N/A	
31	Is the DCV > 0.325 ? Increase the footprint sizing factor on Line 26				ok	

Actual Surface Area provided	3.08%	6,600	sq-ft

Attachment 1E

Project Name **Candlelight** BMP ID **Biofiltration 3**

	Design Capture Volume (DCV)			**Worksheet B-2.1 City SD BMP Manual 2016**		
	Surface	Area (sq-ft)	Area (acres)	Runoff Factor	C x A (acres)	
	Imperv (Roof/Paving)	284,550	6.532	0.9	5.879	
	Semi Pervious Area	-	0.000	0.2	0.000	
	Pervious Area	91,199	2.094	0.1	0.209	
A	Total Area	375,749	8.626	0.706	6.088	acre
B	Adjusted Impervious Area				265,215	sq-ft
C	**85th Percentile 24-Hour Storm**				0.46	inches
D	Design Capture Volume (Gross)			DCV =	10,167	cubic-ft
E	Volume Reductions (Street Trees / Rain Barrels)				0	cubic-ft

	Simple Sizing Method for Biofiltration BMPs				**Worksheet B-5.1**	
1	Remaining DCV after implementing Retention BMPs			**DCV =**	**10,167**	cubic-ft
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible				**0.000**	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain				36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]				0.00	inches
5	Aggregate pore space				0.4	in / in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]				0.00	inches
7	**Assumed surface area of the biofiltration BMP**	3,094	3,757	7,956	**8,000**	sq-ft
8	Media retained pore storage (filter/growing media)				0.1	in / in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7				1,400	cubic-ft
10	DCV that requires biofiltration [Line 1 — Line 9]				8,767	cubic-ft
	BMP Parameters					
11	Surface Ponding [6 inch minimum, 12 inch maximum]				12	inches
12	Media Thickness [18 inches minimum] also add mulch layer thickness 3"				21	inches
13	Aggregate Storage above underdrain invert (3" +.3" Transition + 12 inches Stone)				12	inches
14	Freely drained pore storage (filter media + mulch)				0.2	in / in
15	Media filtration rate to be used for sizing (5 in/hr minimum)				5	in/hr
	Baseline Calculations					
16	Allowable Routing Time for sizing				6	hours
17	Depth filtered during storm [Line 15 x Line 16]				30.0	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]				21	inches
19	Total Depth Treated [Line 17 + Line 18]				51.0	inches
	Option 1 — Biofilter 1.5 times the DCV					
20	Required biofilter volume [1.5 x Line 10] cubic-feet				13,150	cubic-ft
21	Required Footprint [Line 20/ Line 19] x 12				**3,094**	sq-ft
	Option 2 - Store 0.75 of remaining DCV in pores and ponding					
22	Required Storage (surface + pores) Volume [0.75 x Line 10]				6,575	cubic-ft
23	Required Footprint [Line 22/ Line 18] x 12				**3,757**	sq-ft
	Footprint of the BMP					
24	Area draining to the BMP				375,749	sq-ft
25	Adjusted Runoff Factor (Refer to Appendix B.1 and B.2)				0.706	
26	Minimum BMP Sizing Factor = 3% [Alternative Worksheet B.5-2, Line 11]			1.72%	**3%**	
27	Minimum BMP Footprint				**7,956**	sq-ft
28	Footprint of BMP = Maximum (Minimum (Line 21, Line 23), Line 27) Surface Area =				**7,956**	sq-ft
	Check for Volume Reduction [Not Applicable for Partial Infiltration Condition]					
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]			**3.02%**	**0.1377**	
30	Minimum required fraction of DCV retained for partial infiltration condition				**N/A**	
31	Is the DCV > 0.325 ? Increase the footrpint sizing factor on Line 26				**ok**	

Actual Surface Area provided	3.05%	8,082	sq-ft

Project Name **Candlelight** BMP ID **Biofiltration 4**

	Design Capture Volume (DCV)				Worksheet B-2.1 City SD BMP Manual 2016	
	Surface	Area (sq-ft)	Area (acres)	Runoff Factor	C x A (acres)	
	Imperv (Roof/Paving)	82,603	1.896	0.9	1.707	
	Semi Pervious Area	-	0.000	0.2	0.000	
	Pervious Area	8,389	0.193	0.1	0.019	
A	Total Area	90,992	2.089	0.826	1,726	acre
B	Adjusted Impervious Area				75,182	sq-ft
C	**85th Percentile 24-Hour Storm**				0.46	inches
D	Design Capture Volume (Gross)			DCV =	2,882	cubic-ft
E	Volume Reductions (Street Trees / Rain Barrels)				0	cubic-ft

	Simple Sizing Method for Biofiltration BMPs				Worksheet B-5.1	
1	Remaining DCV after implementing Retention BMPs			**DCV =**	**2,882**	cubic-ft
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible				**0.000**	in/hr
3	Allowable drawdown time for aggregate storage below the underdrain				36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]				0.00	inches
5	Aggregate pore space				0.4	in / in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]				0.00	inches
7	**Assumed surface area of the biofiltration BMP**	832	1,010	2,255	**3,000**	sq-ft
8	Media retained pore storage (filter/growing media)				0.1	in / in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7				525	cubic-ft
10	DCV that requires biofiltration [Line 1 — Line 9]				2,357	cubic-ft
	BMP Parameters					
11	Surface Ponding [6 inch minimum, 12 inch maximum]				12	inches
12	Media Thickness [18 inches minimum] also add mulch layer thickness 3"				21	inches
13	Aggregate Storage above underdrain invert (3" + 3" Transition + 12 inches Stone)				12	inches
14	Freely drained pore storage (filter media + mulch)				0.2	in / in
15	Media filtration rate to be used for sizing (5 in/hr minimum)				5	in/hr
	Baseline Calculations					
16	Allowable Routing Time for sizing				6	hours
17	Depth filtered during storm [Line 15 x Line 16]				30.0	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]				21	inches
19	Total Depth Treated [Line 17 + Line 18]				51.0	inches
	Option 1 — Biofilter 1.5 times the DCV					
20	Required biofilter volume [1.5 x Line 10] cubic-feet				3,535	cubic-ft
21	Required Footprint [Line 20/ Line 19] x 12				**832**	sq-ft
	Option 2 - Store 0.75 of remaining DCV in pores and ponding					
22	Required Storage (surface + pores) Volume [0.75 x Line 10]				1,768	cubic-ft
23	Required Footprint [Line 22/ Line 18] x 12				**1,010**	sq-ft
	Footprint of the BMP					
24	Area draining to the BMP				90,992	sq-ft
25	Adjusted Runoff Factor (Refer to Appendix B.1 and B.2)				0.826	
26	Minimum BMP Sizing Factor = 3% [Alternative Worksheet B.5-2, Line 11]			1.72%	**3%**	
27	Minimum BMP Footprint				**2,255**	sq-ft
28	Footprint of BMP = Maximum (Minimum (Line 21, Line 23), Line 27) Surface Area =				**2,255**	sq-ft
	Check for Volume Reduction [Not Applicable for Partial Infiltration Condition]					
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]			**3.99%**	**0.1822**	
30	Minimum required fraction of DCV retained for partial infiltration condition				**N/A**	
31	Is the DCV > 0.325 ? Increase the footrpint sizing factor on Line 26				**ok**	

Actual Surface Area provided	4.26%	3,205	sq-ft

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

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Project Name: **Candlelight**

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☐ Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	■ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	● Not Performed ○ Included ○ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	● Included ○ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	○ Included ● Not required because BMPs will drain in less than 96 hours

Drain time calculations not required for Underground Facilities

Project Name: Candlelight

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

☐ Underlying hydrologic soil group
☐ Approximate depth to groundwater
☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☐ Critical coarse sediment yield areas to be protected
☐ Existing topography
☐ Existing and proposed site drainage network and connections to drainage offsite
☐ Proposed grading
☐ Proposed impervious features
☐ Proposed design features and surface treatments used to minimize imperviousness
☐ Point(s) of Compliance (POC) for Hydromodification Management
☐ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☐ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

See DMA Exhibit – Attachment 1A

SWQMP Attachment 2

PRELIMINARY DETENTION CALCULATIONS

FOR

CANDLELIGHT

City of San Diego TM 114999
Project No. 40329

IN

COUNTY OF SAN DIEGO

Prepared by:

SB&O, Inc.
3990 Ruffin Road, Suite 120
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Allen L. Butcher PE 47107
EXP. 12/31/2017

REGISTERED PROFESSIONAL ENGINEER
ALLEN L. BUTCHER
No. 47107
Exp 12/31/17
CIVIL
STATE OF CALIFORNIA

F 2.0 Second Submittal

June 5, 2017

TABLE OF CONTENTS

EXHIBITS

SCOPE OF REPORT

The project is located in the Otay Mesa Community, which is tributary to the Tijuana River Valley (911.12). In accordance with City of San Diego (City) policy for Otay Mesa, post-development peak flow rates may not exceed pre-development conditions for storms ranging from the 2-year up to the 50-year return frequency. The purpose of this report is to verify the volume of storage required to mitigate post-development runoff increases.

The project proposes 4 biofiltration basins (shallow surface basins) to provide treatment. Underground vaults will provide HMP control.

Site runoff is split West and East. The West detention basin will provide storm attenuation for Lots 1, 2, Caliente Avenue and the majority of Street "A". The East facility accepts runoff from Lot 3 and the Street "A" cul-de-sac. The East facility will provide both HMP control and Detention in a single facility.

EXISTING SITE

Although the site is undeveloped, past disturbances include dirt trails. Runoff from the site is trends southwest to northeast. All of the site runoff is tributary to the canyon located east of the site, then southerly toward the Tijuana River. Topography is mild with slopes ranging from 1% up to 5%. Vegetation is primarily long grasses in poor condition. Surficial soils are finely grained and include some clay. Infiltration rates are expected to be poor, consistent with Type D soils.

PROJECT DESCRIPTION

The Candlelight project has a developed area of approximately 24.2 acres, split east and west of Caliente Avenue extension. Product type is Residential / Multifamily with private drives. Post development drainage patterns will generally continue the north to south trend, with discharge points at the southwest and southeast limits..

See DMA Exhibit in SWQMP Attachment 1A.

RATIONAL METHOD HYDROGRAPH METHODOLOGY

The City of San Diego Drainage Design Manual provides for peak runoff rates for small drainage basins using a Rational Method. The procedure is based upon the City of San Diego Intensity-Duration-Frequency (IDF) Nomograph to determine peak rainfall intensity using a time of concentration (event duration).

In order to model the effects of a detention basin, a runoff time series must be available. The County of San Diego Hydrology Manual includes a similar Rational Method, but also includes a procedure to develop a time based runoff series. The methodology assumes a simple triangular hydrograph and uses the 6-hour rainfall total, and the Rational Method input variables. The methodology provides runoff values at time intervals equal to multiples of the time of concentration, with a peak flow occurring in the 4th hour of the 6-hour rainfall event. Details related to the procedure to develop the hydrograph are provided in Chapter 6 of the County of San Diego Hydrology Manual.

RATIONAL METHOD

Peak flow rates were calculated using the County Rational Method for each of the areas tributary to the detention facilities, neglecting the effects of the biofiltration basins. The County methodology limits initial overland flow lengths based upon land use and average slope. For multiple family projects with an average slope of 1.5%, the initial time is limited to approx. 5.5 minutes. For the development of the unit hydrograph, a time of concentration of 6 minutes will be used. Undeveloped vacant land in the 3% slope range, the initial time is limited to 10.5 minutes. An 11 minutes time of concentration will be used to provide pre-development peak flow estimates.

DETENTION BASINS

Elevation-storage-discharge rating tables were prepared for the combined basins using incremental volumes and corresponding outflows for the Detention vaults. Discharge values for the basins were estimated using standard weir and orifice flow equations.

DETENTION ANALYSES

The range of storm hydrographs were routed through the detention basins, including the 2-, 5-, 10-, 25-, 50- and 100-year events. A review of the results indicates that the proposed detention facilities will attenuate post-development peak flow rates to less than pre-development levels.

See attached West and East Detention Analyses

WEST DETENTION BASIN ANALYSIS

Candlelight Detention Basin - West

Tributary Areas

Preliminary Design 31-May-17

HMP 1 (Lot 1)	7.97
HMP 2 (Lot 2)	7.15
HMP 4 (Street)	2.089
Total	17.205 ac

6-Hour Rational Method Hydrograph

	Elev	Storage (cf)	Storage (ac-ft)
Floor of Basin	505.00	0	
Overflow	510.00	66,476	1.53
Top Of Basin	511.00	81,751	1.88

Storm Frequency	Qexist (cfs)	Qin (cfs)	Qout (cfs)	WSEL (ft)	Depth (ft)
2 YEAR	9.06	28.71	0.18	508.20	3.200
5 YEAR	12.40	39.29	1.22	508.90	3.900
10 YEAR	14.31	45.34	1.96	509.20	4.200
25 YEAR	15.74	49.87	2.41	509.50	4.500
50 YEAR	17.17	54.41	2.89	509.90	4.900
100 YEAR	19.08	60.45	3.31	510.30	5.300

Outlet Control Structure Use 4' x 4' structure (Inside Dimension)

Opening	#1	#2	#3	Overflow - Grate
Elevation	505.0	507.0	509.0	512.00
Width (in)	1.74	18	Not	4 feet
Height (in)	1.74	4	Used	4 feet

Outlet Dia	18	in
Flowline	503.00	
Top of Structure	512.00	

Efficiency Gross (%) #REF! Storage (per ac) 3,864 cf

Candlelight Detention Basin - West

West Detention
Top 511.00 81,751 cf
Storage @ Overflow 510.00 66,476 cf
Basin Storage Volumes 122.98%
dT= 6
1.53
dT= 15

1
Height 0.00 1.50 5.00
1.74 4 48
1.74 18 48

DEPTH (FT)	ELEVATION	AREA (SF)	Raw Storage (CF)	Water Quality (CF)	STORAGE (CF)	2S/dT (CFS)	2S/dT + O (CFS)	2S/dT (CFS)	2S/dT + O (CFS)	OUTFLOW (CFS)	#1 (CFS)	#2 (CFS)	#3 (CFS)	Overflow (CFS)
0.00	505.00	0	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00			
0.10	505.10	20	1	0	1	0.01	0.02	0.00	0.01	0.01	0.01			
0.20	505.20	40	4	0	4	0.02	0.06	0.01	0.04	0.04	0.04			
0.30	505.30	60	9	0	9	0.05	0.10	0.02	0.07	0.05	0.05			
0.40	505.40	80	16	0	16	0.09	0.15	0.04	0.09	0.06	0.06			
0.50	505.50	100	25	0	25	0.14	0.21	0.06	0.12	0.07	0.07			
0.60	505.60	15,275	794	0	794	4.41	4.48	1.76	1.84	0.07	0.07			
0.70	505.70	15,275	2,321	0	2,321	12.90	12.98	5.16	5.24	0.08	0.08			
0.80	505.80	15,275	3,849	0	3,849	21.38	21.47	8.55	8.64	0.09	0.09			
0.90	505.90	15,275	5,376	0	5,376	29.87	29.96	11.95	12.04	0.09	0.09			
1.00	506.00	15,275	6,904	0	6,904	38.35	38.45	15.34	15.44	0.10	0.10			
1.10	506.10	15,275	8,431	0	8,431	46.84	46.94	18.74	18.84	0.10	0.10			
1.20	506.20	15,275	9,959	0	9,959	55.33	55.43	22.13	22.24	0.11	0.11			
1.30	506.30	15,275	11,486	0	11,486	63.81	63.92	25.53	25.64	0.11	0.11			
1.40	506.40	15,275	13,014	0	13,014	72.30	72.42	28.92	29.04	0.12	0.12			
1.50	506.50	15,275	14,541	0	14,541	80.78	80.91	32.31	32.43	0.12	0.12			
1.60	506.60	15,275	16,069	0	16,069	89.27	89.40	35.71	35.83	0.13	0.13			
1.70	506.70	15,275	17,596	0	17,596	97.76	97.89	39.10	39.23	0.13	0.13			
1.80	506.80	15,275	19,124	0	19,124	106.24	106.38	42.50	42.63	0.13	0.13			
1.90	506.90	15,275	20,651	0	20,651	114.73	114.87	45.89	46.03	0.14	0.14			
2.00	507.00	15,275	22,179	0	22,179	123.22	123.36	49.29	49.43	0.14	0.14			
2.10	507.10	15,275	23,706	0	23,706	131.70	131.85	52.68	52.82	0.14	0.14			
2.20	507.20	15,275	25,234	0	25,234	140.19	140.34	56.08	56.22	0.15	0.15			
2.30	507.30	15,275	26,761	0	26,761	148.67	148.82	59.47	59.62	0.15	0.15			
2.40	507.40	15,275	28,289	0	28,289	157.16	157.31	62.86	63.02	0.15	0.15			
2.50	507.50	15,275	29,816	0	29,816	165.65	165.80	66.26	66.42	0.16	0.16			
2.60	507.60	15,275	31,344	0	31,344	174.13	174.29	69.65	69.81	0.16	0.16			
2.70	507.70	15,275	32,871	0	32,871	182.62	182.78	73.05	73.21	0.16	0.16			
2.80	507.80	15,275	34,399	0	34,399	191.10	191.27	76.44	76.61	0.17	0.17			
2.90	507.90	15,275	35,926	0	35,926	199.59	199.76	79.84	80.01	0.17	0.17			
3.00	508.00	15,275	37,454	0	37,454	208.08	208.25	83.23	83.40	0.17	0.17			
3.10	508.10	15,275	38,981	0	38,981	216.56	216.74	86.63	86.80	0.18	0.18			
3.20	508.20	15,275	40,509	0	40,509	225.05	225.23	90.02	90.20	0.18	0.18			
3.30	508.30	15,275	42,036	0	42,036	233.53	233.72	93.41	93.60	0.18	0.18			
3.40	508.40	15,275	43,564	0	43,564	242.02	242.21	96.81	96.99	0.18	0.18			
3.50	508.50	15,275	45,091	0	45,091	250.51	250.69	100.20	100.39	0.19	0.19	0.00		
3.60	508.60	15,275	46,619	0	46,619	258.99	259.31	103.60	103.92	0.32	0.19	0.13		
3.70	508.70	15,275	48,146	0	48,146	267.48	268.03	106.99	107.55	0.55	0.19	0.36		
3.80	508.80	15,275	49,674	0	49,674	275.97	276.83	110.39	111.25	0.86	0.20	0.67		
3.90	508.90	15,275	51,201	0	51,201	284.45	285.67	113.78	115.00	1.22	0.20	1.02		
4.00	509.00	15,275	52,729	0	52,729	292.94	294.53	117.18	118.76	1.59	0.20	1.39		
4.10	509.10	15,275	54,256	0	54,256	301.42	303.21	120.57	122.36	1.79	0.20	1.58		
4.20	509.20	15,275	55,784	0	55,784	309.91	311.87	123.96	125.93	1.96	0.21	1.76		
4.30	509.30	15,275	57,311	0	57,311	318.40	320.52	127.36	129.48	2.12	0.21	1.92		
4.40	509.40	15,275	58,839	0	58,839	326.88	329.15	130.75	133.02	2.27	0.21	2.06		
4.50	509.50	15,275	60,366	0	60,366	335.37	337.78	134.15	136.56	2.41	0.21	2.20		
4.60	509.60	15,275	61,894	0	61,894	343.85	346.39	137.54	140.08	2.54	0.22	2.32		
4.70	509.70	15,275	63,421	0	63,421	352.34	355.00	140.94	143.60	2.66	0.22	2.45		
4.80	509.80	15,275	64,949	0	64,949	360.83	363.61	144.33	147.11	2.78	0.22	2.56		
4.90	509.90	15,275	66,476	0	66,476	369.31	372.21	147.73	150.62	2.89	0.22	2.67		
5.00	510.00	15,275	68,004	0	68,004	377.80	380.80	151.12	154.12	3.00	0.22	2.78		
5.10	510.10	15,275	69,531	0	69,531	386.28	389.39	154.51	157.62	3.11	0.23	2.88		
5.20	510.20	15,275	71,059	0	71,059	394.77	397.98	157.91	161.12	3.21	0.23	2.98		
5.30	510.30	15,275	72,586	0	72,586	403.26	406.56	161.30	164.61	3.31	0.23	3.08		
5.40	510.40	15,275	74,114	0	74,114	411.74	415.14	164.70	168.10	3.40	0.23	3.17		
5.50	510.50	15,275	75,641	0	75,641	420.23	423.72	168.09	171.59	3.49	0.24	3.26		0.00
5.60	510.60	15,275	77,169	0	77,169	428.72	432.98	171.49	175.75	4.27	0.24	3.35		0.68
5.70	510.70	15,275	78,696	0	78,696	437.20	442.80	174.88	180.48	5.60	0.24	3.43		1.93
5.80	510.80	15,275	80,224	0	80,224	445.69	452.99	178.28	185.58	7.31	0.24	3.51		3.55
5.90	510.90	15,275	81,751	0	81,751	454.17	463.48	181.67	190.97	9.30	0.24	3.60		5.46
6.00	511.00	15,275	83,279	0	83,279	462.66	473.39	185.06	195.79	10.73	0.25	3.68		6.81
6.10	511.10	15,275	84,806	0	84,806	471.15	482.60	188.46	199.92	11.46	0.25	3.75		7.46
6.20	511.20	15,275	86,334	0	86,334	479.63	491.77	191.85	203.99	12.13	0.25	3.83		8.05
6.30	511.30	15,275	87,861	0	87,861	488.12	500.89	195.25	208.01	12.77	0.25	3.90		8.61
6.40	511.40	15,275	89,389	0	89,389	496.60	509.97	198.64	212.01	13.37	0.25	3.98		9.13
6.50	511.50	15,275	90,916	0	90,916	505.09	519.02	202.04	215.97	13.93	0.26	4.05		9.63
6.60	511.60	15,275	92,444	0	92,444	513.58	528.05	205.43	219.91	14.48	0.26	4.12		10.10

West

DETENTION BASIN ROUTING

28.71

9.06
0.18

2 YEAR EVENT ~ 6 Hour STORM

508.20

6 Interval	Minutes T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	0.731	0.00	0.00	0.00
2	0.20	0.739	1.47	1.34	0.07
3	0.30	0.756	2.83	2.70	0.07
4	0.40	0.764	4.22	4.09	0.07
5	0.50	0.783	5.63	5.49	0.07
6	0.60	0.792	7.06	6.91	0.07
7	0.70	0.812	8.52	8.37	0.07
8	0.80	0.823	10.01	9.86	0.07
9	0.90	0.845	11.53	11.38	0.07
10	1.00	0.857	13.08	12.92	0.08
11	1.10	0.881	14.66	14.50	0.08
12	1.20	0.894	16.28	16.12	0.08
13	1.30	0.922	17.93	17.77	0.08
14	1.40	0.937	19.63	19.47	0.08
15	1.50	0.968	21.37	21.21	0.08
16	1.60	0.984	23.17	22.99	0.09
17	1.70	1.020	25.00	24.82	0.09
18	1.80	1.039	26.88	26.71	0.09
19	1.90	1.079	28.83	28.66	0.09
20	2.00	1.101	30.84	30.65	0.09
21	2.10	1.149	32.90	32.72	0.09
22	2.20	1.175	35.04	34.86	0.09
23	2.30	1.231	37.26	37.08	0.09
24	2.40	1.262	39.57	39.38	0.10
25	2.50	1.331	41.97	41.78	0.10
26	2.60	1.368	44.48	44.28	0.10
27	2.70	1.453	47.10	46.90	0.10
28	2.80	1.501	49.85	49.65	0.10
29	2.90	1.609	52.76	52.55	0.10
30	3.00	1.672	55.83	55.62	0.11
31	3.10	1.817	59.11	58.89	0.11
32	3.20	1.903	62.61	62.40	0.11
33	3.30	2.110	66.41	66.18	0.11
34	3.40	2.238	70.53	70.31	0.11
35	3.50	2.565	75.11	74.88	0.12
36	3.60	2.781	80.22	79.99	0.12
37	3.70	3.400	86.17	85.93	0.12
38	3.80	3.872	93.20	92.95	0.13
39	3.90	5.686	102.51	102.25	0.13
40	4.00	8.011	115.95	115.68	0.14
41	4.10	28.715	152.40	152.10	0.15
42	4.20	4.560	185.37	185.05	0.16
43	4.30	3.051	192.66	192.32	0.17
44	4.40	2.387	197.76	197.43	0.17
45	4.50	2.000	201.81	201.47	0.17
46	4.60	1.740	205.21	204.87	0.17
47	4.70	1.553	208.17	207.83	0.17
48	4.80	1.409	210.79	210.44	0.17
49	4.90	1.295	213.15	212.80	0.17
50	5.00	1.202	215.30	214.95	0.17
51	5.10	1.125	217.28	216.93	0.18
52	5.20	1.059	219.11	218.76	0.18
53	5.30	1.002	220.82	220.46	0.18
54	5.40	0.952	222.42	222.07	0.18
54	5.50	0.908	223.93	223.57	0.18
54	5.60	0.869	225.35	224.99	0.18
54	5.70	0.834	226.69	226.34	0.18
54	5.80	0.802	227.97	227.61	0.18
54	5.90	0.773	229.19	228.83	0.18
54	6.00	0.747	230.35	230.00	0.18
54	6.10	0.000	230.74	230.38	0.18

West

DETENTION BASIN ROUTING

39.29

12.40

1.22

5 YEAR EVENT ~ 6 Hour STORM

508.90

6 Interval	Minutes T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	1.000	0.00	0.00	0.00
2	0.20	1.011	2.01	1.88	0.07
3	0.30	1.034	3.92	3.79	0.07
4	0.40	1.046	5.87	5.72	0.07
5	0.50	1.071	7.84	7.69	0.07
6	0.60	1.084	9.85	9.70	0.07
7	0.70	1.112	11.90	11.75	0.07
8	0.80	1.126	13.99	13.83	0.08
9	0.90	1.156	16.11	15.95	0.08
10	1.00	1.172	18.28	18.12	0.08
11	1.10	1.206	20.50	20.34	0.08
12	1.20	1.224	22.77	22.59	0.09
13	1.30	1.262	25.08	24.91	0.09
14	1.40	1.282	27.45	27.28	0.09
15	1.50	1.324	29.88	29.71	0.09
16	1.60	1.347	32.38	32.20	0.09
17	1.70	1.395	34.94	34.76	0.09
18	1.80	1.421	37.57	37.39	0.09
19	1.90	1.477	40.29	40.09	0.10
20	2.00	1.507	43.08	42.88	0.10
21	2.10	1.572	45.96	45.77	0.10
22	2.20	1.608	48.95	48.74	0.10
23	2.30	1.685	52.03	51.83	0.10
24	2.40	1.727	55.24	55.03	0.10
25	2.50	1.821	58.58	58.37	0.11
26	2.60	1.873	62.06	61.85	0.11
27	2.70	1.988	65.71	65.48	0.11
28	2.80	2.054	69.53	69.30	0.11
29	2.90	2.202	73.56	73.32	0.12
30	3.00	2.287	77.81	77.58	0.12
31	3.10	2.486	82.35	82.11	0.12
32	3.20	2.604	87.20	86.96	0.12
33	3.30	2.888	92.45	92.20	0.13
34	3.40	3.062	98.15	97.89	0.13
35	3.50	3.510	104.47	104.21	0.13
36	3.60	3.806	111.52	111.26	0.13
37	3.70	4.652	119.72	119.44	0.14
38	3.80	5.299	129.39	129.11	0.14
39	3.90	7.780	142.19	141.90	0.15
40	4.00	10.962	160.64	160.33	0.15
41	4.10	39.294	210.59	210.24	0.17
42	4.20	6.240	255.78	255.40	0.19
43	4.30	4.175	265.82	265.18	0.32
44	4.40	3.267	272.62	271.51	0.55
45	4.50	2.736	277.52	275.79	0.86
46	4.60	2.382	280.91	279.19	0.86
47	4.70	2.125	283.70	281.97	0.86
48	4.80	1.928	286.03	283.58	1.22
49	4.90	1.772	287.28	284.84	1.22
50	5.00	1.645	288.26	285.81	1.22
51	5.10	1.539	288.99	286.55	1.22
52	5.20	1.448	289.54	287.09	1.22

West

DETENTION BASIN ROUTING

45.34

14.31

1.96

10 YEAR EVENT ~ 6 Hour STORM

509.20

6 Interval	Minutes T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	1.154	0.00	0.00	0.00
2	0.20	1.167	2.32	2.19	0.07
3	0.30	1.193	4.55	4.40	0.07
4	0.40	1.207	6.80	6.65	0.07
5	0.50	1.236	9.10	8.95	0.07
6	0.60	1.251	11.44	11.29	0.07
7	0.70	1.283	13.82	13.66	0.08
8	0.80	1.299	16.24	16.08	0.08
9	0.90	1.334	18.72	18.56	0.08
10	1.00	1.353	21.24	21.08	0.08
11	1.10	1.392	23.83	23.65	0.09
12	1.20	1.412	26.46	26.29	0.09
13	1.30	1.456	29.15	28.98	0.09
14	1.40	1.479	31.92	31.73	0.09
15	1.50	1.528	34.74	34.55	0.09
16	1.60	1.554	37.64	37.45	0.09
17	1.70	1.610	40.62	40.42	0.10
18	1.80	1.640	43.67	43.48	0.10
19	1.90	1.704	46.82	46.63	0.10
20	2.00	1.739	50.07	49.86	0.10
21	2.10	1.814	53.42	53.21	0.10
22	2.20	1.855	56.88	56.67	0.11
23	2.30	1.944	60.47	60.25	0.11
24	2.40	1.993	64.19	63.96	0.11
25	2.50	2.101	68.06	67.83	0.11
26	2.60	2.161	72.09	71.87	0.11
27	2.70	2.294	76.33	76.09	0.12
28	2.80	2.370	80.76	80.52	0.12
29	2.90	2.541	85.43	85.19	0.12
30	3.00	2.639	90.37	90.12	0.13
31	3.10	2.869	95.63	95.38	0.13
32	3.20	3.004	101.25	101.00	0.13
33	3.30	3.332	107.33	107.07	0.13
34	3.40	3.534	113.93	113.66	0.13
35	3.50	4.050	121.25	120.98	0.14
36	3.60	4.392	129.42	129.14	0.14
37	3.70	5.368	138.90	138.61	0.14
38	3.80	6.114	150.09	149.79	0.15
39	3.90	8.977	164.88	164.57	0.15
40	4.00	12.649	186.20	185.87	0.16
41	4.10	45.339	243.86	243.49	0.18
42	4.20	7.200	296.03	292.85	1.59
43	4.30	4.818	304.87	301.29	1.79
44	4.40	3.769	309.88	306.30	1.79
45	4.50	3.157	313.23	309.30	1.96
46	4.60	2.748	315.21	311.28	1.96
47	4.70	2.451	316.48	312.56	1.96
48	4.80	2.225	317.23	313.31	1.96
49	4.90	2.045	317.58	313.65	1.96
50	5.00	1.898	317.60	313.67	1.96
51	5.10	1.776	317.34	313.42	1.96
52	5.20	1.671	316.86	312.94	1.96

West

DETENTION BASIN ROUTING

49.87

15.74

2.41

25 YEAR EVENT ~ 6 Hour STORM

509.5

6 Min Interval	T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	1.269	0.00	0.00	0.00
2	0.20	1.283	2.55	2.42	0.07
3	0.30	1.312	5.02	4.87	0.07
4	0.40	1.327	7.51	7.36	0.07
5	0.50	1.359	10.05	9.90	0.07
6	0.60	1.376	12.64	12.49	0.07
7	0.70	1.411	15.28	15.12	0.08
8	0.80	1.429	17.96	17.80	0.08
9	0.90	1.468	20.69	20.53	0.08
10	1.00	1.488	23.49	23.32	0.09
11	1.10	1.531	26.33	26.16	0.09
12	1.20	1.553	29.25	29.07	0.09
13	1.30	1.601	32.23	32.04	0.09
14	1.40	1.627	35.27	35.09	0.09
15	1.50	1.681	38.39	38.21	0.09
16	1.60	1.709	41.60	41.41	0.10
17	1.70	1.771	44.89	44.69	0.10
18	1.80	1.804	48.27	48.06	0.10
19	1.90	1.875	51.74	51.53	0.10
20	2.00	1.913	55.32	55.12	0.10
21	2.10	1.996	59.03	58.81	0.11
22	2.20	2.041	62.85	62.63	0.11
23	2.30	2.139	66.81	66.59	0.11
24	2.40	2.192	70.92	70.69	0.11
25	2.50	2.311	75.20	74.96	0.12
26	2.60	2.377	79.65	79.42	0.12
27	2.70	2.524	84.32	84.08	0.12
28	2.80	2.607	89.21	88.97	0.12
29	2.90	2.795	94.37	94.12	0.13
30	3.00	2.903	99.82	99.56	0.13
31	3.10	3.156	105.62	105.36	0.13
32	3.20	3.305	111.82	111.55	0.13
33	3.30	3.665	118.52	118.25	0.14
34	3.40	3.887	125.80	125.52	0.14
35	3.50	4.455	133.86	133.57	0.14
36	3.60	4.831	142.86	142.56	0.15
37	3.70	5.905	153.30	153.00	0.15
38	3.80	6.725	165.63	165.32	0.15
39	3.90	9.875	181.92	181.60	0.16
40	4.00	13.914	205.39	205.05	0.17
41	4.10	49.873	268.83	267.72	0.55
42	4.20	7.920	325.52	321.27	2.12
43	4.30	5.299	334.49	329.95	2.27
44	4.40	4.146	339.39	334.58	2.41
45	4.50	3.473	342.19	337.38	2.41
46	4.60	3.023	343.87	339.05	2.41
47	4.70	2.697	344.77	339.95	2.41
48	4.80	2.447	345.10	340.28	2.41
49	4.90	2.250	344.97	340.16	2.41
50	5.00	2.088	344.49	339.67	2.41
51	5.10	1.953	343.71	338.90	2.41
52	5.20	1.838	342.69	337.87	2.41
53	5.30	1.740	341.45	336.63	2.41
54	5.40	1.653	340.02	335.20	2.41
55	5.50	1.577	338.43	333.61	2.41
56	5.60	1.509	336.70	332.15	2.27
57	5.70	1.448	335.11	330.57	2.27
58	5.80	1.393	333.41	328.87	2.27
59	5.90	1.343	331.60	327.06	2.27
60	6.00	1.298	329.70	325.16	2.27
61	6.10	0.000	326.46	322.21	2.12

West

DETENTION BASIN ROUTING

17.17

54.41

2.89

50 YEAR EVENT ~ 6 Hour STORM

509.9

6 Min Interval	T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	1.385	0.00	0.00	0.00
2	0.20	1.400	2.78	2.65	0.07
3	0.30	1.432	5.48	5.34	0.07
4	0.40	1.448	8.22	8.07	0.07
5	0.50	1.483	11.00	10.85	0.07
6	0.60	1.501	13.84	13.68	0.08
7	0.70	1.539	16.72	16.56	0.08
8	0.80	1.559	19.65	19.49	0.08
9	0.90	1.601	22.65	22.48	0.09
10	1.00	1.623	25.71	25.53	0.09
11	1.10	1.670	28.83	28.65	0.09
12	1.20	1.695	32.02	31.83	0.09
13	1.30	1.747	35.28	35.09	0.09
14	1.40	1.775	38.61	38.42	0.10
15	1.50	1.833	42.03	41.83	0.10
16	1.60	1.865	45.53	45.34	0.10
17	1.70	1.932	49.13	48.93	0.10
18	1.80	1.968	52.83	52.62	0.10
19	1.90	2.045	56.63	56.42	0.11
20	2.00	2.087	60.55	60.34	0.11
21	2.10	2.177	64.60	64.38	0.11
22	2.20	2.226	68.78	68.56	0.11
23	2.30	2.333	73.11	72.88	0.12
24	2.40	2.392	77.61	77.37	0.12
25	2.50	2.521	82.29	82.04	0.12
26	2.60	2.593	87.16	86.92	0.12
27	2.70	2.753	92.26	92.01	0.13
28	2.80	2.844	97.61	97.36	0.13
29	2.90	3.049	103.25	102.99	0.13
30	3.00	3.167	109.21	108.94	0.13
31	3.10	3.443	115.55	115.28	0.14
32	3.20	3.605	122.33	122.05	0.14
33	3.30	3.998	129.66	129.38	0.14
34	3.40	4.240	137.61	137.33	0.14
35	3.50	4.860	146.43	146.13	0.15
36	3.60	5.270	156.26	155.96	0.15
37	3.70	6.441	167.67	167.36	0.16
38	3.80	7.337	181.14	180.81	0.16
39	3.90	10.773	198.92	198.59	0.17
40	4.00	15.179	224.54	224.19	0.18
41	4.10	54.407	293.77	291.33	1.22
42	4.20	8.640	354.38	349.30	2.54
43	4.30	5.781	363.72	358.15	2.78
44	4.40	4.523	368.46	362.90	2.78
45	4.50	3.789	371.21	365.64	2.78
46	4.60	3.298	372.73	366.94	2.89
47	4.70	2.942	373.18	367.39	2.89
48	4.80	2.670	373.00	367.21	2.89
49	4.90	2.454	372.34	366.55	2.89
50	5.00	2.278	371.28	365.72	2.78
51	5.10	2.131	370.12	364.56	2.78
52	5.20	2.006	368.70	363.13	2.78
53	5.30	1.898	367.04	361.47	2.78
54	5.40	1.803	365.17	359.61	2.78
55	5.50	1.720	363.13	357.81	2.66
56	5.60	1.646	361.17	355.85	2.66
57	5.70	1.580	359.07	353.74	2.66
58	5.80	1.520	356.84	351.52	2.66
59	5.90	1.465	354.50	349.42	2.54
60	6.00	1.415	352.30	347.22	2.54
61	6.10	0.000	348.64	343.56	2.54

West

DETENTION BASIN ROUTING

60.45

100 YEAR EVENT ~ 6 Hour STORM

19.08

3.31 Q Out

510.30 Max WSEL

6 Min Interval	T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	1.538	0.00	0.00	0.00
2	0.20	1.555	3.09	2.96	0.07
3	0.30	1.591	6.11	5.96	0.07
4	0.40	1.609	9.16	9.01	0.07
5	0.50	1.648	12.27	12.12	0.07
6	0.60	1.668	15.44	15.28	0.08
7	0.70	1.710	18.66	18.50	0.08
8	0.80	1.732	21.94	21.77	0.09
9	0.90	1.779	25.28	25.10	0.09
10	1.00	1.804	28.69	28.51	0.09
11	1.10	1.855	32.17	31.99	0.09
12	1.20	1.883	35.73	35.54	0.09
13	1.30	1.941	39.37	39.17	0.10
14	1.40	1.972	43.09	42.89	0.10
15	1.50	2.037	46.90	46.70	0.10
16	1.60	2.072	50.81	50.61	0.10
17	1.70	2.147	54.83	54.62	0.10
18	1.80	2.187	58.96	58.74	0.11
19	1.90	2.272	63.20	62.98	0.11
20	2.00	2.319	67.58	67.35	0.11
21	2.10	2.419	72.09	71.86	0.11
22	2.20	2.473	76.76	76.52	0.12
23	2.30	2.592	81.59	81.35	0.12
24	2.40	2.657	86.60	86.36	0.12
25	2.50	2.801	91.81	91.56	0.13
26	2.60	2.881	97.25	97.00	0.13
27	2.70	3.059	102.94	102.68	0.13
28	2.80	3.159	108.90	108.63	0.13
29	2.90	3.388	115.18	114.90	0.14
30	3.00	3.519	121.81	121.54	0.14
31	3.10	3.825	128.88	128.60	0.14
32	3.20	4.006	136.43	136.14	0.14
33	3.30	4.443	144.59	144.30	0.15
34	3.40	4.711	153.45	153.15	0.15
35	3.50	5.400	163.26	162.95	0.15
36	3.60	5.856	174.21	173.89	0.16
37	3.70	7.157	186.91	186.58	0.16
38	3.80	8.152	201.89	201.55	0.17
39	3.90	11.970	221.67	221.32	0.18
40	4.00	16.865	250.15	249.78	0.18
41	4.10	60.452	327.10	322.85	2.12
42	4.20	9.601	392.91	386.69	3.11
43	4.30	6.423	402.71	396.30	3.21
44	4.40	5.026	407.75	401.13	3.31
45	4.50	4.210	410.37	403.75	3.31
46	4.60	3.664	411.63	405.01	3.31
47	4.70	3.269	411.95	405.33	3.31
48	4.80	2.967	411.57	404.96	3.31
49	4.90	2.727	410.65	404.04	3.31
50	5.00	2.531	409.29	402.68	3.31
51	5.10	2.367	407.58	400.97	3.31
52	5.20	2.228	405.56	399.14	3.21
53	5.30	2.109	403.48	397.06	3.21
54	5.40	2.004	401.17	394.76	3.21
55	5.50	1.911	398.67	392.25	3.21
56	5.60	1.829	395.99	389.78	3.11
57	5.70	1.755	393.36	387.15	3.11
58	5.80	1.689	390.59	384.38	3.11
59	5.90	1.628	387.69	381.69	3.00
60	6.00	1.573	384.89	378.88	3.00

Candlelight Preliminary Design 31-May-17
West Detention Basin

Rational Method Unit Hydrograph 6 hr Storm

County of San Diego Hydrology Manual - Chapter 6 Lot 1

Area	17.205 ac		P6	0.95 in	P24	1.46
C	0.75	76% Imperv	Storm	2 year		
Tc=	6					
Tc=	6 minutes		I=	2.23 in/hr	7.44 P6 Tc ^-0.645	
Qpeak =	28.71 cfs		Vol	44,499		
				-	0.7125	
N=	60 Number of Precipitation Blocks			(44,499)		
				-100.00%		
Qn = 60 C A Pn/Tc		60				

Pt(n) = 0.124 P6 (n Tc)^0.355

Pn = Pt(n) - Pt(n-1)

Candlelight
West Detention Basin

N	Pt(n)	Pn	Q(n)	Q(n)
1	0.22	0.22	28.71	28.71
2	0.28	0.06	8.01	8.01
3	0.33	0.04	5.69	5.69
4	0.36	0.04	4.56	4.56
5	0.39	0.03	3.87	3.87
6	0.42	0.03	3.40	3.40
7	0.44	0.02	3.05	3.05
8	0.47	0.02	2.78	2.78
9	0.49	0.02	2.57	2.57
10	0.50	0.02	2.39	2.39
11	0.52	0.02	2.24	2.24
12	0.54	0.02	2.11	2.11
13	0.55	0.02	2.00	2.00
14	0.57	0.01	1.90	1.90
15	0.58	0.01	1.82	1.82
16	0.60	0.01	1.74	1.74
17	0.61	0.01	1.67	1.67
18	0.62	0.01	1.61	1.61
19	0.63	0.01	1.55	1.55
20	0.64	0.01	1.50	1.50
21	0.66	0.01	1.45	1.45
22	0.67	0.01	1.41	1.41
23	0.68	0.01	1.37	1.37
24	0.69	0.01	1.33	1.33
25	0.70	0.01	1.30	1.30
26	0.71	0.01	1.26	1.26
27	0.72	0.01	1.23	1.23
28	0.73	0.01	1.20	1.20
29	0.74	0.01	1.17	1.17
30	0.74	0.01	1.15	1.15
31	0.75	0.01	1.12	1.12
32	0.76	0.01	1.10	1.10
33	0.77	0.01	1.08	1.08
34	0.78	0.01	1.06	1.06
35	0.79	0.01	1.04	1.04
36	0.79	0.01	1.02	1.02
37	0.80	0.01	1.00	1.00
38	0.81	0.01	0.98	0.98
39	0.82	0.01	0.97	0.97
40	0.82	0.01	0.95	0.95
41	0.83	0.01	0.94	0.94
42	0.84	0.01	0.92	0.92
43	0.85	0.01	0.91	0.91
44	0.85	0.01	0.89	0.89
45	0.86	0.01	0.88	0.88
46	0.87	0.01	0.87	0.87
47	0.87	0.01	0.86	0.86
48	0.88	0.01	0.85	0.85
49	0.89	0.01	0.83	0.83
50	0.89	0.01	0.82	0.82
51	0.90	0.01	0.81	0.81
52	0.90	0.01	0.80	0.80
53	0.91	0.01	0.79	0.79
54	0.92	0.01	0.78	0.78
55	0.92	0.01	0.77	0.77
56	0.93	0.01	0.76	0.76
57	0.93	0.01	0.76	0.76
58	0.94	0.01	0.75	0.75
59	0.95	0.01	0.74	0.74
60	0.95	0.01	0.73	0.73
61	0.96	0.01	0.72	0.00

N	Time (min)	Time (hrs)	Qn (cfs)	N	Time (min)	Time (hrs)	Qn (cfs)
1	246	4.10	28.71	4	252	4.20	0.00
2	240	4.00	8.01	7	258	4.30	3.05
3	234	3.90	5.69	10	264	4.40	2.39
5	228	3.80	3.87	13	270	4.50	2.00
6	222	3.70	3.40	16	276	4.60	1.74
8	216	3.60	2.78	19	282	4.70	1.55
9	210	3.50	2.57	22	288	4.80	1.41
11	204	3.40	2.24	25	294	4.90	1.30
12	198	3.30	2.11	28	300	5.00	1.20
14	192	3.20	1.90	31	306	5.10	1.12
15	186	3.10	1.82	34	312	5.20	1.06
17	180	3.00	1.67	37	318	5.30	1.00
18	174	2.90	1.61	40	324	5.40	0.95
20	168	2.80	1.50	43	330	5.50	0.91
21	162	2.70	1.45	46	336	5.60	0.87
23	156	2.60	1.37	49	342	5.70	0.83
24	150	2.50	1.33	52	348	5.80	0.80
26	144	2.40	1.26	55	354	5.90	0.77
27	138	2.30	1.23	58	360	6.00	0.75
29	132	2.20	1.17	61	366	6.10	0.00
30	126	2.10	1.15	64	372	6.20	0.00
32	120	2.00	1.10	67	378	6.30	0.00
33	114	1.90	1.08	70	384	6.40	0.00
35	108	1.80	1.04	73	390	6.50	0.00
36	102	1.70	1.02	76	396	6.60	0.00
38	96	1.60	0.98	79	402	6.70	0.00
39	90	1.50	0.97	82	408	6.80	0.00
41	84	1.40	0.94	85	414	6.90	0.00
42	78	1.30	0.92				
44	72	1.20	0.89				
45	66	1.10	0.88				
47	60	1.00	0.86				
48	54	0.90	0.85				
50	48	0.80	0.82				
51	42	0.70	0.81				
53	36	0.60	0.79				
54	30	0.50	0.78				
56	24	0.40	0.76				
57	18	0.30	0.76				
59	12	0.20	0.74				
60	6	0.10	0.73				
61	0	0.00	0.00				

Candlelight
West Detention Basin

Preliminary Design 31-May-17

Post Development Hydrographs - 6 Hour Rational Method

					Ratio X/2		1.37	1.58	1.74	1.89	2.11
					P6	0.95	1.30	1.50	1.65	1.80	2.00
					Pre-Deve	9.06	12.40	14.31	15.74	17.17	19.08
					Peak	28.71	39.29	45.34	49.87	54.41	60.45
			2 Year		Return /Year	2	5	10	25	50	100
N	Time (min)	Time (hrs)	Qn (cfs)	Vol (cf)	Time (hrs)	Q(n)	Q(n)	Q(n)	Q(n)	Q(n)	Q(n)
	0	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60	6	0.10	0.73	66	0.10	0.73	1.00	1.15	1.27	1.38	1.54
59	12	0.20	0.74	265	0.20	0.74	1.01	1.17	1.28	1.40	1.56
57	18	0.30	0.76	269	0.30	0.76	1.03	1.19	1.31	1.43	1.59
56	24	0.40	0.76	274	0.40	0.76	1.05	1.21	1.33	1.45	1.61
54	30	0.50	0.78	278	0.50	0.78	1.07	1.24	1.36	1.48	1.65
53	36	0.60	0.79	283	0.60	0.79	1.08	1.25	1.38	1.50	1.67
51	42	0.70	0.81	289	0.70	0.81	1.11	1.28	1.41	1.54	1.71
50	48	0.80	0.82	294	0.80	0.82	1.13	1.30	1.43	1.56	1.73
48	54	0.90	0.85	300	0.90	0.85	1.16	1.33	1.47	1.60	1.78
47	60	1.00	0.86	306	1.00	0.86	1.17	1.35	1.49	1.62	1.80
45	66	1.10	0.88	313	1.10	0.88	1.21	1.39	1.53	1.67	1.86
44	72	1.20	0.89	320	1.20	0.89	1.22	1.41	1.55	1.69	1.88
42	78	1.30	0.92	327	1.30	0.92	1.26	1.46	1.60	1.75	1.94
41	84	1.40	0.94	335	1.40	0.94	1.28	1.48	1.63	1.77	1.97
39	90	1.50	0.97	343	1.50	0.97	1.32	1.53	1.68	1.83	2.04
38	96	1.60	0.98	351	1.60	0.98	1.35	1.55	1.71	1.86	2.07
36	102	1.70	1.02	361	1.70	1.02	1.40	1.61	1.77	1.93	2.15
35	108	1.80	1.04	370	1.80	1.04	1.42	1.64	1.80	1.97	2.19
33	114	1.90	1.08	381	1.90	1.08	1.48	1.70	1.87	2.05	2.27
32	120	2.00	1.10	393	2.00	1.10	1.51	1.74	1.91	2.09	2.32
30	126	2.10	1.15	405	2.10	1.15	1.57	1.81	2.00	2.18	2.42
29	132	2.20	1.17	418	2.20	1.17	1.61	1.86	2.04	2.23	2.47
27	138	2.30	1.23	433	2.30	1.23	1.68	1.94	2.14	2.33	2.59
26	144	2.40	1.26	449	2.40	1.26	1.73	1.99	2.19	2.39	2.66
24	150	2.50	1.33	467	2.50	1.33	1.82	2.10	2.31	2.52	2.80
23	156	2.60	1.37	486	2.60	1.37	1.87	2.16	2.38	2.59	2.88
21	162	2.70	1.45	508	2.70	1.45	1.99	2.29	2.52	2.75	3.06
20	168	2.80	1.50	532	2.80	1.50	2.05	2.37	2.61	2.84	3.16
18	174	2.90	1.61	560	2.90	1.61	2.20	2.54	2.80	3.05	3.39
17	180	3.00	1.67	591	3.00	1.67	2.29	2.64	2.90	3.17	3.52
15	186	3.10	1.82	628	3.10	1.82	2.49	2.87	3.16	3.44	3.83
14	192	3.20	1.90	670	3.20	1.90	2.60	3.00	3.30	3.61	4.01
12	198	3.30	2.11	722	3.30	2.11	2.89	3.33	3.67	4.00	4.44
11	204	3.40	2.24	783	3.40	2.24	3.06	3.53	3.89	4.24	4.71
9	210	3.50	2.57	865	3.50	2.57	3.51	4.05	4.46	4.86	5.40
8	216	3.60	2.78	962	3.60	2.78	3.81	4.39	4.83	5.27	5.86
6	222	3.70	3.40	1,113	3.70	3.40	4.65	5.37	5.90	6.44	7.16
5	228	3.80	3.87	1,309	3.80	3.87	5.30	6.11	6.73	7.34	8.15
3	234	3.90	5.69	1,720	3.90	5.69	7.78	8.98	9.88	10.77	11.97
2	240	4.00	8.01	2,465	4.00	8.01	10.96	12.65	13.91	15.18	16.87
1	246	4.10	28.71	6,611	4.10	28.71	39.29	45.34	49.87	54.41	60.45
4	252	4.20	4.56	5,990	4.20	4.56	6.24	7.20	7.92	8.64	9.60
7	258	4.30	3.05	1,370	4.30	3.05	4.18	4.82	5.30	5.78	6.42
10	264	4.40	2.39	979	4.40	2.39	3.27	3.77	4.15	4.52	5.03
13	270	4.50	2.00	790	4.50	2.00	2.74	3.16	3.47	3.79	4.21
16	276	4.60	1.74	673	4.60	1.74	2.38	2.75	3.02	3.30	3.66
19	282	4.70	1.55	593	4.70	1.55	2.12	2.45	2.70	2.94	3.27
22	288	4.80	1.41	533	4.80	1.41	1.93	2.22	2.45	2.67	2.97
25	294	4.90	1.30	487	4.90	1.30	1.77	2.05	2.25	2.45	2.73
28	300	5.00	1.20	450	5.00	1.20	1.65	1.90	2.09	2.28	2.53
31	306	5.10	1.12	419	5.10	1.12	1.54	1.78	1.95	2.13	2.37
34	312	5.20	1.06	393	5.20	1.06	1.45	1.67	1.84	2.01	2.23
37	318	5.30	1.00	371	5.30	1.00	1.37	1.58	1.74	1.90	2.11
40	324	5.40	0.95	352	5.40	0.95	1.30	1.50	1.65	1.80	2.00
43	330	5.50	0.91	335	5.50	0.91	1.24	1.43	1.58	1.72	1.91
46	336	5.60	0.87	320	5.60	0.87	1.19	1.37	1.51	1.65	1.83
49	342	5.70	0.83	306	5.70	0.83	1.14	1.32	1.45	1.58	1.76
52	348	5.80	0.80	294	5.80	0.80	1.10	1.27	1.39	1.52	1.69
55	354	5.90	0.77	284	5.90	0.77	1.06	1.22	1.34	1.47	1.63
58	360	6.00	0.75	274	6.00	0.75	1.02	1.18	1.30	1.42	1.57
61	366	6.10	0.00	134	6.10	0.00	0.00	0.00	0.00	0.00	0.00

Candlelight
West

31-May-17

Pre-Development Condition

Rational Method Unit Hydrograph 6 hr Storm

County of San Diego Hydrology Manual - Chapter 6

Area	17.205 ac	P6	0.95 in	P24	1.46
C	0.35	Storm	2 year		
Tc=	11				
Tc=	11 minutes	I=	1.51 in/hr	7.44 P6 Tc ^-0.645	
Qpeak =	9.06 cfs	Vol	20,766		

Peak Runoff - PreDevelopment

Year	Peak (cfs)
2	9.06
5	12.40
10	14.31
25	15.74
50	17.17
100	19.08

EAST DETENTION BASIN ANALYSIS

County SD - Hydrology Manual

Hydrology & Rational Method Hydrograph Exceprts

Candlelight Detention East / HMP

Tributary Areas

Preliminary Design 3-Oct-17

Lot 3 / Street	8.630
	0
	0
Total	8.63 ac

6-Hour Rational Method Hydrograph

	Elev	Storage (cf)	Storage (ac-ft)
Floor of Storage	500.00	0	
Overflow	505.00	66,455	1.53
Top Of Storage	505.60	75,617	1.74

Storm Frequency	Qexist (cfs)	Qin (cfs)	Qout (cfs)	WSEL (ft)	Depth (ft)
2 YEAR	4.55	14.60	0.047	501.90	1.900
5 YEAR	6.22	19.97	0.054	502.50	2.500
10 YEAR	7.18	23.05	0.057	502.80	2.800
25 YEAR	7.90	25.35	0.059	503.00	3.000
50 YEAR	8.61	27.65	0.061	503.20	3.200
100 YEAR	9.57	30.73	0.063	503.50	3.500

Outlet Control Structure Use 4' x 4' grate

Opening	#1	#2	#3	Overflow - Grate
Elevation	500.0	503.7		505.00
Width (in)	1.25	12	Not	4 feet
Height (in)	1.25	4	Used	4 feet

Outlet Dia	18	in
Flowline	498.00	
Top of Structure	505.00	

Efficiency Gross (%) 0.00% Storage (per ac) 7,700 cf

Candlelight Detention East / HMP

1

East Tank	Top	505.60	75,617 cf	Height	0.00	3.70	5.00
	Storage @ Overflow	505.00	66,455 cf		1.25	4	48
Basin Storage Volumes		113.79%	dT= 6		1.25	12	48

DEPTH (FT)	ELEVATION	AREA (SF)	Raw Storage (CF)	Water Quality (CF)	STORAGE (CF)	2S/dT (CFS)	2S/dT + O (CFS)	OUTFLOW (CFS)	#1 (CFS)	#2 (CFS)	#3 (CFS)	Overflo (CFS)
0.00	500.00	**0**	0	0	0	0.00	0.00	0.00	0.0000			
0.10	500.10	20	1	0	1	0.01	0.02	0.01	0.0107			
0.20	500.20	40	4	0	4	0.02	0.04	0.02	0.0152			
0.30	500.30	60	9	0	9	0.05	0.07	0.02	0.0186			
0.40	500.40	80	16	0	16	0.09	0.11	0.02	0.0215			
0.50	500.50	**100**	25	0	25	0.14	0.16	0.02	0.0240			
0.60	500.60	15,270	794	0	794	4.41	4.43	0.03	0.0263			
0.70	500.70	15,270	2,321	0	2,321	12.89	12.92	0.03	0.0284			
0.80	500.80	15,270	3,848	0	3,848	21.38	21.41	0.03	0.0303			
0.90	500.90	15,270	5,375	0	5,375	29.86	29.89	0.03	0.0322			
1.00	501.00	15,270	6,902	0	6,902	38.34	38.38	0.03	0.0339			
1.10	501.10	15,270	8,429	0	8,429	46.83	46.86	0.04	0.0356			
1.20	501.20	15,270	9,956	0	9,956	55.31	55.35	0.04	0.0372			
1.30	501.30	15,270	11,483	0	11,483	63.79	63.83	0.04	0.0387			
1.40	501.40	15,270	13,010	0	13,010	72.28	72.32	0.04	0.0401			
1.50	501.50	15,270	14,537	0	14,537	80.76	80.80	0.04	0.0415			
1.60	501.60	15,270	16,064	0	16,064	89.24	89.28	0.04	0.0429			
1.70	501.70	15,270	17,591	0	17,591	97.73	97.77	0.04	0.0442			
1.80	501.80	15,270	19,118	0	19,118	106.21	106.25	0.05	0.0455			
1.90	501.90	15,270	20,645	0	20,645	114.69	114.74	0.05	0.0468			
2.00	502.00	15,270	22,172	0	22,172	123.18	123.22	0.05	0.0480			
2.10	502.10	15,270	23,699	0	23,699	131.66	131.71	0.05	0.0492			
2.20	502.20	15,270	25,226	0	25,226	140.14	140.19	0.05	0.0503			
2.30	502.30	15,270	26,753	0	26,753	148.63	148.68	0.05	0.0514			
2.40	502.40	15,270	28,280	0	28,280	157.11	157.16	0.05	0.0526			
2.50	502.50	15,270	29,807	0	29,807	165.59	165.65	0.05	0.0536			
2.60	502.60	15,270	31,334	0	31,334	174.08	174.13	0.05	0.0547			
2.70	502.70	15,270	32,861	0	32,861	182.56	182.61	0.06	0.0557			
2.80	502.80	15,270	34,388	0	34,388	191.04	191.10	0.06	0.0568			
2.90	502.90	15,270	35,915	0	35,915	199.53	199.58	0.06	0.0578			
3.00	503.00	15,270	37,442	0	37,442	208.01	208.07	0.06	0.0588			
3.10	503.10	15,270	38,969	0	38,969	216.49	216.55	0.06	0.0597			
3.20	503.20	15,270	40,496	0	40,496	224.98	225.04	0.06	0.0607			
3.30	503.30	15,270	42,023	0	42,023	233.46	233.52	0.06	0.0616			
3.40	503.40	15,270	43,550	0	43,550	241.94	242.00	0.06	0.0625			
3.50	503.50	15,270	45,077	0	45,077	250.43	250.49	0.06	0.0635			
3.60	503.60	15,270	46,604	0	46,604	258.91	258.97	0.06	0.0644			
3.70	503.70	15,270	48,131	0	48,131	267.39	267.46	0.07	0.0652	0.00		
3.80	503.80	15,270	49,658	0	49,658	275.88	276.03	0.15	0.0661	0.09		
3.90	503.90	15,270	51,185	0	51,185	284.36	284.67	0.31	0.0670	0.24		
4.00	504.00	15,270	52,712	0	52,712	292.84	293.35	0.51	0.0678	0.44		
4.10	504.10	15,270	54,239	0	54,239	301.33	302.08	0.75	0.0687	0.68		
4.20	504.20	15,270	55,766	0	55,766	309.81	310.80	1.00	0.0695	0.93		
4.30	504.30	15,270	57,293	0	57,293	318.29	319.42	1.13	0.0703	1.06		
4.40	504.40	15,270	58,820	0	58,820	326.78	328.43	1.66	0.4881	1.17		
4.50	504.50	15,270	60,347	0	60,347	335.26	337.74	2.48	1.2066	1.28		
4.60	504.60	15,270	61,874	0	61,874	343.74	347.08	3.33	1.9598	1.37		
4.70	504.70	15,270	63,401	0	63,401	352.23	356.21	3.99	2.5236	1.46		
4.80	504.80	15,270	64,928	0	64,928	360.71	365.09	4.38	2.8285	1.55		
4.90	504.90	15,270	66,455	0	66,455	369.19	373.95	4.76	3.1247	1.63		
5.00	505.00	15,270	67,982	0	67,982	377.68	382.75	5.08	3.3698	1.71		0.00
5.10	505.10	15,270	69,509	0	69,509	386.16	391.62	5.46	3.5980	1.78		0.09
5.20	505.20	15,270	71,036	0	71,036	394.64	400.55	5.91	3.8124	1.85		0.24
5.30	505.30	15,270	72,563	0	72,563	403.13	409.50	6.38	4.0151	1.92		0.44
5.40	505.40	15,270	74,090	0	74,090	411.61	418.49	6.88	4.2080	1.99		0.68
5.50	505.50	15,270	75,617	0	75,617	420.09	427.46	7.37	4.3924	2.05		0.93
5.60	505.60	15,270	77,144	0	77,144	428.58	436.31	7.74	4.5692	2.11		1.06

East

DETENTION BASIN ROUTING

4.55

14.60

0.05

2 YEAR EVENT ~ 6 Hour STORM

501.90

6	Minutes				
Interval	T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	0.371	0.00	0.00	0.000
2	0.20	0.376	0.75	0.70	0.024
3	0.30	0.384	1.46	1.41	0.024
4	0.40	0.388	2.18	2.14	0.024
5	0.50	0.398	2.92	2.87	0.024
6	0.60	0.403	3.67	3.63	0.024
7	0.70	0.413	4.44	4.39	0.026
8	0.80	0.418	5.22	5.17	0.026
9	0.90	0.430	6.02	5.96	0.026
10	1.00	0.435	6.83	6.78	0.026
11	1.10	0.448	7.66	7.61	0.026
12	1.20	0.455	8.51	8.46	0.026
13	1.30	0.469	9.38	9.33	0.026
14	1.40	0.476	10.27	10.22	0.026
15	1.50	0.492	11.19	11.13	0.026
16	1.60	0.500	12.13	12.07	0.026
17	1.70	0.518	13.09	13.04	0.028
18	1.80	0.528	14.08	14.02	0.028
19	1.90	0.549	15.10	15.04	0.028
20	2.00	0.560	16.15	16.10	0.028
21	2.10	0.584	17.24	17.18	0.028
22	2.20	0.597	18.36	18.31	0.028
23	2.30	0.626	19.53	19.47	0.028
24	2.40	0.642	20.74	20.68	0.028
25	2.50	0.676	22.00	21.94	0.030
26	2.60	0.696	23.31	23.25	0.030
27	2.70	0.739	24.69	24.63	0.030
28	2.80	0.763	26.13	26.07	0.030
29	2.90	0.818	27.65	27.59	0.030
30	3.00	0.850	29.26	29.19	0.030
31	3.10	0.924	30.97	30.90	0.032
32	3.20	0.967	32.79	32.73	0.032
33	3.30	1.073	34.77	34.70	0.032
34	3.40	1.137	36.92	36.85	0.032
35	3.50	1.304	39.29	39.22	0.034
36	3.60	1.414	41.94	41.87	0.034
37	3.70	1.728	45.02	44.95	0.034
38	3.80	1.968	48.64	48.57	0.036
39	3.90	2.890	53.43	53.36	0.036
40	4.00	4.072	60.32	60.25	0.037
41	4.10	14.595	78.91	78.83	0.040
42	4.20	2.318	95.75	95.66	0.043
43	4.30	1.551	99.53	99.44	0.044
44	4.40	1.213	102.21	102.12	0.044
45	4.50	1.016	104.35	104.26	0.044
46	4.60	0.885	106.16	106.07	0.044
47	4.70	0.789	107.75	107.65	0.046
48	4.80	0.716	109.16	109.07	0.046
49	4.90	0.658	110.44	110.35	0.046
50	5.00	0.611	111.62	111.53	0.046
51	5.10	0.572	112.71	112.62	0.046
52	5.20	0.538	113.73	113.64	0.046
53	5.30	0.509	114.69	114.60	0.046
54	5.40	0.484	115.59	115.50	0.047
54	5.50	0.461	116.44	116.35	0.047
54	5.60	0.442	117.25	117.16	0.047
54	5.70	0.424	118.02	117.93	0.047
54	5.80	0.408	118.76	118.67	0.047
54	5.90	0.393	119.47	119.38	0.047
54	6.00	0.380	120.15	120.05	0.047

East

DETENTION BASIN ROUTING

6.22

19.97

0.05

5 YEAR EVENT ~ 6 Hour STORM

502.50

6 Interval	Minutes T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	0.508	0.00	0.00	0.00
2	0.20	0.514	1.02	0.97	0.02
3	0.30	0.526	2.01	1.97	0.02
4	0.40	0.532	3.02	2.97	0.02
5	0.50	0.544	4.05	4.00	0.02
6	0.60	0.551	5.10	5.05	0.03
7	0.70	0.565	6.16	6.11	0.03
8	0.80	0.572	7.25	7.19	0.03
9	0.90	0.588	8.35	8.30	0.03
10	1.00	0.596	9.49	9.43	0.03
11	1.10	0.613	10.64	10.59	0.03
12	1.20	0.622	11.82	11.77	0.03
13	1.30	0.641	13.03	12.98	0.03
14	1.40	0.651	14.27	14.21	0.03
15	1.50	0.673	15.54	15.48	0.03
16	1.60	0.685	16.84	16.78	0.03
17	1.70	0.709	18.18	18.12	0.03
18	1.80	0.722	19.55	19.49	0.03
19	1.90	0.751	20.97	20.91	0.03
20	2.00	0.766	22.43	22.37	0.03
21	2.10	0.799	23.93	23.87	0.03
22	2.20	0.817	25.49	25.43	0.03
23	2.30	0.856	27.10	27.04	0.03
24	2.40	0.878	28.77	28.71	0.03
25	2.50	0.925	30.52	30.45	0.03
26	2.60	0.952	32.33	32.27	0.03
27	2.70	1.011	34.23	34.16	0.03
28	2.80	1.044	36.22	36.15	0.03
29	2.90	1.119	38.32	38.25	0.03
30	3.00	1.163	40.54	40.47	0.03
31	3.10	1.264	42.89	42.83	0.03
32	3.20	1.323	45.41	45.35	0.03
33	3.30	1.468	48.14	48.07	0.04
34	3.40	1.557	51.09	51.02	0.04
35	3.50	1.784	54.36	54.29	0.04
36	3.60	1.935	58.01	57.93	0.04
37	3.70	2.365	62.23	62.16	0.04
38	3.80	2.693	67.22	67.14	0.04
39	3.90	3.955	73.79	73.71	0.04
40	4.00	5.572	83.23	83.15	0.04
41	4.10	19.973	108.69	108.60	0.05
42	4.20	3.172	131.75	131.65	0.05
43	4.30	2.122	136.94	136.84	0.05
44	4.40	1.661	140.63	140.53	0.05
45	4.50	1.391	143.58	143.48	0.05
46	4.60	1.211	146.08	145.98	0.05
47	4.70	1.080	148.27	148.17	0.05
48	4.80	0.980	150.23	150.13	0.05
49	4.90	0.901	152.01	151.90	0.05
50	5.00	0.836	153.64	153.54	0.05
51	5.10	0.782	155.16	155.05	0.05
52	5.20	0.736	156.57	156.47	0.05

East

DETENTION BASIN ROUTING

7.18

23.05

0.057

10 YEAR EVENT ~ 6 Hour STORM

502.80

6 Interval	Minutes T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	0.586	0.00	0.00	0.000
2	0.20	0.593	1.18	1.13	0.024
3	0.30	0.606	2.33	2.28	0.024
4	0.40	0.613	3.50	3.45	0.024
5	0.50	0.628	4.70	4.64	0.026
6	0.60	0.636	5.91	5.85	0.026
7	0.70	0.652	7.14	7.09	0.026
8	0.80	0.660	8.40	8.35	0.026
9	0.90	0.678	9.69	9.64	0.026
10	1.00	0.688	11.00	10.95	0.026
11	1.10	0.707	12.34	12.29	0.026
12	1.20	0.718	13.72	13.66	0.028
13	1.30	0.740	15.12	15.06	0.028
14	1.40	0.752	16.55	16.50	0.028
15	1.50	0.777	18.02	17.97	0.028
16	1.60	0.790	19.53	19.48	0.028
17	1.70	0.818	21.08	21.03	0.028
18	1.80	0.834	22.68	22.62	0.030
19	1.90	0.866	24.32	24.26	0.030
20	2.00	0.884	26.01	25.95	0.030
21	2.10	0.922	27.75	27.69	0.030
22	2.20	0.943	29.56	29.50	0.030
23	2.30	0.988	31.43	31.36	0.032
24	2.40	1.013	33.37	33.30	0.032
25	2.50	1.068	35.38	35.32	0.032
26	2.60	1.098	37.48	37.42	0.032
27	2.70	1.166	39.68	39.62	0.034
28	2.80	1.204	41.99	41.92	0.034
29	2.90	1.292	44.41	44.35	0.034
30	3.00	1.342	46.98	46.91	0.036
31	3.10	1.458	49.71	49.64	0.036
32	3.20	1.527	52.62	52.55	0.036
33	3.30	1.694	55.77	55.70	0.037
34	3.40	1.796	59.19	59.11	0.037
35	3.50	2.059	62.97	62.89	0.037
36	3.60	2.232	67.18	67.11	0.039
37	3.70	2.728	72.07	71.99	0.039
38	3.80	3.108	77.83	77.75	0.040
39	3.90	4.563	85.42	85.33	0.042
40	4.00	6.429	96.33	96.24	0.043
41	4.10	23.045	125.72	125.62	0.048
42	4.20	3.660	152.32	152.22	0.051
43	4.30	2.449	158.33	158.23	0.053
44	4.40	1.916	162.59	162.48	0.053
45	4.50	1.605	166.01	165.90	0.054
46	4.60	1.397	168.90	168.79	0.054
47	4.70	1.246	171.44	171.33	0.054
48	4.80	1.131	173.71	173.60	0.054
49	4.90	1.040	175.77	175.66	0.055
50	5.00	0.965	177.66	177.55	0.055
51	5.10	0.903	179.42	179.31	0.055
52	5.20	0.850	181.06	180.95	0.055
53	5.30	0.804	182.61	182.50	0.055
54	5.40	0.764	184.07	183.95	0.056
55	5.50	0.729	185.45	185.34	0.056
56	5.60	0.697	186.76	186.65	0.056
57	5.70	0.669	188.02	187.90	0.056
58	5.80	0.644	189.22	189.11	0.056
59	5.90	0.621	190.37	190.26	0.056
60	6.00	0.600	191.48	191.37	0.057

East

DETENTION BASIN ROUTING

7.90

25.35

0.06

25 YEAR EVENT ~ 6 Hour STORM

6 Min

503

Interval	T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	0.645	0.00	0.00	0.00
2	0.20	0.652	1.30	1.25	0.02
3	0.30	0.667	2.57	2.52	0.02
4	0.40	0.675	3.86	3.81	0.02
5	0.50	0.691	5.18	5.13	0.03
6	0.60	0.699	6.52	6.47	0.03
7	0.70	0.717	7.88	7.83	0.03
8	0.80	0.726	9.27	9.22	0.03
9	0.90	0.746	10.69	10.64	0.03
10	1.00	0.756	12.14	12.09	0.03
11	1.10	0.778	13.62	13.57	0.03
12	1.20	0.790	15.14	15.08	0.03
13	1.30	0.814	16.68	16.63	0.03
14	1.40	0.827	18.27	18.21	0.03
15	1.50	0.854	19.89	19.83	0.03
16	1.60	0.869	21.56	21.50	0.03
17	1.70	0.900	23.26	23.20	0.03
18	1.80	0.917	25.02	24.96	0.03
19	1.90	0.953	26.83	26.77	0.03
20	2.00	0.972	28.69	28.63	0.03
21	2.10	1.014	30.62	30.56	0.03
22	2.20	1.037	32.61	32.54	0.03
23	2.30	1.087	34.67	34.60	0.03
24	2.40	1.114	36.80	36.74	0.03
25	2.50	1.175	39.03	38.96	0.03
26	2.60	1.208	41.34	41.28	0.03
27	2.70	1.283	43.77	43.70	0.03
28	2.80	1.325	46.31	46.24	0.03
29	2.90	1.421	48.98	48.91	0.04
30	3.00	1.476	51.81	51.74	0.04
31	3.10	1.604	54.82	54.75	0.04
32	3.20	1.680	58.03	57.96	0.04
33	3.30	1.863	61.50	61.43	0.04
34	3.40	1.976	65.26	65.19	0.04
35	3.50	2.265	69.43	69.35	0.04
36	3.60	2.455	74.07	73.99	0.04
37	3.70	3.001	79.45	79.37	0.04
38	3.80	3.418	85.79	85.70	0.04
39	3.90	5.019	94.14	94.05	0.04
40	4.00	7.072	106.15	106.06	0.04
41	4.10	25.350	138.48	138.38	0.05
42	4.20	4.026	167.76	167.65	0.05
43	4.30	2.694	174.37	174.26	0.05
44	4.40	2.108	179.06	178.95	0.05
45	4.50	1.765	182.82	182.71	0.06
46	4.60	1.536	186.01	185.90	0.06
47	4.70	1.371	188.81	188.70	0.06
48	4.80	1.244	191.31	191.20	0.06
49	4.90	1.143	193.59	193.47	0.06
50	5.00	1.061	195.68	195.57	0.06
51	5.10	0.993	197.62	197.51	0.06
52	5.20	0.934	199.43	199.32	0.06
53	5.30	0.884	201.14	201.02	0.06
54	5.40	0.840	202.75	202.63	0.06
55	5.50	0.801	204.27	204.16	0.06
56	5.60	0.767	205.73	205.61	0.06
57	5.70	0.736	207.11	207.00	0.06
58	5.80	0.708	208.44	208.32	0.06
59	5.90	0.683	209.72	209.60	0.06
60	6.00	0.660	210.94	210.82	0.06
61	6.10	0.000	211.48	211.36	0.06

East

DETENTION BASIN ROUTING

8.61

27.65

0.06

50 YEAR EVENT ~ 6 Hour STORM

6 Min

503.2

Interval	T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	0.704	0.00	0.00	0.00
2	0.20	0.712	1.42	1.37	0.02
3	0.30	0.728	2.81	2.76	0.02
4	0.40	0.736	4.22	4.17	0.02
5	0.50	0.754	5.66	5.61	0.03
6	0.60	0.763	7.13	7.08	0.03
7	0.70	0.782	8.62	8.57	0.03
8	0.80	0.792	10.14	10.09	0.03
9	0.90	0.814	11.70	11.64	0.03
10	1.00	0.825	13.28	13.23	0.03
11	1.10	0.849	14.90	14.84	0.03
12	1.20	0.861	16.55	16.50	0.03
13	1.30	0.888	18.25	18.19	0.03
14	1.40	0.902	19.98	19.92	0.03
15	1.50	0.932	21.76	21.70	0.03
16	1.60	0.948	23.58	23.51	0.03
17	1.70	0.982	25.44	25.38	0.03
18	1.80	1.000	27.37	27.31	0.03
19	1.90	1.040	29.35	29.28	0.03
20	2.00	1.061	31.39	31.32	0.03
21	2.10	1.107	33.49	33.42	0.03
22	2.20	1.131	35.66	35.60	0.03
23	2.30	1.186	37.91	37.85	0.03
24	2.40	1.216	40.25	40.18	0.03
25	2.50	1.281	42.68	42.61	0.03
26	2.60	1.318	45.21	45.14	0.03
27	2.70	1.399	47.86	47.79	0.04
28	2.80	1.445	50.64	50.56	0.04
29	2.90	1.550	53.56	53.49	0.04
30	3.00	1.610	56.65	56.57	0.04
31	3.10	1.750	59.93	59.86	0.04
32	3.20	1.832	63.44	63.37	0.04
33	3.30	2.032	67.23	67.15	0.04
34	3.40	2.155	71.34	71.26	0.04
35	3.50	2.470	75.89	75.81	0.04
36	3.60	2.679	80.96	80.88	0.04
37	3.70	3.274	86.83	86.75	0.04
38	3.80	3.729	93.75	93.66	0.04
39	3.90	5.476	102.87	102.78	0.04
40	4.00	7.715	115.97	115.88	0.05
41	4.10	27.654	151.25	151.14	0.05
42	4.20	4.392	183.19	183.08	0.06
43	4.30	2.938	190.41	190.30	0.06
44	4.40	2.299	195.53	195.42	0.06
45	4.50	1.926	199.65	199.53	0.06
46	4.60	1.676	203.13	203.02	0.06
47	4.70	1.495	206.19	206.07	0.06
48	4.80	1.357	208.93	208.81	0.06
49	4.90	1.247	211.41	211.29	0.06
50	5.00	1.158	213.70	213.58	0.06
51	5.10	1.083	215.82	215.71	0.06
52	5.20	1.019	217.81	217.69	0.06
53	5.30	0.965	219.67	219.55	0.06
54	5.40	0.917	221.43	221.32	0.06
55	5.50	0.874	223.11	222.99	0.06
56	5.60	0.837	224.70	224.58	0.06
57	5.70	0.803	226.22	226.10	0.06
58	5.80	0.772	227.67	227.55	0.06
59	5.90	0.745	229.07	228.95	0.06
60	6.00	0.719	230.41	230.29	0.06
61	6.10	0.000	231.01	230.89	0.06

East

DETENTION BASIN ROUTING

30.73

100 YEAR EVENT ~ 6 Hour STORM

9.57
0.06 Q Out

503.50 Max WSEL

6 Min

Interval	T (HRS)	Q IN (CFS)	2S/dT+O	2S/dT-O (CFS)	O (CFS)
1	0.10	0.782	0.00	0.00	0.000
2	0.20	0.791	1.57	1.52	0.024
3	0.30	0.809	3.12	3.08	0.024
4	0.40	0.818	4.70	4.65	0.026
5	0.50	0.837	6.30	6.25	0.026
6	0.60	0.848	7.94	7.88	0.026
7	0.70	0.869	9.60	9.55	0.026
8	0.80	0.881	11.30	11.25	0.026
9	0.90	0.904	13.03	12.97	0.028
10	1.00	0.917	14.80	14.74	0.028
11	1.10	0.943	16.60	16.54	0.028
12	1.20	0.957	18.44	18.39	0.028
13	1.30	0.987	20.33	20.27	0.028
14	1.40	1.002	22.26	22.20	0.030
15	1.50	1.035	24.24	24.18	0.030
16	1.60	1.053	26.27	26.21	0.030
17	1.70	1.091	28.35	28.29	0.030
18	1.80	1.111	30.49	30.43	0.032
19	1.90	1.155	32.69	32.63	0.032
20	2.00	1.179	34.96	34.90	0.032
21	2.10	1.230	37.31	37.24	0.032
22	2.20	1.257	39.73	39.66	0.034
23	2.30	1.318	42.24	42.17	0.034
24	2.40	1.351	44.84	44.77	0.034
25	2.50	1.424	47.54	47.47	0.036
26	2.60	1.464	50.36	50.29	0.036
27	2.70	1.555	53.31	53.24	0.036
28	2.80	1.606	56.40	56.32	0.037
29	2.90	1.722	59.65	59.58	0.037
30	3.00	1.789	63.09	63.01	0.037
31	3.10	1.944	66.75	66.67	0.039
32	3.20	2.036	70.65	70.57	0.039
33	3.30	2.258	74.87	74.79	0.040
34	3.40	2.395	79.44	79.36	0.040
35	3.50	2.745	84.50	84.41	0.042
36	3.60	2.976	90.14	90.05	0.043
37	3.70	3.638	96.66	96.58	0.043
38	3.80	4.144	104.36	104.27	0.044
39	3.90	6.084	114.50	114.41	0.046
40	4.00	8.572	129.07	128.97	0.048
41	4.10	30.727	168.27	168.16	0.054
42	4.20	4.880	203.77	203.65	0.058
43	4.30	3.265	211.80	211.68	0.059
44	4.40	2.555	217.50	217.38	0.060
45	4.50	2.140	222.07	221.95	0.060
46	4.60	1.862	225.96	225.84	0.061
47	4.70	1.661	229.36	229.24	0.061
48	4.80	1.508	232.41	232.29	0.061
49	4.90	1.386	235.18	235.06	0.062
50	5.00	1.286	237.73	237.61	0.062
51	5.10	1.203	240.10	239.97	0.062
52	5.20	1.133	242.31	242.18	0.063
53	5.30	1.072	244.39	244.26	0.063
54	5.40	1.018	246.35	246.23	0.063
55	5.50	0.972	248.22	248.09	0.063
56	5.60	0.930	249.99	249.87	0.063
57	5.70	0.892	251.69	251.56	0.063
58	5.80	0.858	253.31	253.19	0.063
59	5.90	0.828	254.87	254.75	0.063
60	6.00	0.799	256.37	256.25	0.063

3.1.4 Time of Concentration

The Time of Concentration (T_c) is the time required for runoff to flow from the most remote part of the drainage area to the point of interest. The T_c is composed of two components: initial time of concentration (T_i) and travel time (T_t). Methods of computation for T_i and T_t are discussed below. The T_i is the time required for runoff to travel across the surface of the most remote subarea in the study, or "initial subarea." Guidelines for designating the initial subarea are provided within the discussion of computation of T_i. The T_t is the time required for the runoff to flow in a watercourse (e.g., swale, channel, gutter, pipe) or series of watercourses from the initial subarea to the point of interest. For the RM, the T_c at any point within the drainage area is given by:

$$T_c = T_i + T_t$$

Methods of calculation differ for natural watersheds (nonurbanized) and for urban drainage systems. When analyzing storm drain systems, the designer must consider the possibility that an existing natural watershed may become urbanized during the useful life of the storm drain system. Future land uses must be used for T_c and runoff calculations, and can be determined from the local Community General Plan.

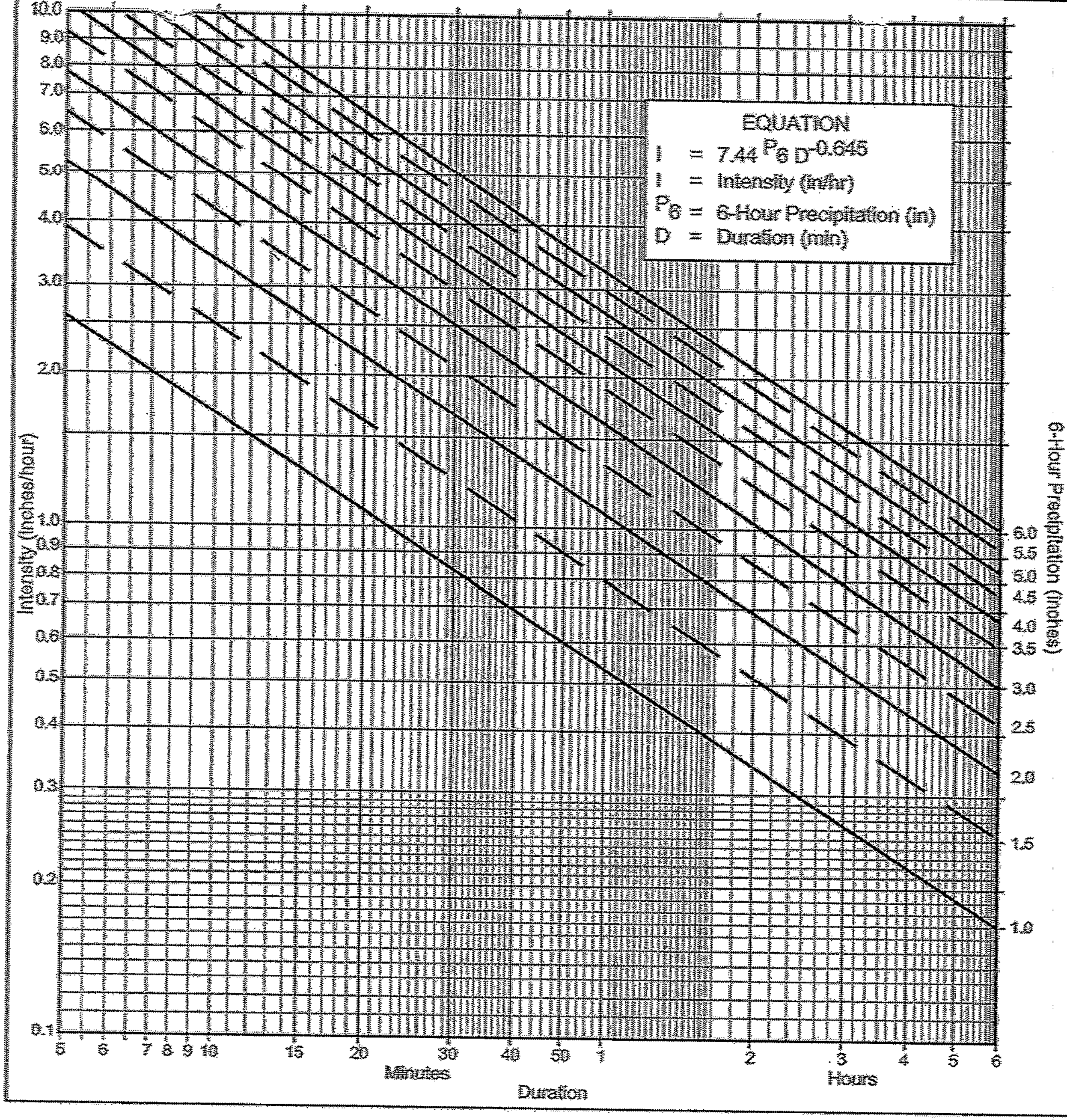
3.1.4.1 Initial Time of Concentration

The initial time of concentration is typically based on sheet flow at the upstream end of a drainage basin. The Overland Time of Flow (Figure 3-3) is approximated by an equation developed by the Federal Aviation Agency (FAA) for analyzing flow on runaways (FAA, 1970). The usual runway configuration consists of a crown, like most freeways, with sloping pavement that directs flow to either side of the runway. This type of flow is uniform in the direction perpendicular to the velocity and is very shallow. Since these depths are ¼ of an inch (more or less) in magnitude, the relative roughness is high. Some higher relative roughness values for overland flow are presented in Table 3.5 of the *HEC-1 Flood Hydrograph Package User's Manual* (USACE, 1990).

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service



EQUATION

$I = 7.44 P_6 D^{-0.645}$

I = Intensity (in/hr)

P_6 = 6-Hour Precipitation (in)

D = Duration (min)

Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency ______ year

(b) P_6 = ______ in., P_{24} = ______, $\frac{P_6}{P_{24}}$ = ______ %$^{(2)}$

(c) Adjusted $P_6^{(2)}$ = ______ in.

(d) t_x = ______ min.

(e) I = ______ in./hr.

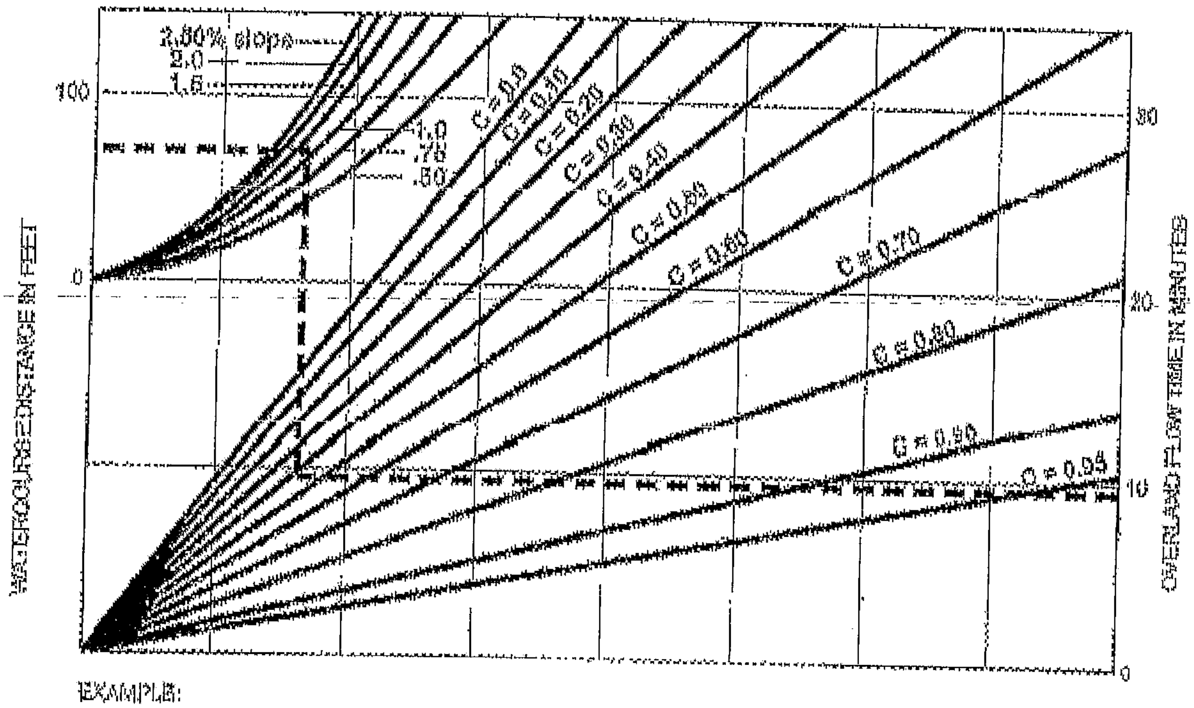
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.0%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.6 Minutes

$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

Rational Formula - Overland Time of Flow Nomograph

FIGURE

3-3

The sheet flow that is predicted by the FAA equation is limited to conditions that are similar to runway topography. Some considerations that limit the extent to which the FAA equation applies are identified below:

- Urban Areas - This "runway type" runoff includes:
  1) Flat roofs, sloping at 1% ±
  2) Parking lots at the extreme upstream drainage basin boundary (at the "ridge" of a catchment area).
     Even a parking lot is limited in the amounts of sheet flow. Parked or moving vehicles would "break-up" the sheet flow, concentrating runoff into streams that are not characteristic of sheet flow.
  3) Driveways are constructed at the upstream end of catchment areas in some developments. However, if flow from a roof is directed to a driveway through a downspout or other conveyance mechanism, flow would be concentrated.
  4) Flat slopes are prone to meandering flow that tends to be disrupted by minor irregularities and obstructions. Maximum Overland Flow lengths are shorter for the flatter slopes (see Table 3-2).

- Rural or Natural Areas - The FAA equation is applicable to these conditions since (.5% to 10%) slopes that are uniform in width of flow have slow velocities consistent with the equation. Irregularities in terrain limit the length of application.
  1) Most hills and ridge lines have a relatively flat area near the drainage divide. However, with flat slopes of .5% ±, minor irregularities would cause flow to concentrate into streams.
  2) Parks, lawns and other vegetated areas would have slow velocities that are consistent with the FAA Equation.

The concepts related to the initial time of concentration were evaluated in a report entitled *Initial Time of Concentration, Analysis of Parameters* (Hill, 2002) that was reviewed by the Hydrology Manual Committee. The Report is available at San Diego County Department of Public Works, Flood Control Section and on the San Diego County Department of Public Works web page.

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/	.5%		1%		2%		3%		5%		10%	
	Acre	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.9
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description

3.1.4.1A Planning Considerations

The purpose of most hydrology studies is to develop flood flow values for areas that are not at the upstream end of the basin. Another example is the Master Plan, which is usually completed before the actual detailed design of lots, streets, etc. are accomplished. In these situations it is necessary that the initial time of concentration be determined without detailed information about flow patterns.

To provide guidance for the initial time of concentration design parameters, Table 3-2 includes the Land Use Elements and other variables related to the Time of Concentration. The table development included a review of the typical "layout" of the different Land Use Elements and related flow patterns and consideration of the extent of the sheet flow regimen, the effect of ponding, the significance to the drainage basin, downstream effects, etc.

3.1.4.1B Computation Criteria

(a) <u>Developed Drainage Areas With Overland Flow</u> - Ti may be obtained directly from the chart, "Rational Formula – Overland Time of Flow Nomograph," shown in Figure 3-3 or from Table 3-2. This chart is based on the Federal Aviation Agency (FAA) equation (FAA, 1970). For the short rain durations (<15 minutes) involved, intensities are high but the depth of flooding is limited and much of the runoff is stored temporarily in the overland flow and in shallow ponded areas. In developed areas, overland flow is limited to lengths given in Table 3-2. Beyond these distances, flow tends to become concentrated into streets, gutters, swales, ditches, etc.

(5) Natural Or Rural Watersheds – These areas usually have an initial subarea at the upstream end with sheet flow. The sheet flow length is limited to 50 to 100 feet as specified in Table 3-2. The Overland Time of Flow Nomograph, Figure 3-3, can be used to obtain T_i. The initial time of concentration can excessively affect the magnitude of flow further downstream in the drainage basin. For instance, variations in the initial time of concentration for an initial subarea of one acre can change the flow further downstream where the area is 400 acres by 100%. Therefore, the initial time of concentration is limited (see Table 3-2).

The Rational Method procedure included in the original Hydrology Manual (1971) and Design and Procedure Manual (1968) included a 10 minute value to be added to the initial time of concentration developed through the Kirpich Formula (see Figure 3-4) for a natural watershed. That procedure is superceded by the procedure above to use Table 3-2 or Figure 3-3 to determine T_i for the appropriate sheet flow length of the initial subarea. The values for natural watersheds given in Table 3-2 vary from 13 to 7 minutes, depending on slope. If the total length of the initial subarea is greater than the maximum length allowable based on Table 3-2, add the travel time based on the Kirpich formula for the remaining length of the initial subarea.

3.1.4.2 Travel Time

The T_t is the time required for the runoff to flow in a watercourse (e.g., swale, channel, gutter, pipe) or series of watercourses from the initial subarea to the point of interest. The T_t is computed by dividing the length of the flow path by the computed flow velocity. Since the velocity normally changes as a result of each change in flow rate or slope, such as at an inlet or grade break, the total T_t must be computed as the sum of the T_t's for each section of the flow path. Use Figure 3-6 to estimate time of travel for street gutter flow. Velocity in a channel can be estimated by using the nomograph shown in Figure 3-7 (Manning's Equation Nomograph).

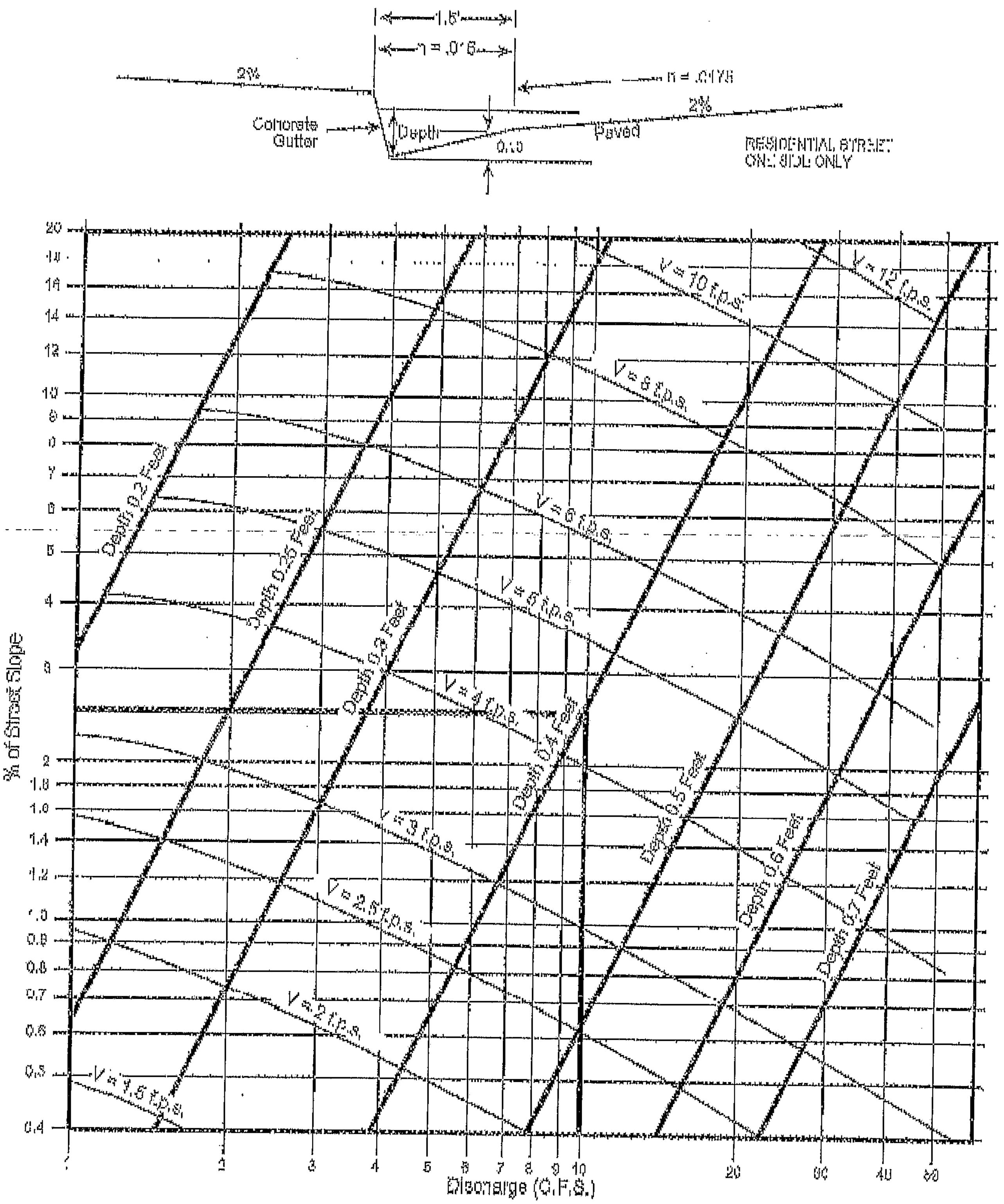
(a) Natural Watersheds – This includes rural, ranch, and agricultural areas with natural channels. Obtain T_t directly from the Kirpich nomograph in Figure 3-4 or from the equation. This nomograph requires values for length and change in elevation along the effective slope line for the subarea. See Figure 3-5 for a representation of the effective slope line.

This nomograph is based on the Kirpich formula, which was developed with data from agricultural watersheds ranging from 1.25 to 112 acres in area, 350 to 4,000 feet in length, and 2.7 to 8.8% slope (Kirpich, 1940). A maximum length of 4,000 feet should be used for the subarea length. Typically, as the flow length increases, the depth of flow will increase, and therefore it is considered a concentration of flow at points beyond lengths listed in Figure 3-2. However, because the Kirpich formula has been shown to be applicable for watersheds up to 4,000 feet in length (Kirpich, 1940), a subarea may be designated with a length up to 4,000 feet provided the topography and slope of the natural channel are generally uniform.

Justification needs to be included with this calculation showing that the watershed will remain natural forever. Examples include areas located in the Multiple Species Conservation Plan (MSCP), areas designated as open space or rural in a community's General Plan, and Cleveland National Forest.

(b) Urban Watersheds - Flow through a closed conduit where no additional flow can enter the system during the travel, length, velocity and T_t are determined using the peak flow in the conduit. In cases where the conduit is not closed and additional flow from a contributing subarea is added to the total flow during travel (e.g., street flow in a gutter), calculation of velocity and T_t is performed using an assumed average flow based on the total area (including upstream subareas) contributing to the point of interest. The Manning equation is usually used to determine velocity. Discharges for small watersheds typically range from 2 to 3 cfs per acre, depending on land use, drainage area, and slope and rainfall intensity.

Note: The MRM should be used to calculate the peak discharge when there is a junction from independent subareas into the drainage system.



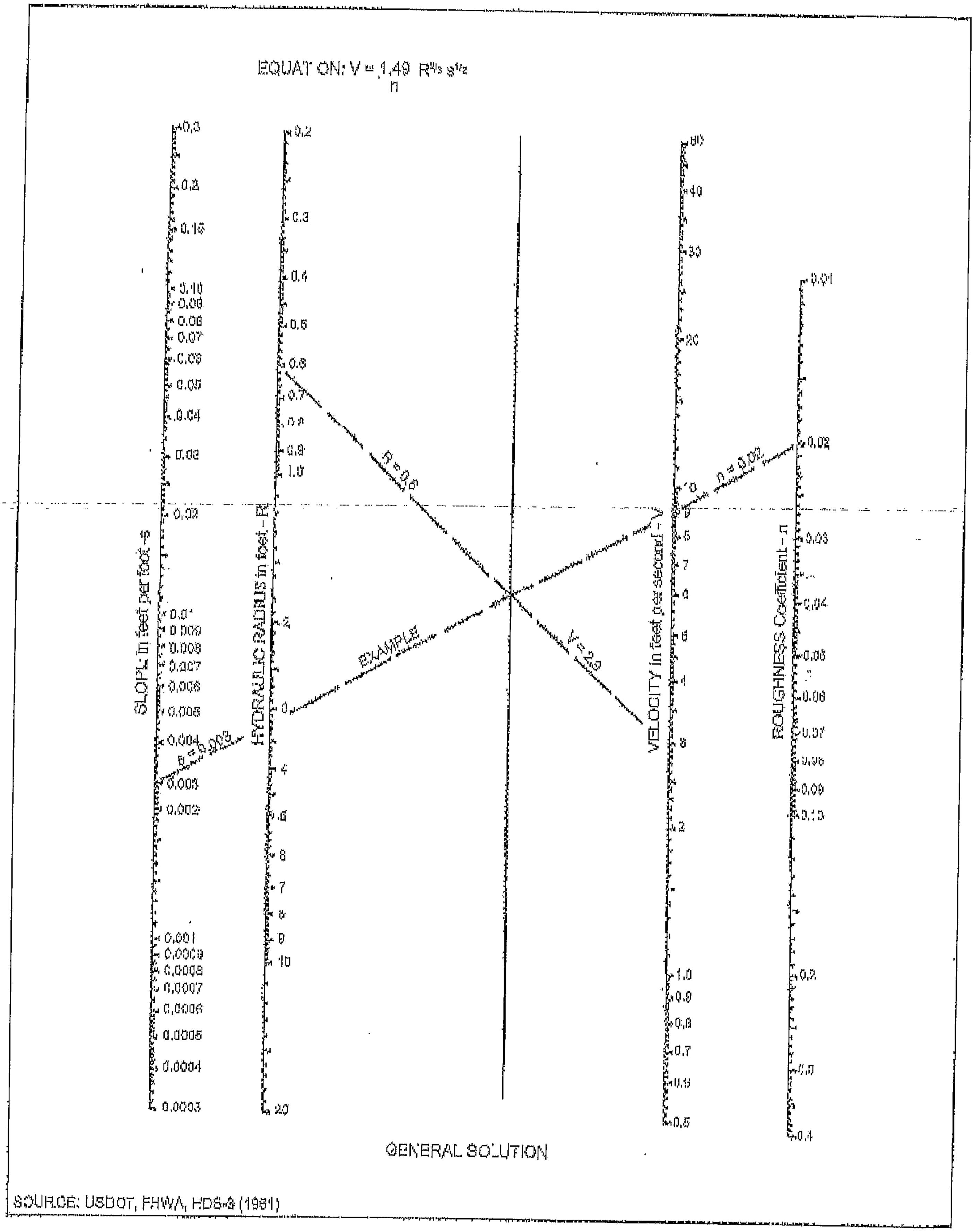
EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

Gutter and Roadway Discharge - Velocity Chart

FIGURE

3-6

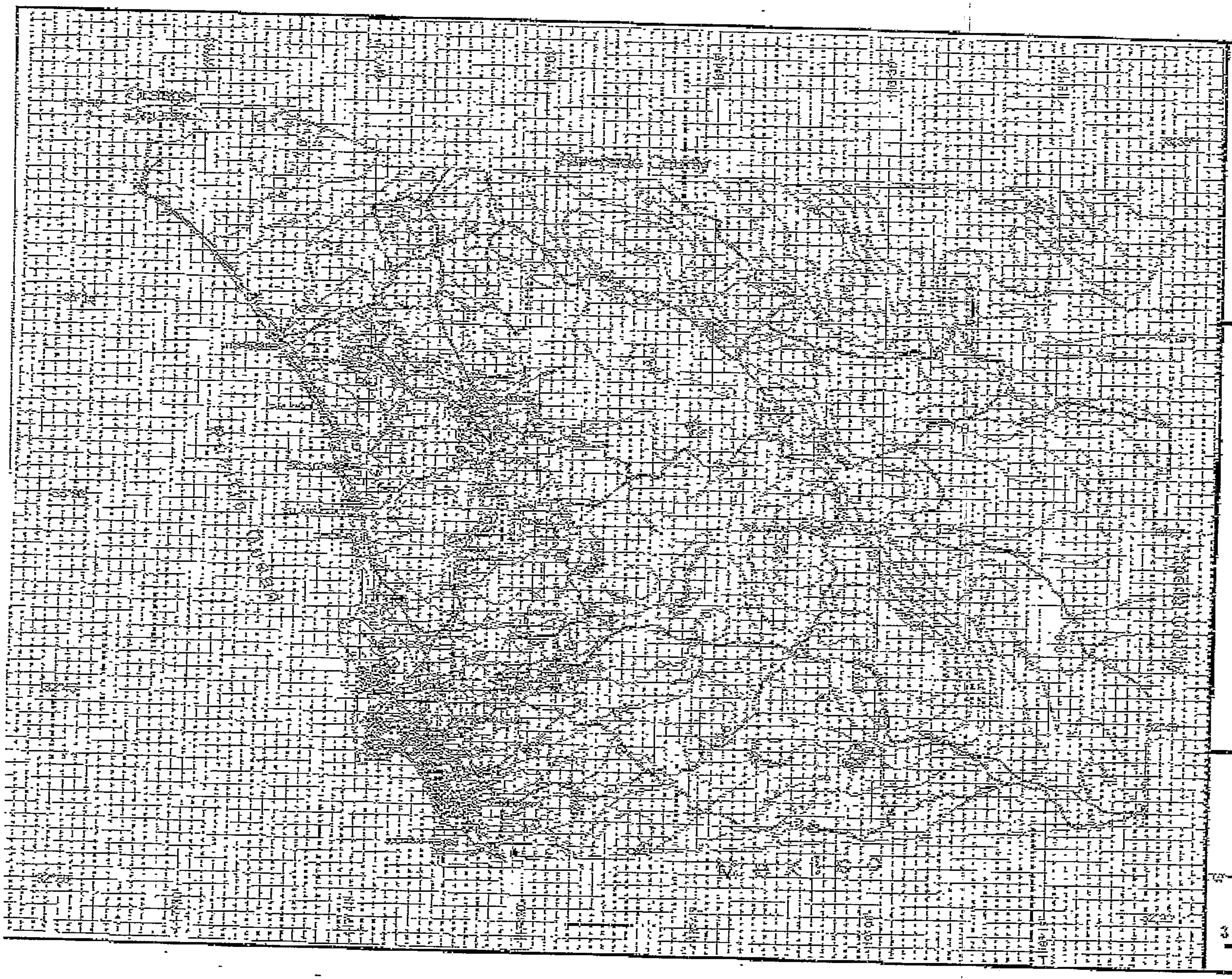


SOURCE: USDOT, FHWA, HDS-3 (1961)

Manning's Equation Nomograph

FIGURE

3-7



County of San Diego Hydrology Manual

Rainfall Isopluvials

2 Year Rainfall Event - 6 Hours

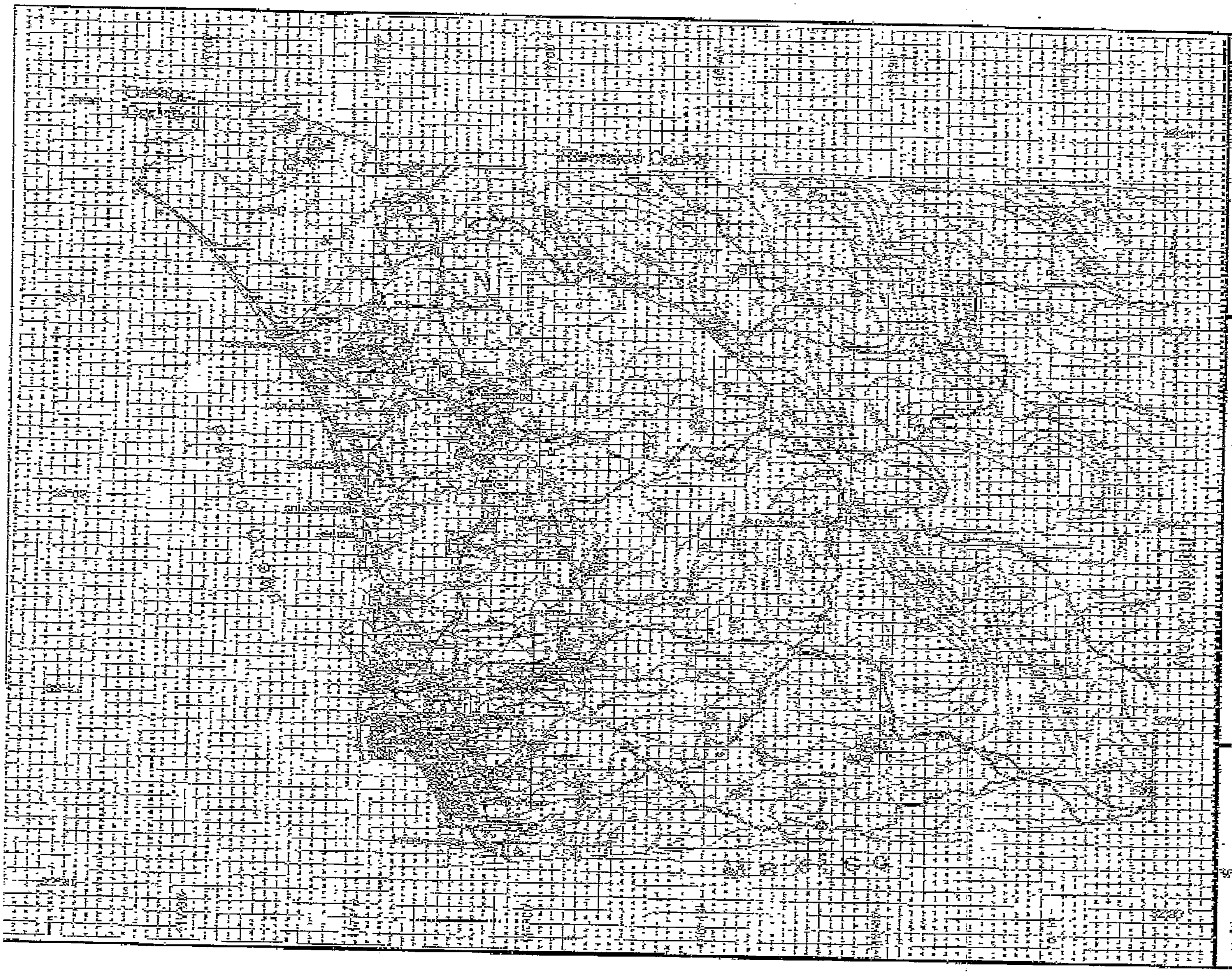
Isopluvial (inches)

DPW GIS

SanGIS

N
W E
S

3 0 3 Miles



County of San Diego
Hydrology Manual

Rainfall Isopluvials

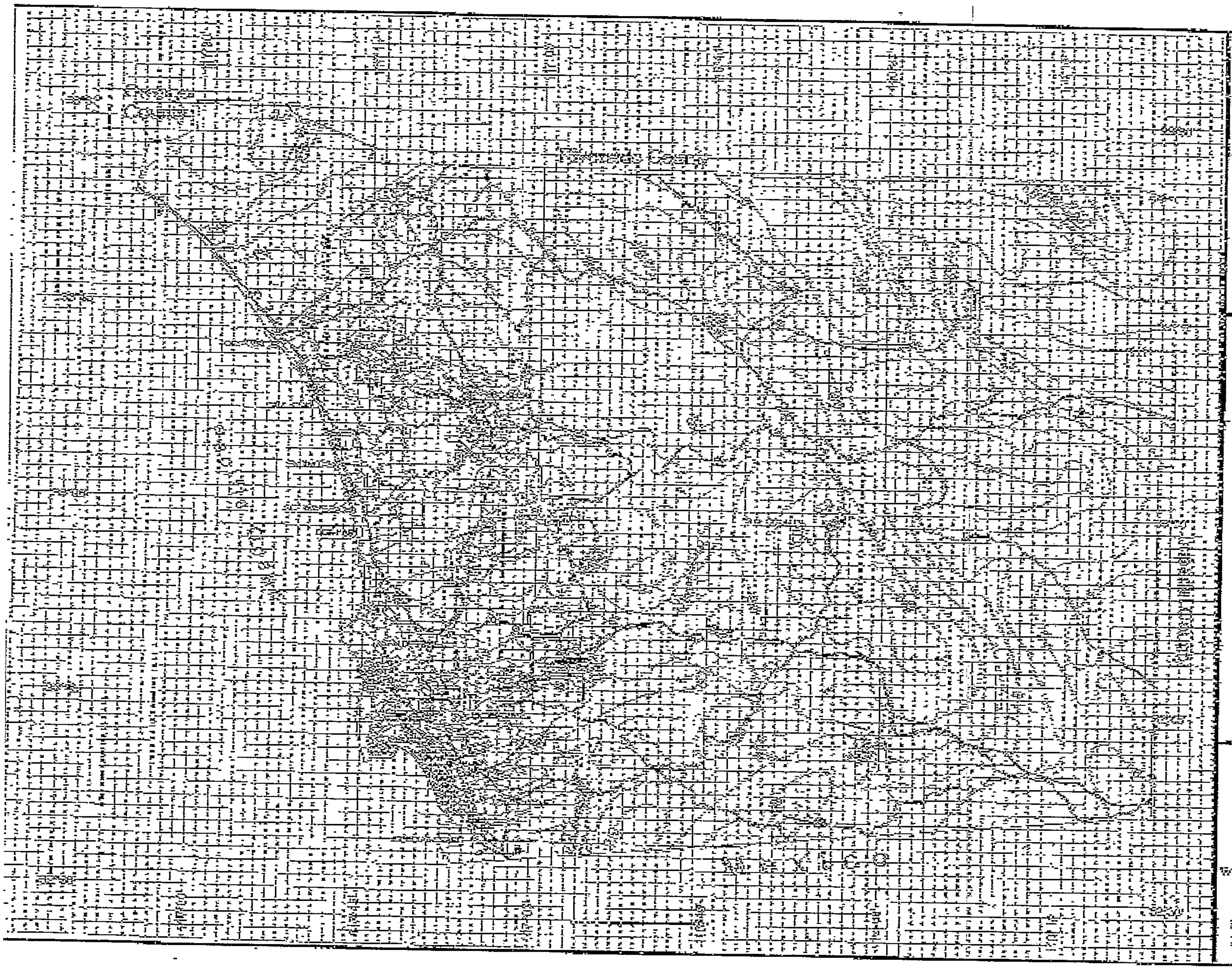
2 Year Rainfall Event - 24 Hours

Isopluvial (inches)

DPW GIS

SanGIS

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

5 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS

SanGIS

N
W
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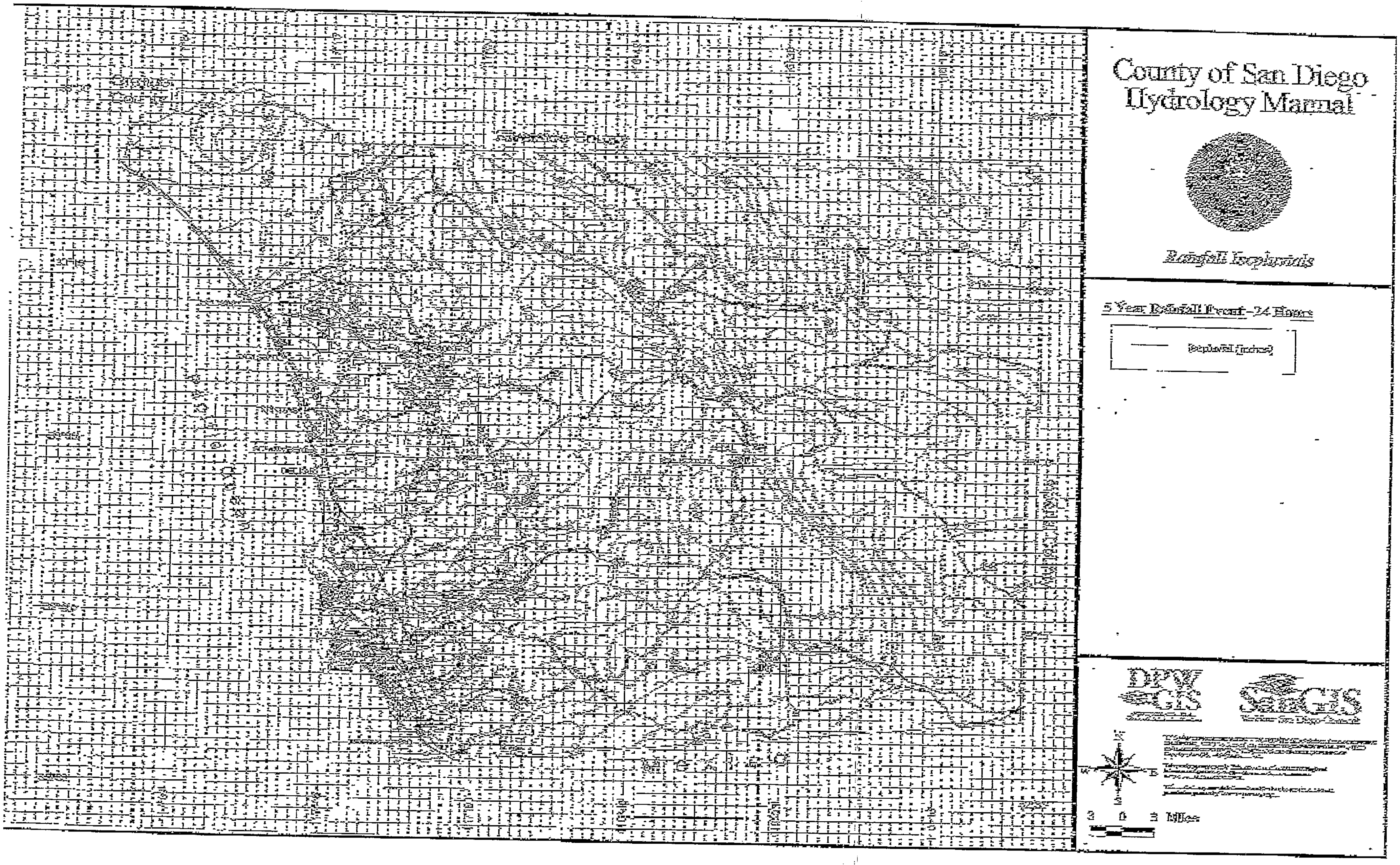
3 0 3 Miles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5 Year Rainfall Event - 24 Hours
Isopluvial (inches)
Orange County
Riverside County
DPW GIS
SanGIS
N
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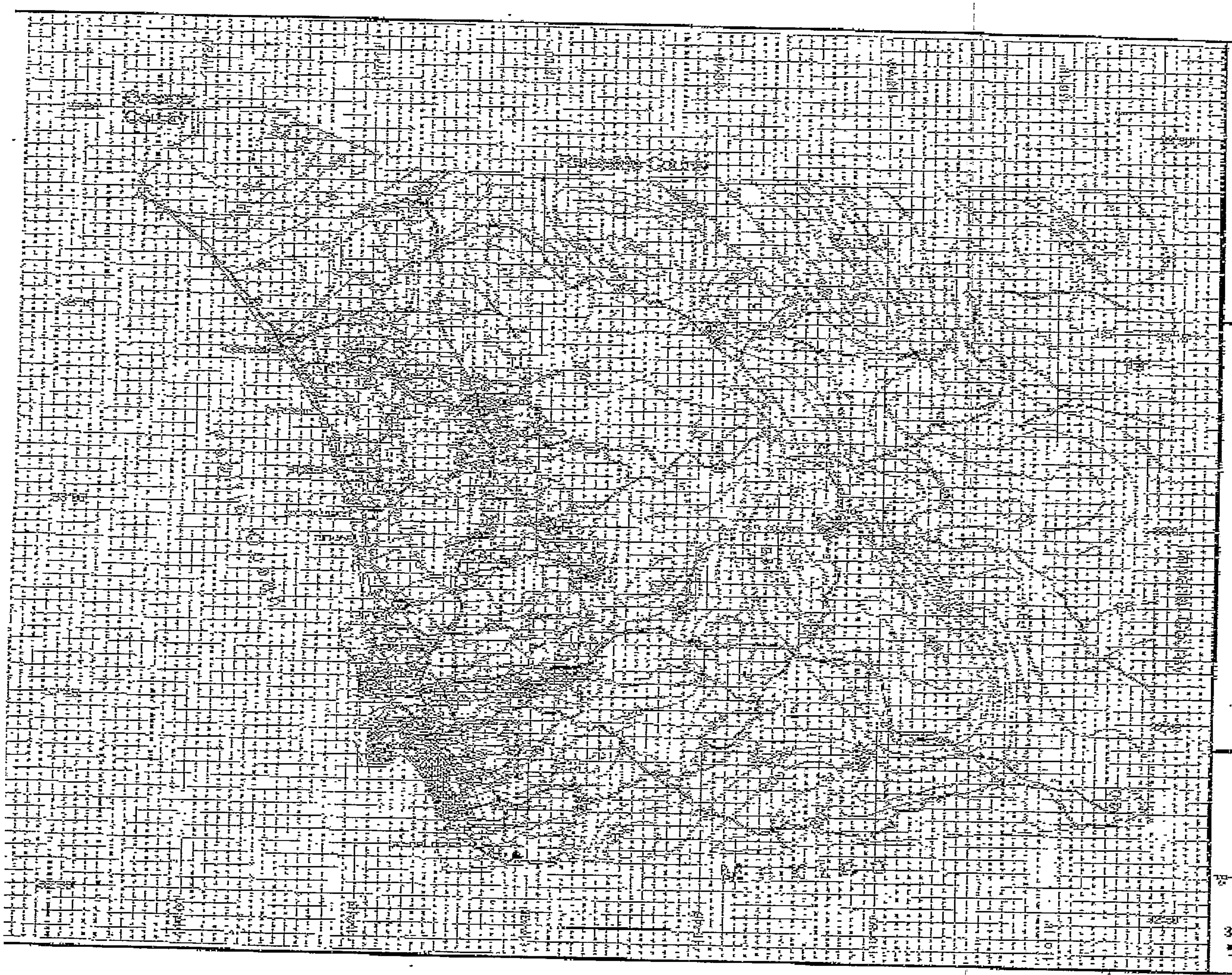
3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

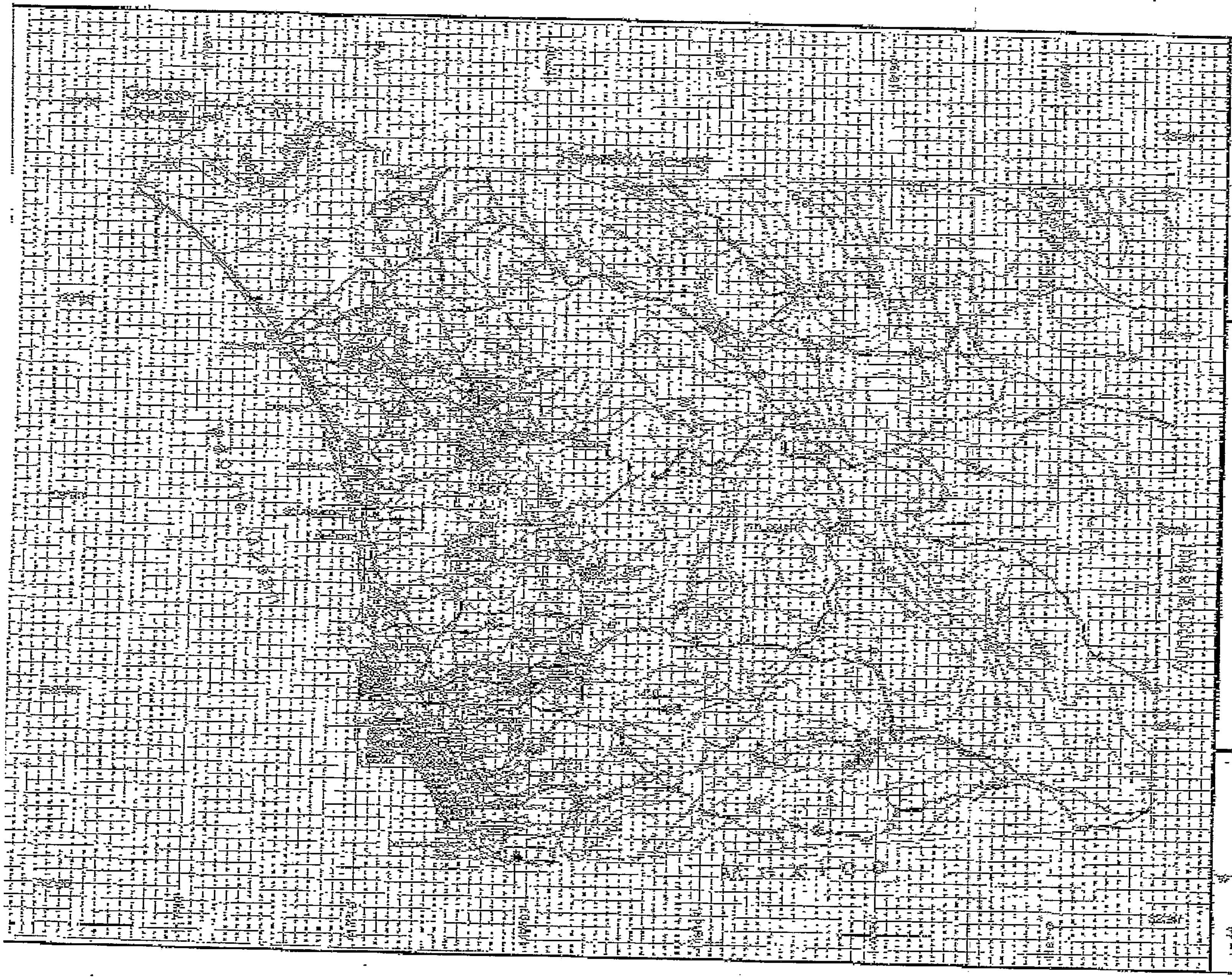
10 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS

SanGIS

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

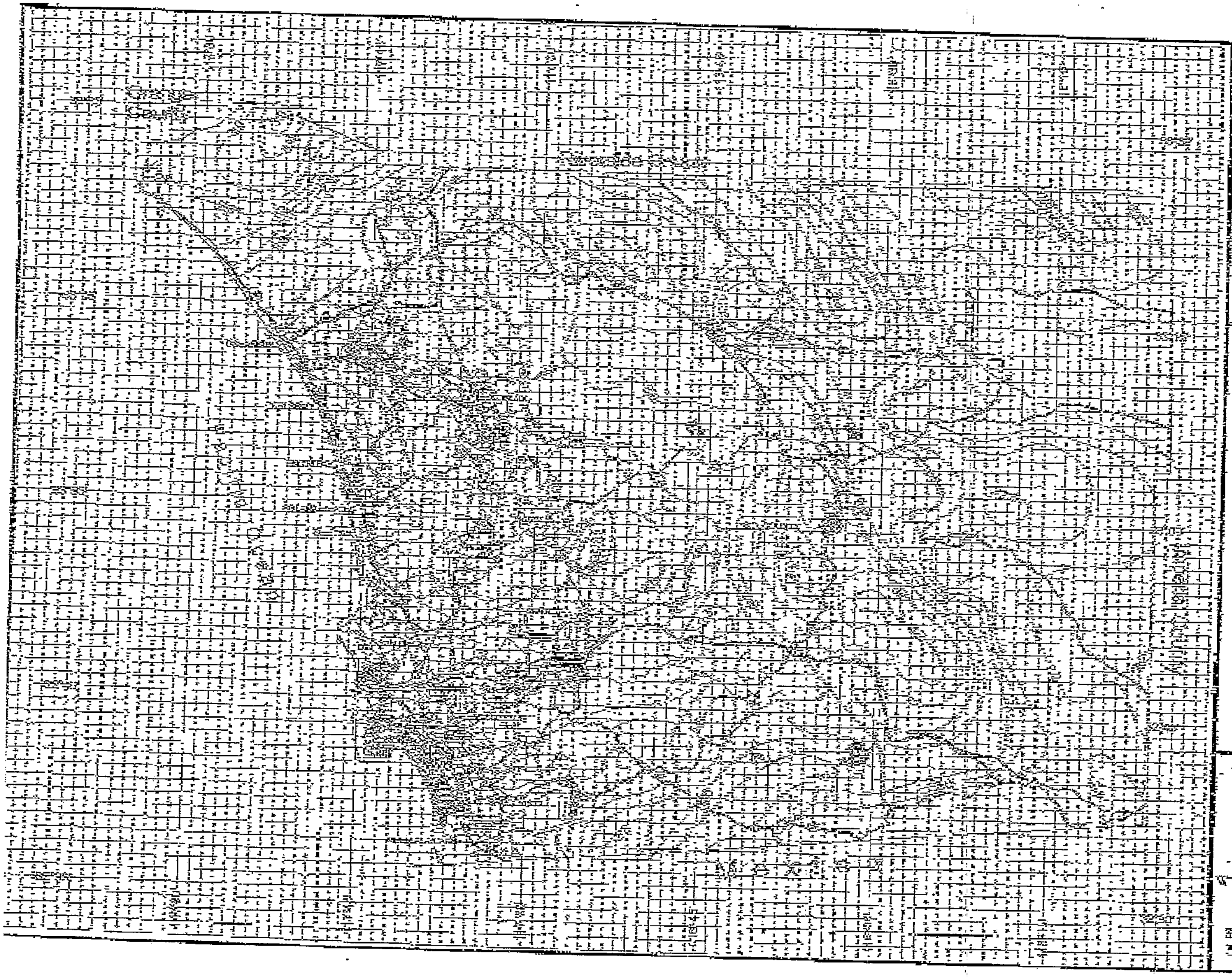
10 Year Rainfall Event - 24 Hours

Isopluvial (inches)

DPW GIS

SanGIS

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

25 Year Rainfall Event - 6 Hours

—— Isopluvial (inches)

DPW GIS

SanGIS

N

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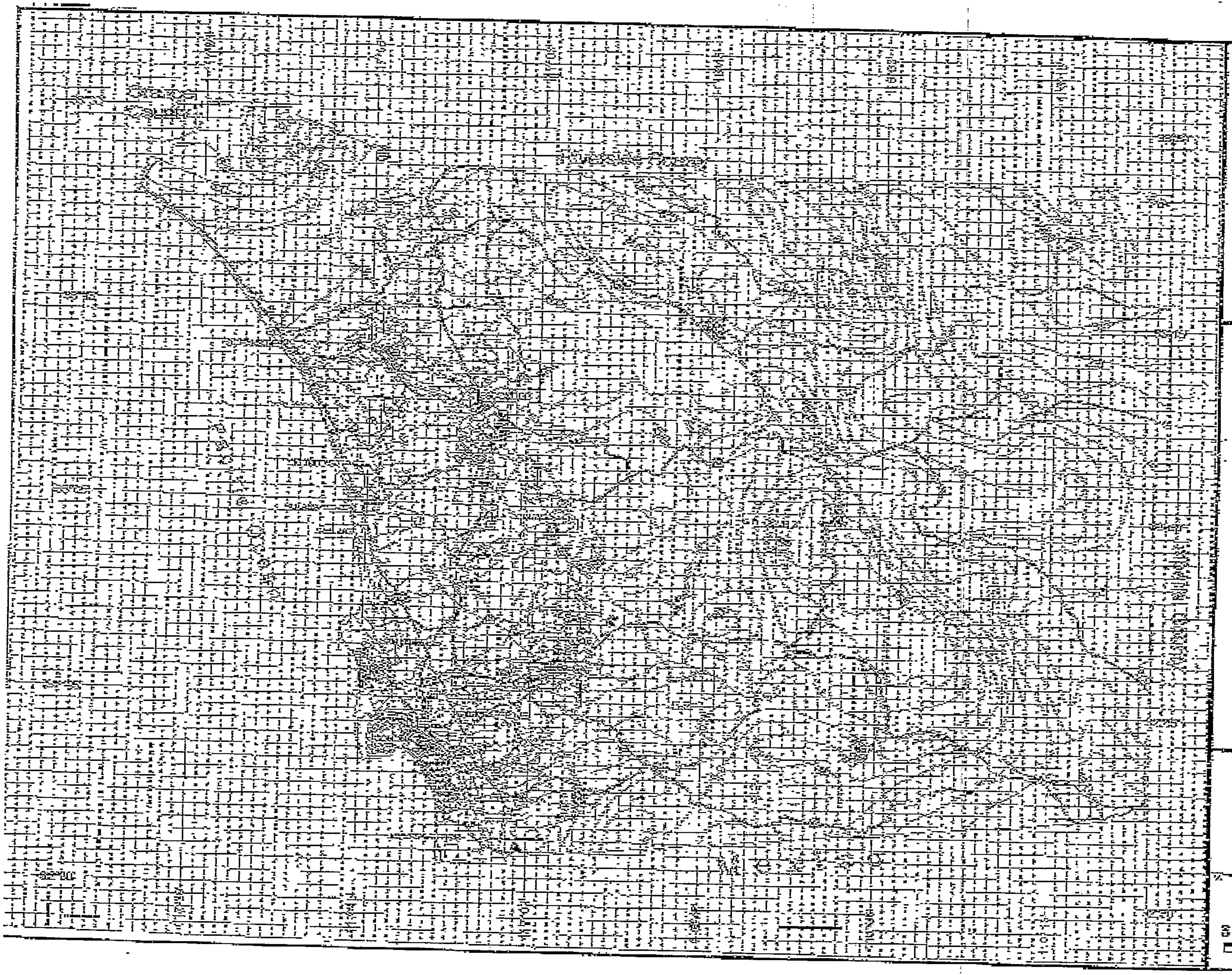


County of San Diego Hydrology Manual

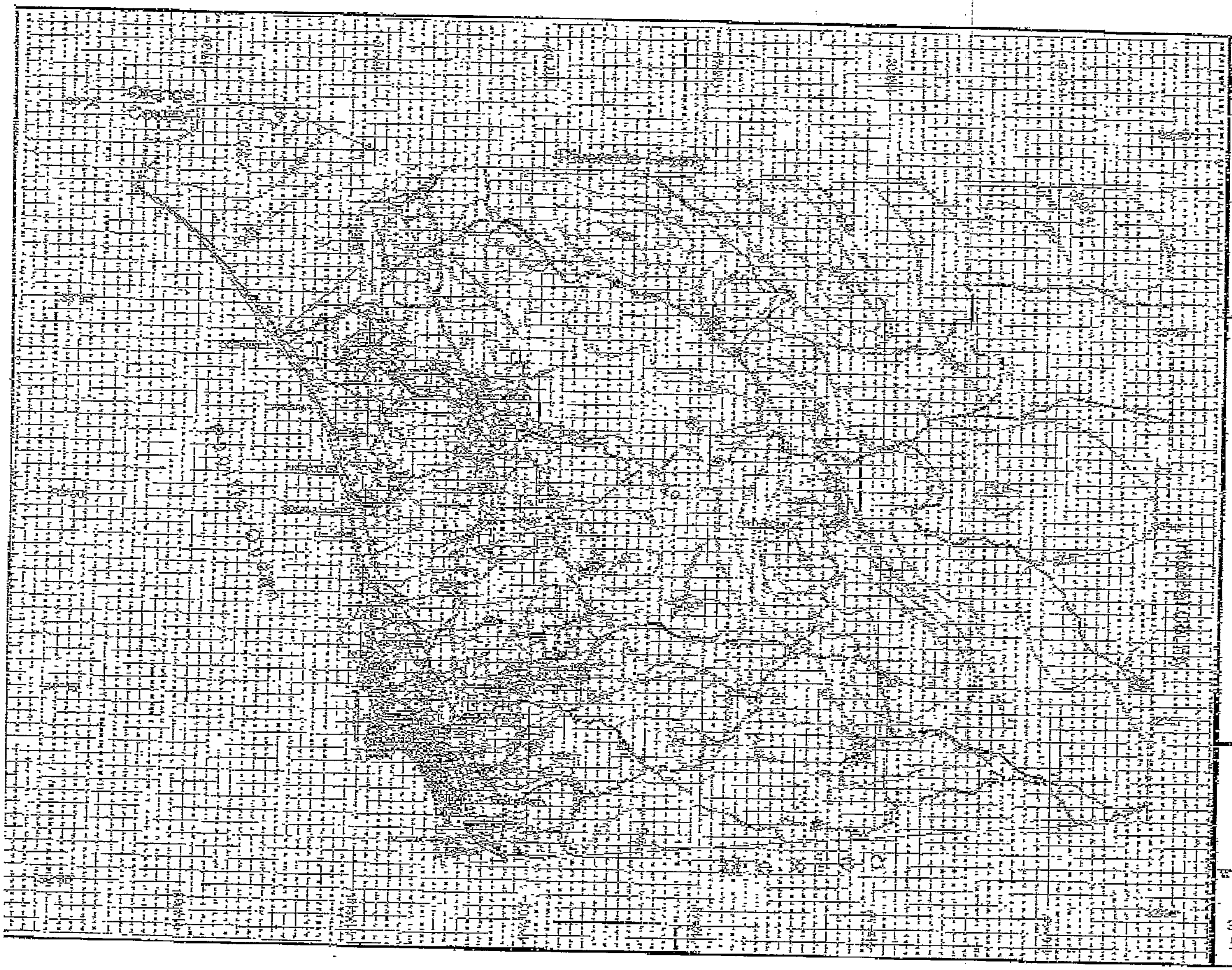
Rainfall Isopluvials

25 Year Rainfall Event - 24 Hours

--- Isopluvial (inches)

DPW GIS

SanGIS



County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS

SanGIS

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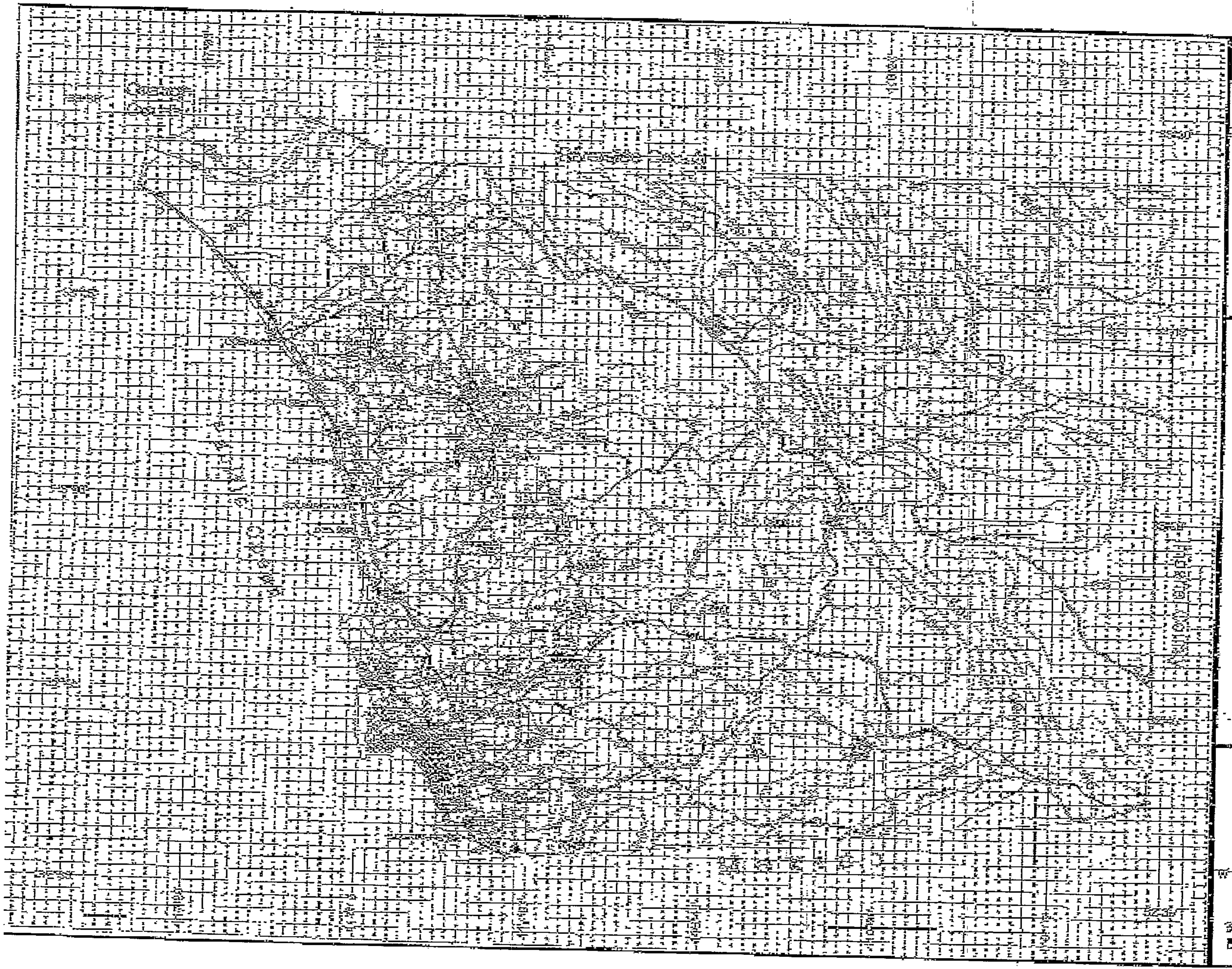

County of San Diego Hydrology Manual

Rainfall Isopluvials

50 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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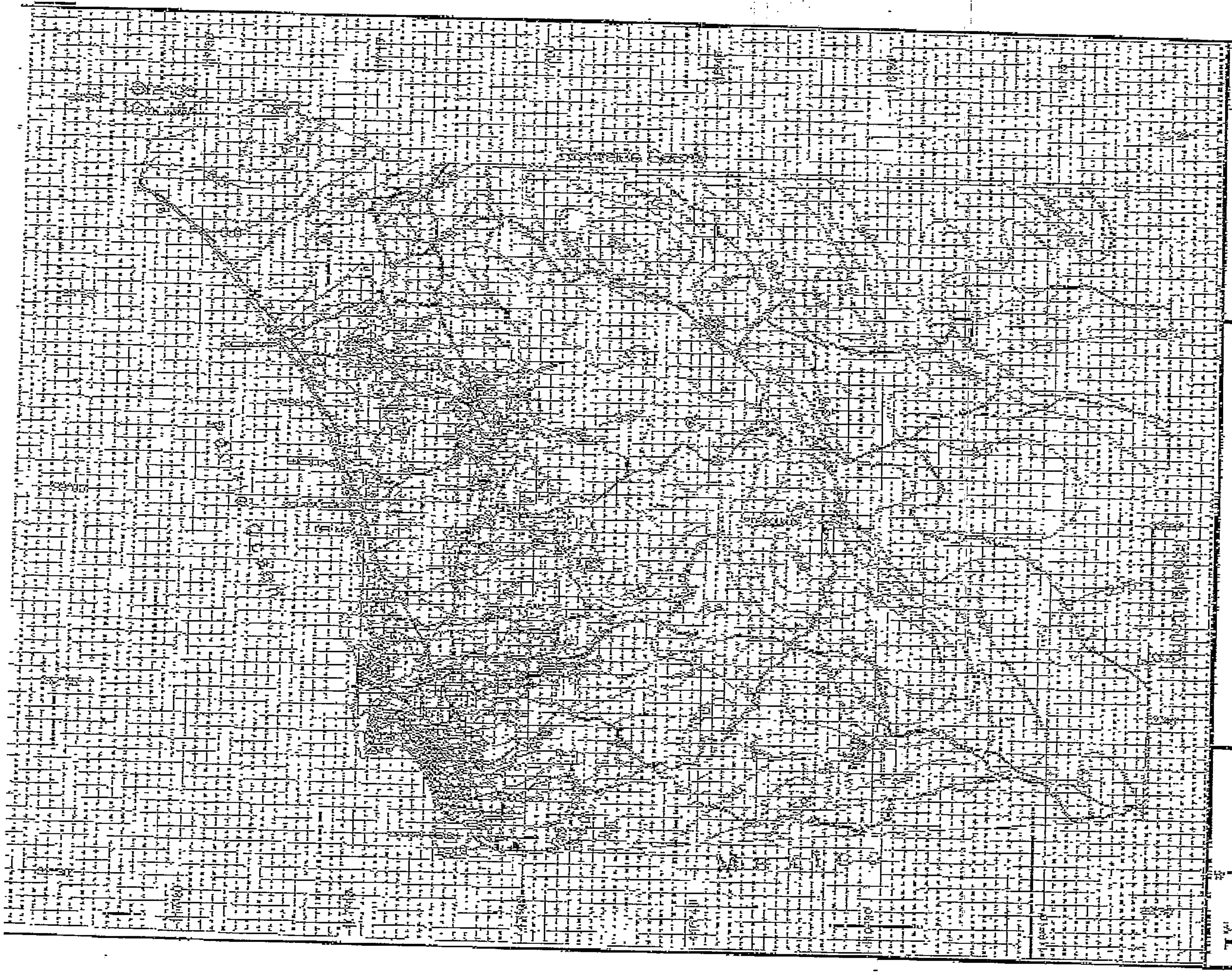

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS

SanGIS

We Have San Diego Covered

[illegible]

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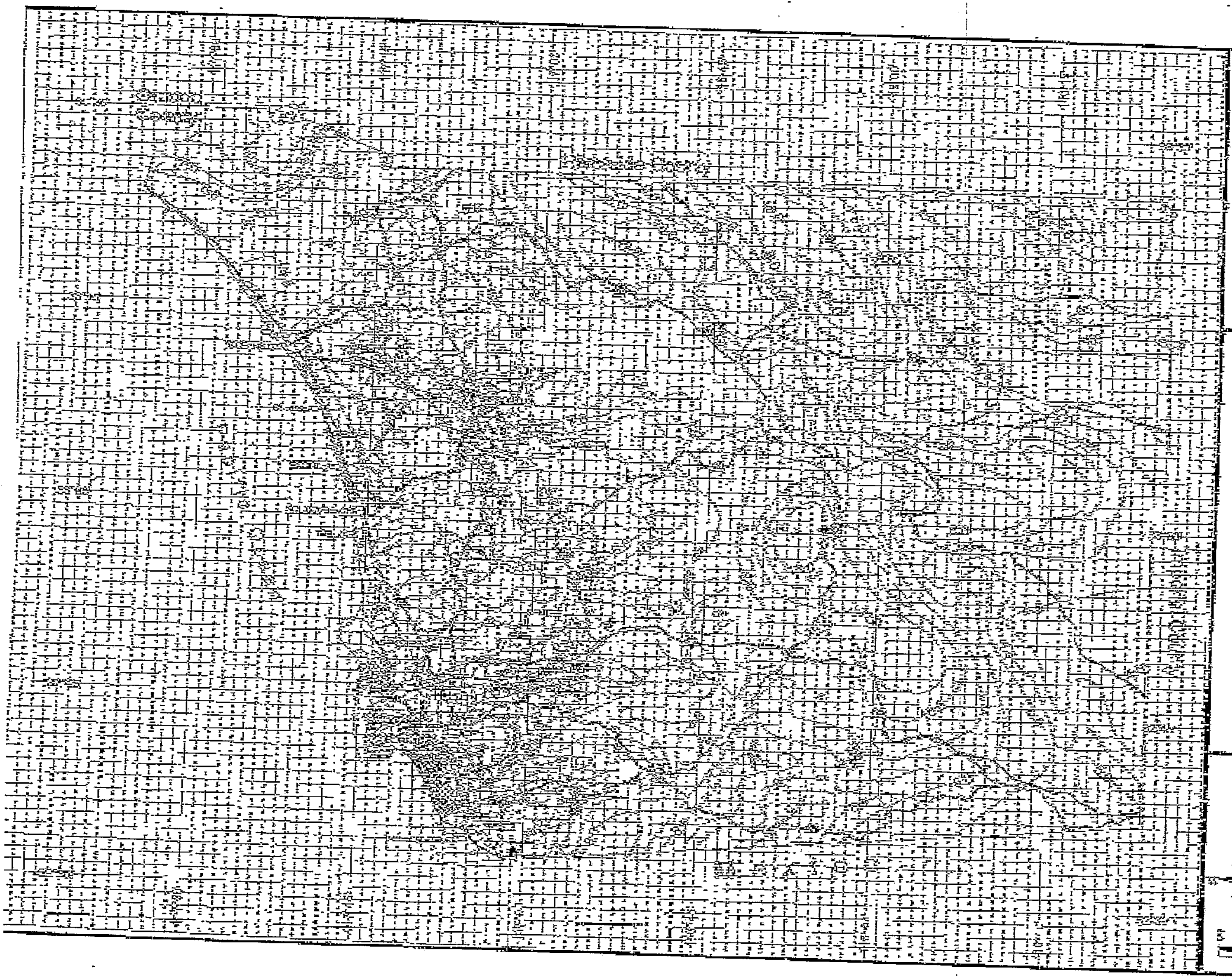

County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

DPW GIS

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SECTION 6
RATIONAL METHOD HYDROGRAPH PROCEDURE

6.1 INTRODUCTION

The procedures in this section are for the development of hydrographs from RM study results for study areas up to approximately 1 square mile in size. The RM, discussed in Section 3, is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage, where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and small drainage structures. However, in some instances such as for design of detention basins, the peak runoff rate is insufficient information for the design, and a hydrograph is needed. Unlike the NRCS hydrologic method (discussed in Section 4), the RM itself does not create hydrographs. The procedures for detention basin design based on RM study results were first developed as part of the East Otay Mesa Drainage Study. Rick Engineering Company performed this study under the direction of County Flood Control. The procedures in this section may be used for the development of hydrographs from RM study results for study areas up to approximately 1 square mile in size.

6.2 HYDROGRAPH DEVELOPMENT

The concept of this hydrograph procedure is based on the RM formula:

$$Q = C\,I\,A$$

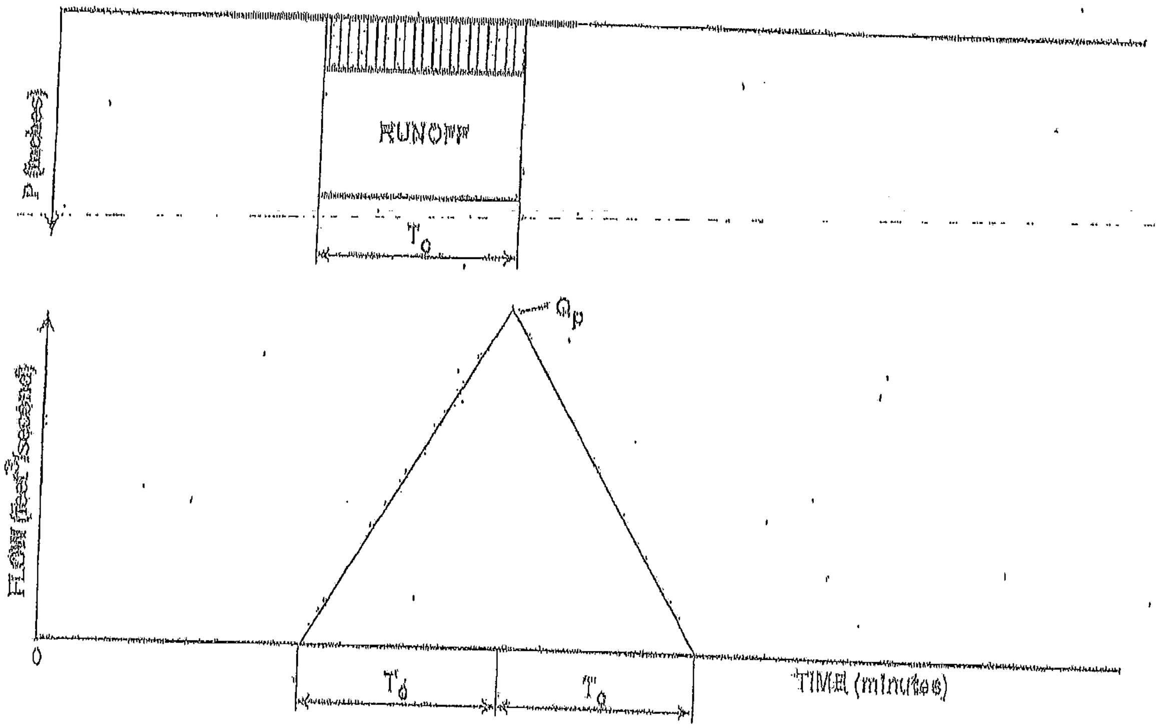
Where:
Q = peak discharge, in cubic feet per second (cfs)
C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)
I = average rainfall intensity for a duration equal to the T_c for the area, in inches per hour
A = drainage area contributing to the design location, in acres

The RM formula is discussed in more detail in Section 3.

An assumption of the RM is that discharge increases linearly over the T_c for the drainage area until reaching the peak discharge as defined by the RM formula, and then decreases linearly. A linear hydrograph can be developed for the peak flow occurring over the T_c as shown in Figure 6-1. However, for designs that are dependent on the total storm volume, it is not sufficient to consider a single hydrograph for peak flow occurring over the T_c at the beginning of a 6-hour storm event because the hydrograph does not account for the entire volume of runoff from the storm event. The volume under the hydrograph shown in Figure 6-1 is equal to the rainfall intensity multiplied by the duration for which that intensity occurs (T_c), the drainage area (A) contributing to the design location, and the runoff coefficient (C) for the drainage area. For designs that are dependent on the total storm volume, a hydrograph must be generated to account for the entire volume of runoff from the 6-hour storm event. The hydrograph for the entire 6-hour storm event is generated by creating a rainfall distribution consisting of blocks of rain, creating an incremental hydrograph for each block of rain, and adding the hydrographs from each block of rain. This process creates a hydrograph that contains runoff from all the blocks of rain and accounts for the entire volume of runoff from the 6-hour storm event. The total volume under the resulting hydrograph is equal to the following equation:

$$VOL = CP_6A \qquad \text{(Eq. 6-1)}$$

Where: VOL = volume of runoff (acre-inches)
P_6 = 6-hour rainfall (inches)
C = runoff coefficient
A = area of the watershed (acres)



Triangular Hydrograph

FIGURE

6-1

6.2.1 Rainfall Distribution

Figure 6-2 shows a 6-hour rainfall distribution consisting of blocks of rain over increments of time equal to T_c. The number of blocks is determined by rounding T_c to the nearest whole number of minutes, dividing 360 minutes (6 hours) by T_c, and rounding again to the nearest whole number. The blocks are distributed using a (2/3, 1/3) distribution in which the peak rainfall block is placed at the 4-hour time within the 6-hour rainfall duration. The additional blocks are distributed in a sequence alternating two blocks to the left and one block to the right of the 4-hour time (see Figure 6-2). The total amount of rainfall ($P_{T(N)}$) for any given block (N) is determined as follows:

$$P_{T(N)} = (I_{T(N)}\ T_{T(N)}) / 60$$

Where: $P_{T(N)}$ = total amount of rainfall for any given block (N)

$I_{T(N)}$ = average rainfall intensity for a duration equal to $T_{T(N)}$ in inches per hour

$T_{T(N)}$ = NT_c in minutes (N is an integer representing the given block number of rainfall)

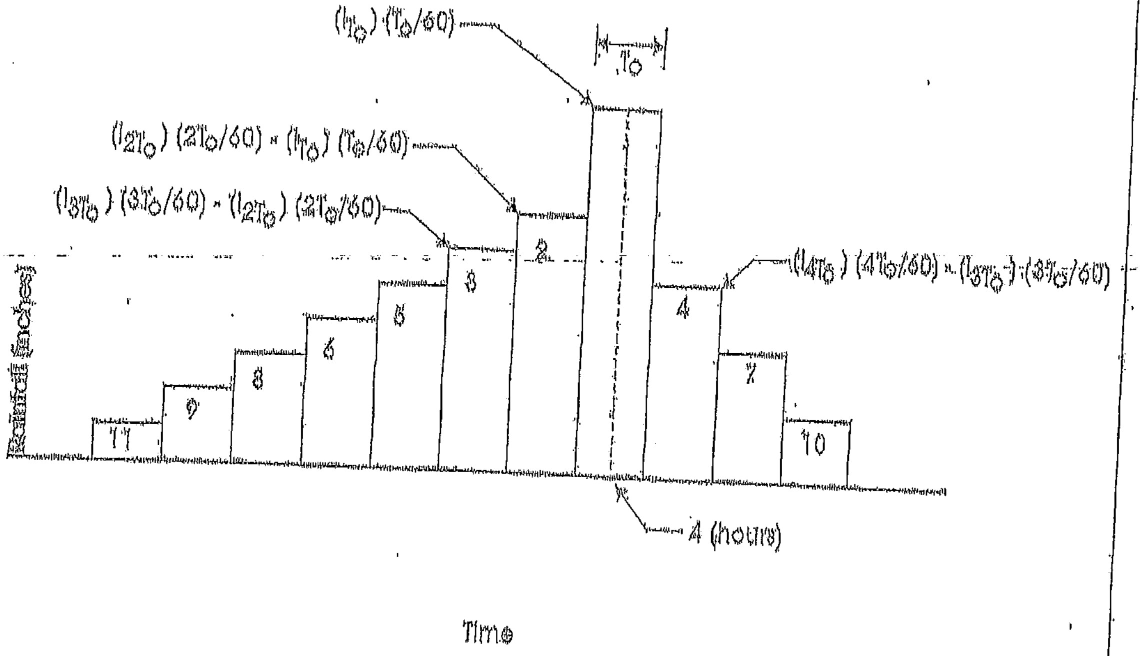
Intensity is calculated using the following equation (described in detail in Section 3):

$$I = 7.44\ P_6\ D^{-0.645}$$

Where: I = average rainfall intensity for a duration equal to D in inches per hour

P_6 = adjusted 6-hour storm rainfall

D = duration in minutes



Rainfall Distribution

FIGURE

6-2

Substituting the equation for I in the equation above for $P_{T(N)}$ and setting the duration (D) equal to $T_{T(N)}$ yields:

$$P_{T(N)} = [(7.44\, P_6/T_{T(N)}^{0.645})(T_{T(N)})] / 60$$
$$P_{T(N)} = 0.124\, P_6 T_{T(N)}^{0.355}$$

Substituting NT_o for T_T (where N equals the block number of rainfall) in the equation above yields:

$$P_{T(N)} = 0.124\, P_6\, (NT_o)^{0.355} \qquad \text{(Eq. 6-2)}$$

Equation 6-2 represents the total rainfall amount for a rainfall block with a time base equal to $T_{T(N)}$ (NT_o). The actual time base of each rainfall block in the rainfall distribution is T_o, as shown in Figure 6-2. The actual rainfall amount (P_N) for each block of rain is equal to P_T at N ($P_{T(N)}$) minus the previous P_T at N–1 ($P_{T(N-1)}$) at any given multiple of T_o (any NT_o). For example, the rainfall for block 2 is equal to $P_{T(N)}$ at $T_{T(N)} = 2T_o$ minus the $P_{T(N)}$ at $T_{T(N)} = 1T_o$, and the rainfall for block 3 equals $P_{T(N)}$ at $T_{T(N)} = 3T_o$ minus the $P_{T(N)}$ at $T_{T(N)} = 2T_o$, or P_N can be represented by the following equation:

$$P_N = P_{T(N)} - P_{T(N-1)} \qquad \text{(Eq. 6-3)}$$

For the rainfall distribution, the rainfall at block N = 1, ($1T_o$), is centered at 4 hours, the rainfall at block N = 2, ($2T_o$), is centered at 4 hours – $1T_o$, the rainfall at block N = 3, ($3T_o$), is centered at 4 hours – $2T_o$, and the rainfall at at block N = 4, ($4T_o$), is centered at 4 hours + $1T_o$. The sequence continues alternating two blocks to the left and one block to the right (see Figure 6-2).

6.2.2 Construction of Incremental Hydrographs

Figure 6-1 shows the relationship of a single block of rain to a single hydrograph. Figure 6-3 shows the relationship of the rainfall distribution to the overall hydrograph for the storm event. The peak flow amount from each block of rain is determined by the RM formula, Q = CIA, where I equals I_N (the actual rainfall intensity for the rainfall block). I_N is determined by dividing P_N by the actual time base of the block, T_c. The following equation shows this relationship:

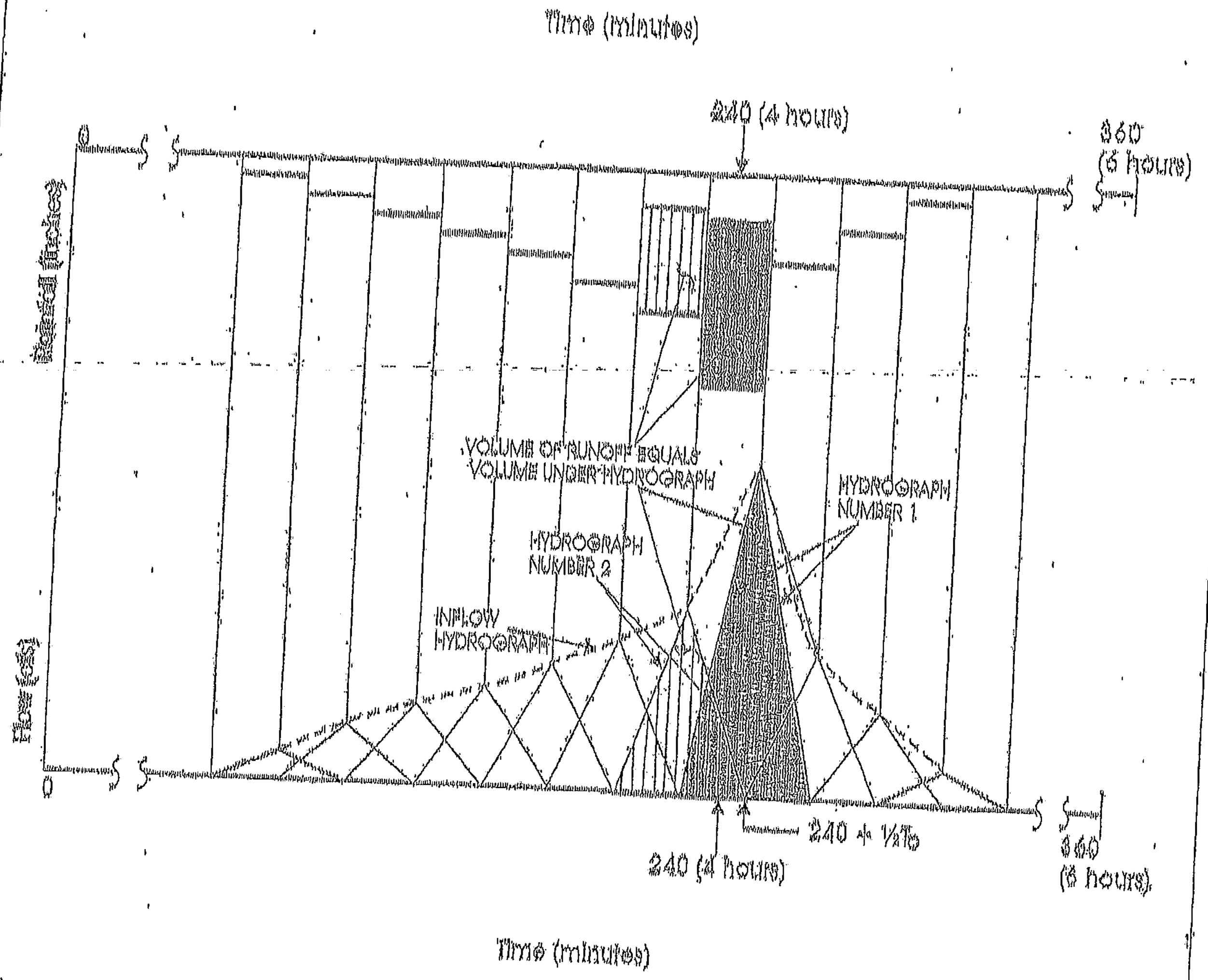
$$I_N = 60\ P_N/T_c \qquad \text{(Eq. 6-4)}$$

Where: I_N = average rainfall intensity for a duration equal to T_c in inches per hour
P_N = rainfall amount for the block in inches
T_c = time of concentration in minutes

By substituting equation 6-4 into the rational equation, the following relationship is obtained:

$$Q_N = 60\ CAP_N/T_c \text{ (cfs)} \qquad \text{(Eq. 6-5)}$$

Finally, the overall hydrograph for the storm event is determined by adding all the hydrographs from each block of rain. Since the peak flow amount for each incremental hydrograph corresponds to a zero flow amount from the previous and proceeding hydrographs, as shown in Figure 6-3, the inflow hydrograph can be plotted by connecting the peak flow amounts (see the dashed line in Figure 6-3).



6-Hour Rational Method Hydrograph

FIGURE

6-3

6.3 GENERATING A HYDROGRAPH USING RATHYDRO

The rainfall distribution and related hydrographs can be developed using the RATHYDRO computer program provided to the County by Rick Engineering Company. A copy of this program is available at no cost from the County. The output from this computer program may be used with HEC-1 or other software for routing purposes.

The design storm pattern used by the RATHYDRO program is based on the (2/3, 1/3) distribution described in Sections 4.1.1 and 6.2.1. The ordinates on the hydrograph are calculated based on the County of San Diego Intensity-Duration Design Chart (Figure 3-1), which uses the intensity equation described in Sections 3.1.3 and 6.2.1 to relate the intensity (I) of the storm to T_o, $I = 7.44\ P_6 D^{-0.645}$. The computer program uses equations 6-2 and 6-3 described above and calculates I_N directly. The intensity at any given multiple of T_o is calculated by the following equation:

$$I_N = [(I_{T(N)})\ (T_{T(N)}) - (I_{T(N-1)})\ (T_{T(N-1)})]\ /\ T_o \qquad \text{(Eq. 6-6)}$$

Where: N = number of rainfall blocks

$T_{T(N)}$ = time of concentration at rainfall block N in minutes (equal to NT_o)

I_N = actual rainfall intensity at rainfall block N in inches per hour

$I_{T(N)}$ = rainfall intensity at time of concentration $T_{T(N)}$ in inches per hour

Figure 6-2 shows the rainfall distribution used in the RM hydrograph, computed at multiples of T_o. The rainfall at block N = 1, ($1T_o$), is centered at 4 hours, the rainfall at block N = 2, ($2T_o$), is centered at 4 hours – $1T_o$, the rainfall at block N = 3, ($3T_o$), is centered at 4 hours – $2T_o$, and the rainfall at at block N = 4, ($4T_o$), is centered at 4 hours + $1T_o$. The sequence continues alternating two blocks to the left and one block to the right (see Figure 6-2).

As described in Section 6.2.2, the peak discharge (Q_N) of the hydrograph for any given rainfall block (N) is determined by the RM formula Q = CIA, where $I = I_N$ = the actual rainfall intensity for the rainfall block. The RATHYDRO program substitutes equation 6-6 into the RM formula to determine Q_N yielding the following equation:

$$Q_N = [(I_{T(N)})(T_{T(N)}) - (I_{T(N-1)})(T_{T(N-1)})]\ CA / T_o \qquad \text{(Eq. 6-7)}$$

Where: Q_N = peak discharge for rainfall block N in cubic feet per second (cfs)
N = number of rainfall blocks
$T_{T(N)}$ = time of concentration at rainfall block N in minutes (equal to NT_o)
$I_{T(N)}$ = rainfall intensity at time of concentration $T_{T(N)}$ in inches per hour
C = RM runoff coefficient
A = area of the watershed (acres)

To develop the hydrograph for the 6-hour design storm, a series of triangular hydrographs with ordinates at multiples of the given T_o are created and added to create the hydrograph. This hydrograph has its peak at 4 hours plus ½ of the T_o. The total volume under the hydrograph is equal to the following equation (equation 6-1):

$$VOL = CP_6A$$

Where: VOL = volume of runoff (acre-inches)
P_6 = 6-hour rainfall (inches)
C = runoff coefficient
A = area of the watershed (acres)

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

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Project Name: **Candlelight**

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	■ Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Maintenance Agreement (Form DS-3247) (when applicable)	○ Included ● Not Applicable

Project Name: Candlelight

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:
  - ☐ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual
- Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

Final Design level submittal:

Attachment 3a must identify:

☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
☐ How to access the structural BMP(s) to inspect and perform maintenance
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐ When applicable, frequency of bioretention soil media replacement
☐ Recommended equipment to perform maintenance
☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

☐ Vicinity map
☐ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
☐ BMP and HMP location and dimensions
☐ BMP and HMP specifications/cross section/model
☐ Maintenance recommendations and frequency
☐ LID features such as (permeable paver and LS location, dim, SF).

PR-1

Biofiltration with Partial Retention

BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL BMP PR-1 BIOFILTRATION WITH PARTIAL RETENTION

Biofiltration with partial retention facilities are vegetated surface water systems that filter water through vegetation and soil or engineered media prior to infiltrating into native soils, discharge via underdrain, or overflow to the downstream conveyance system. These BMPs have an elevated underdrain discharge point that creates storage capacity in the aggregate storage layer. Typical biofiltration with partial retention components include:

- Inflow distribution mechanisms (e.g., perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer consisting of aggregate to prevent the migration of fines into uncompacted native soils or the aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Uncompacted native soils at the bottom of the facility
- Overflow structure

Normal Expected Maintenance

Biofiltration with partial retention requires routine maintenance to: remove accumulated materials such as sediment, trash or debris; maintain vegetation health; maintain infiltration capacity of the media layer; replenish mulch; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the media layer, filter course, aggregate storage layer, underdrain, or outlet structure. The specific cause of the drainage issue must be determined and corrected.
- Sediment, trash, or debris accumulation greater than 25% of the surface ponding volume within one month. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require pretreatment measures within the tributary area draining to the BMP to intercept the materials. Pretreatment components, especially for sediment, will extend the life of components that are more expensive to replace such as media, filter course, and aggregate layers.

- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.

Other Special Considerations

Biofiltration with partial retention is a vegetated structural BMP. Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, **routine maintenance is key to preventing this scenario**.

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION

The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district.

Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation or compaction of the media layer.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Obstructed inlet or outlet structure	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.	• Inspect annually. • Maintenance when needed.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Dead or diseased vegetation	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintenance when needed.
Overgrown vegetation	Mow or trim as appropriate.	• Inspect monthly. • Maintenance when needed.
2/3 of mulch has decomposed, or mulch has been removed	Remove decomposed fraction and top off with fresh mulch to a total depth of 3 inches.	• Inspect monthly. • Replenish mulch annually, or more frequently when needed based on inspection.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR PR-1 BIOFILTRATION WITH PARTIAL RETENTION (Continued from previous page)

Threshold/Indicator	Maintenance Action	Typical Maintenance Frequency
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintenance when needed.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.	• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the [City Engineer] shall be contacted prior to any additional repairs or reconstruction.
Standing water in BMP for longer than 24 hours following a storm event Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains, or repairing/replacing clogged or compacted soils.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water. If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria due to release rates controlled by an orifice installed on the underdrain, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.
Underdrain clogged	Clear blockage.	• Inspect if standing water is observed for longer than 24-96 hours following a storm event. • Maintenance when needed.

HU-1
Cistern

BMP MAINTENANCE FACT SHEET
FOR
STRUCTURAL BMP HU-1 CISTERN

Cisterns are containers that capture runoff (typically rooftop runoff) and store it for future use such as irrigation or alternative grey water between storm events. Cisterns can be aboveground or below ground systems. Typical cistern components include:

- Storage container, barrel or tank for holding captured flows
- Inlet and associated valves and piping
- Outlet and associated valves and piping
- Overflow outlet
- Access riser or tank serviceway (i.e., access for underground and above-ground cisterns)
- Optional pump
- Optional first flush diverters
- Optional debris screen or pretreatment BMP (e.g., roof drain filter, drainage inlet insert)
- Optional roof, supports, foundation, level indicator, and other accessories

Normal Expected Maintenance

Cisterns can be expected to accumulate sediment and debris that is small enough to pass through the inlet into the storage container. Larger debris such as leaves or trash may accumulate at the inlet. While the storage container is generally a permanent structure, ancillary parts including valves, piping, screens, level indicators, and other accessories will wear and require occasional replacement. Maintenance of a cistern generally involves: removing accumulated sediment and debris from the inlet and storage container on a routine basis; and replacement of ancillary parts on an as-needed basis. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet. If the system as a whole includes a pump or other electrical equipment, maintenance of the equipment shall be based on the manufacturer's recommended maintenance plan.

Non-Standard Maintenance or BMP Failure

If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The inlet is found to be obstructed at every inspection such that storm water bypasses the cistern. The cistern is not functioning properly if it is not capturing storm water. This would require addition of ancillary features to protect the inlet, or pretreatment measures within the watershed draining to the cistern to intercept larger debris, such as screens on roof gutters, or drainage inserts within catch basins. Increase the frequency of inspection until the issue is resolved.
- Accumulation of sediment within one year is greater than 25% of the volume of the cistern. This means the sediment load from the tributary drainage area has diminished the storage volume of the cistern and the cistern will not capture the required volume of storm water. This would require pretreatment measures within the tributary area draining to the cistern to intercept sediment.
- The cistern is not drained between storm events. If the cistern is not drained between storm events, the storage volume will be diminished and the cistern will not capture the required volume of storm water from subsequent storms. This would require implementation of practices onsite to drain and use the stored water, or a different BMP if onsite use cannot be reliably sustained.

SUMMARY OF STANDARD INSPECTION AND MAINTENANCE FOR HU-1 CISTERN

The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district.

Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.

Threshold/Indicator	Maintenance Action	Typical Inspection and Maintenance Frequency
Accumulation of sediment, litter, or debris at the inlet	Remove and properly dispose of accumulated materials.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Outlet blocked	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.
Accumulation of sediment, litter, or debris in the storage container	Remove and properly dispose of accumulated materials.	• Inspect monthly. If the BMP is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove materials annually (minimum), or more frequently when BMP is 25% full* (or at manufacturer threshold if manufacturer threshold is less than 25% full*) in less than one year, or if accumulation blocks outlet
Standing water in storage container between storm events outside of normal use timeframe for the stored water. Normal use timeframe is 36 to 96 hours following a storm event depending on the purpose and design of the cistern.	Use the water as intended, or disperse to landscaping. Implement practices onsite to drain and use the stored water. Contact the [City Engineer] to determine a solution if onsite use cannot be reliably sustained.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintenance when needed.

*"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure)

THE CITY OF SAN DIEGO
RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO
AND WHEN RECORDED MAIL
Click or tap here to enter text.
Click or tap here to enter text.
Click or tap here to enter text.

(THIS SPACE IS FOR THE RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSOR'S PARCEL NUMBER:	PROJECT NUMBER:
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

This agreement is made by and between the City of San Diego, a municipal corporation [City] and Click or tap here to enter text.

the owner or duly authorized representative of the owner [Property Owner] of property located at:
Click or tap here to enter text.
(PROPERTY ADDRESS)

and more particularly described as: Click or tap here to enter text.

(LEGAL DESCRIPTION OF PROPERTY)

in the City of San Diego, County of San Diego, State of California.

Property Owner is required pursuant to the City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, Chapter 14, Article 2, Division 2, and the Land Development Manual, Storm Water Standards to enter into a Storm Water Management and Discharge Control Maintenance Agreement [Maintenance Agreement] for the installation and maintenance of Permanent Storm Water Best Management Practices [Permanent Storm Water BMP's] prior to the issuance of construction permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMP's onsite, as described in the attached exhibit(s), the project's Storm Water Quality Management Plan [SWQMP] and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): Click or

Property Owner wishes to obtain a building or engineering permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s): Click or tap here to enter text

Continued on Page 2

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s):Click or tap here to enter text..
2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's WQTR and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s)Click or tap here to enter text..
3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

See Attached Exhibits(s):Click or tap here to enter text.

(Owner Signature)

Click or tap here to enter text.
(Print Name and Title)

Click or tap here to enter text.
(Company/Organization Name)

Click or tap to enter a date.
(Date)

THE CITY OF SAN DIEGO

APPROVED:

(City Control engineer Signature

(Print Name)

(Date)

NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDMENTS PER CIVIL CODE SEC. 1180 ET.SEQ

ATTACHMENT 4
COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

Construction Drawings are not applicable for a preliminary report.

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Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

☐ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
☐ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☐ Details and specifications for construction of structural BMP(s)
☐ Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
☐ How to access the structural BMP(s) to inspect and perform maintenance
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐ Recommended equipment to perform maintenance
☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☐ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☐ All BMPs must be fully dimensioned on the plans
☐ When proprietary BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Brochure photocopies are not allowed.

See DMA Exhibit – Attachment 1A.

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ATTACHMENT 5
DRAINAGE REPORT

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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SB&O INC.
PLANNING ENGINEERING SURVEYING

Addendum #1

DRAINAGE STUDY - PRELIMINARY

FOR

CANDLELIGHT

(Schwerin & Associates, August 2013)

City of San Diego TM/SDP/PDP 114999
Project No.40329

Prepared for:
CANDLELIGHT, LLC
8015 North La Jolla Scenic Drive
La Jolla, CA 92037
Telephone: 858-455-5055

Prepared by:
SB&O, Inc.
3990 Ruffin Road, Suite 120
San Diego, CA 92123
858-560-1141 x 102
abutcher@sboinc.com
SB&O Job No. 66900.60

REGISTERED PROFESSIONAL ENGINEER
ALLEN L. BUTCHER
No. 47107
Exp. 12-31-17
CIVIL
STATE OF CALIFORNIA

Allen L. Butcher PE C47107

December 4, 2017

TABLE OF CONTENTS

EXHIBITS

SCOPE OF REPORT

The preliminary Technical Reports for Water Quality & Drainage (prepared by Schwerin & Associates 2013) were reviewed as part of the discretionary process.

A separate Storm Water Quality Management Plan (SWQMP) was prepared in accordance with the current post-construction water quality requirements of the City of San Diego Storm Water Standards Manual and MS-4 Permit (SDRWQCB Order No. R9-2013-0001, as amended by R9-2015-0001 and R9-2015-0100).

This addendum to the Preliminary Drainage Report is prepared to document changes to the project storm drain system required by the Water Quality permit update. Primarily changes to the storm drain system include additional inlets to intercept and direct surface runoff from Caliente Avenue and Public Street "A" for treatment and HMP control, including new inlets for the 10' wide paving of Public Street "A" located south of the project boundary. A fourth treatment and HMP control facility was added to the project to address public street runoff only.

Curb inlets will be added to Caliente Ave at the northerly boundary (limits of the existing cul-de-sac paving). These inlets will be part of the "bypass" storm drain system that will convey runoff from the High School beyond the project site, avoiding the treatment BMP, HMP and Detention facilities.

OVERVIEW

Correction: The hydrology calculations for the Detention Basin are based upon the County of San Diego Rational Method, and the Rational Method Hydrograph, not the SCS methodology. These calculations were part of the Water Quality Report.

Note: The street and offsite areas tributary to the treatment BMPs and HMP facilities were previously included in the detention analyses.

<u>The detention calculations are included in the SWQMP as Attachment 2.</u>

METHODOLOGY

The hydrology calculations in the original preliminary drainage study were based upon the Rational Method, in accordance with the City of San Diego Drainage Manual.

BYPASS STORM DRAIN SYSTEM

The original report described multiple storm drain systems and provided hydrology calculations and pipe sizes. "System 1 Waters from High School" and "Caliente Ave" estimated runoff tributary to the Bypass Storm Drain system, which will intercept and convey runoff from the northerly boundary at Caliente Ave through the site (estimated at 43.1 cfs). This 27" storm drain system is separate from the project storm drain system, and does not include any runoff from the Candlelight development. No changes are proposed to the Bypass System.

ADDITIONAL STORM DRAIN

As described in the scope of the report, the primary purpose of the addendum is to document the storm drain changes and additions (See Drainage and Storm Drain Exhibit in the Map Pocket). In order to intercept street runoff for Caliente, Public Street "A" and the 10' interim pavement adjacent to the south project boundary, several curb inlets will be required, located as follows;

West Site (To Biofiltration #4/ HMP #4)
Public Street A East of Caliente (Offsite Strip) to
Public Street A (East of Caliente Intersection) to
East ½ of Caliente (East Return) to
West ½ of Caliente (West Return) to Biofiltration 4

West Site (To Biofiltration #1/ HMP #1)
Public Street "A" West of Caliente – directly to Biofiltration #1
Public Street "A" West of Caliente (Offsite Strip) - – directly to Biofiltration #1
Public Street "A" West Cul-De-Sac – directly to Biofiltration #1

East Site (To Biofiltration #3)
Public Street "A" East Cul-De-Sac through Lot 3 to Biofiltration #3.

In addition, treated or "clean" storm drain lines will convey treated runoff to the Detention facilities as follows;

West Detention
POC 2 & POC 4 in Street A to Detention West
POC 1 – directly to Detention West

East Detention
POC 3 to HMP3/Detention East

Detailed inlet Sizing, Hydrology Calculations and Pipe Selection are included in Exhibit "A".

CONCLUSION

The storm drain additions or changes further define the prior drainage concept, primarily to provide treatment and HMP controls for the street flows (Caliente and Public Street "A", and the interim offsite improvements located south of the boundary (10'pavement strip along the southerly boundary and the easterly cul-de-sac).

EXHIBIT A

Inlet Calculations
Hydrology Calculations
Pipe Selection /Capacity Check

Project Name **Candlelight** Prelim 25-Nov-17

Inlet Areas - West Side (Caliente @ Street A Interection)

Inlet	**OFF 2**		**Inlet**	**ST 2**		**Inlet**	**ST-1 (East)**		**Inlet**	**ST-1 (West)**	
OFF 1			Area ST 2			Area CAL3+CAL4+ Por ST1			Area CAL2 + Por ST1		
A =	0.22	ac	A =	0.57	ac	A =	0.67	ac	A =	0.63	
Lo =	11	ft	Lo =	22	ft	Lo =	45	ft	Lo =	45	ac
C =	0.95	Table 2	C =	0.9	Table 2	C =	0.9	Table 2	C =	0.9	ft
S =	2.2	%	S =	2.2	%	S =	2.75	%	S =	2.75	Table 2
Ti =	0.7	min	Ti =	1.3	min	Ti =	1.7	min	To =	1.7	%
Lg =	750	ft	Lg =	775	ft	Lg =	590	ft	Lg =	600	min
Sg =	0.9	%	Sg =	0.9	%	Sg =	2.7	%	Sg =	2.7	ft
Vg	2	fps	Vg	2.2	fps	Vg	3.5	fps	Vg	3.5	%
Tg =	6.3	min	Tg =	5.9	min	Tg =	2.8	min	Tg =	2.9	fps
Lp =		ft	Lp =		ft	Lp =	0	ft	Lp =	0	min
Sp =		%	Sp =		%	Sp =	0	%	Sp =	0	ft
Vp			Vp			Vp	0		Vp	-	%
Tp =		min	Tp =		min	Tp =	0.0	min	Tp =	0.0	
Ti=	6.9	min	Ti=	7.2	min	Ti=	4.5	min	Ti=	4.6	min
I100=	4.00	in/hr	I100=	3.96	in/hr	I100=	4.40	in/hr	I100=	4.40	min
Q100=	0.84	cfs	Q100=	2.03	cfs	Q100=	2.65	cfs	Q100=	2.49	in/hr
Pasing Grade			**Pasing Grade**			**Pasing Grade**			**Pasing Grade**		cfs
Depth	0.24		Depth	0.29		Depth	0.26		Depth	0.26	
Length	6	A Inlet	Length	7	B-1 Inlet	Length	10	B-1 Inlet	Length	9	B-1 Inlet

Assume 8" Curb Face for Temp Inlet

To ST 2	**To ST 1 (East)**	**To ST 1 (West)**	**To BIO 4**

Project Name **Candlelight** Prelim 25-Nov-17

Inlet Areas - West Side (Street A)

Inlet	**ST-4 West**		**Inlet**	**ST-4 East**		**Inlet**	**OFF 1**	
Portion ST 4			Portion ST-4			OFF 1		
A =	0.64	ac	A =	0.2	ac	A =	0.17	ac
Lo =	26	ft	Lo =	26	ft	Lo =	11	ft
C =	0.9	Table 2	C =	0.9	Table 2	C =	0.95	Table 2
S =	2.1	%	S =	2.1	%	S =	2.1	%
Ti =	1.4	min	Ti =	1.4	min	Ti =	0.7	min
Lg =	310	ft	Lg =	470	ft	Lg =	520	ft
Sg =	0.9	%	Sg =	0.9	%	Sg =	1	%
Vg	2.2		Vg	2.2	fps	Vg	1.9	
Tg =	2.3	min	Tg =	3.6	min	Tg =	4.6	min
Lp =		ft	Lp =		ft	Lp =		ft
Sp =		%	Sp =		%	Sp =		%
Vp			Vp			Vp		
Tp =		min	Tp =		min	Tp =		min
Ti=	3.8	min	Ti=	5.0	min	Ti=	5.3	min
I100=	4.40	in/hr	I100=	4.40	in/hr	I100=	4.35	in/hr
Q100=	2.53	cfs	Q100=	0.79	cfs	Q100=	0.70	cfs
Sump Condition - B Inlet			**Pasing Grade**			**Sump Condition - B Inlet**		
Opening (h)	6.2	in	Depth	0.24		Opening (h)	2.2	in
Curb face (H)	10	in	Length	5	B Inlet	Curb face (H)	6	in
Ratio (H/h)	1.61					Ratio (H/h)	2.73	
Q / L =	1.70	cfs / ft				Q / L =	0.40	cfs / ft
Length	5	B Inlet				Length	5	A Inlet
						Assume 6" Curb Face for Temp Inlet		
To BIO 1			**To BIO 1**			**To BIO 1**		

Project Name **Candlelight** Prelim 25-Nov-17

Inlet Areas - East Side

Street "A" **East Cul-De-Sac**

ST 3 + OFF 3

A =	0.4	ac
Lo =	20	ft
C =	0.9	Table 2
S =	2	%
Ti =	1.3	min
Lg =	625	ft
Sg =	1	%
Vg	2.3	
Tg =	4.5	min
Lp =		ft
Sp =		%
Vp		
Tp =		min
Ti=	5.8	min
I100=	4.25	in/hr
Q100=	**1.53**	cfs

Sump Condition - B Inlet

Opening (h)	6.2	in
Curb face (H)	10	in
Ratio (H/h)	1.61	
Q / L =	1.70	cfs / ft
Length	5	B Inlet

To BIO 3

Project Name **Candlelight** Prelim 25-Nov-17

Storm Drain - West (Caliente @ Street A Intersection) to Bio 4

DMA ID	Area (ac)	C	Cumm C x A (ac)	Tc (min)	I100 (in/hr)	Q100 (cfs)	Pipe Dia / Capacity
OFF 2	0.22	0.95	0.21	6.9	4.00	0.84	18" @ 0.6% Capacity = 8.7 cfs
ST 2	0.57	0.9	0.72	7.2	3.96	2.86	18" @ 0.6% Capacity = 8.7 cfs
ST 1 East	0.67	0.9	1.33	7.2	3.96	5.25	18" @ 0.6% Capacity = 8.7 cfs
ST 1 West	0.63	0.9	1.89	7.2	3.96	7.49	18" @ 0.6% Capacity = 8.7 cfs
	2.09	**To BIO 4**	0.91				

Storm Drain - West (Por Street A to Bio 1)

DMA ID	Area (ac)	C	Cumm C x A (ac)	Tc (min)	I100 (in/hr)	Q100 (cfs)	Pipe Dia / Capacity
OFF 1	0.17	0.95	0.16	5.3	4.2	0.68	18" @ 0.6% Capacity = 8.7 cfs
ST 4 East	0.2	0.9	0.18	5.0	4.40	0.79	18" @ 0.6% Capacity = 8.7 cfs
ST 4 West	0.64	0.9	0.58	3.8	4.40	2.53	18" @ 0.6% Capacity = 8.7 cfs
	1.01	**To BIO 1**					

Storm Drain - East Street to Bio 3

DMA ID	Area (ac)	C	Cumm C x A (ac)	Tc (min)	I100 (in/hr)	Q100 (cfs)	Pipe Dia / Capacity
OFF 3 & ST 3	0.4	0.9	0.36	5.8	4.25	1.53	18" @ 0.6% Capacity = 8.7 cfs
		To BIO 3					

Candlelight

Prelim 25-Nov-17

Treated Storm Drain Systems

Storm Drain - Street "A" to Detention West

	Area (ac)	Tc (min)	I100 (in/hr)	C	Q100 (cfs)	Pipe Dia / Capacity
HMP 2 Outflow / POC 2	7.15	9.0	3.6	0.78	20.1	24" @ 0.8% Capacity = 21.7 cfs
HMP 4 Outflow / POC 4	2.09	8.0	3.8	0.91	7.2	18" @ 0.6% Capacity = 8.7 cfs
To Detention West	9.24	9.0	3.6	0.81	26.88	24" @ 1.25% Capacity = 27.2 cfs

Note: Tc = 9 minutes for Lot 2 per original report.

Storm Drain - POC 1 to Detention West

	Area (ac)	Tc (min)	I100 (in/hr)	C	Q100 (cfs)	Pipe Dia / Capacity
HMP 1 Outflow / POC 1						
Lot 1	6.95	9		0.75		
Streets	1.01	5.3		0.9		
To Detention West	7.97	9	3.6	0.77	22.0	24" @ 0.9% Capacity = 23.1 cfs

Note: Tc = 9 minutes per original drainage report.

Total Detention West 17.20

Detention West Outflow (From Detention Analysis) Q100= 3.3 24" @ 0.5% Capacity = 20 cfs

Storm Drain - BIO 3 to HMP 3/Detention East

	Area (ac)	Tc (min)	I100 (in/hr)	C	Q100 (cfs)	Pipe Dia / Capacity
BMP 3 Outflow						
Lot 3	8.23	9.0		0.78		
Street	0.4	5.8		0.9		
To HMP 3 / Detention East	8.63	9.0	3.6	0.79	24.41	24" @ 1.25% Capacity = 27.2 cfs

Note: Tc = 9 minutes per original report.

Detention East Outflow (From Detention Analysis) Q100= 0.1 18" @ 1.0% Capacity = 11.3 cfs

Developed Total 25.83 ac (West + East Detention Basins)

Appendix H

Drainage Study
Schwerin & Associates, Aug. 2013

Candlelight Drainage Study

I am a registered Civil Engineer and hereby state that this Drainage Study has been prepared by me or under my supervision.

Walter T.

Walter T. Schwerin, RCE 22139

REGISTERED PROFESSIONAL ENGINEER
WALTER T. SCHWERIN
NO. 22139
EXP. 9/30/13
CIVIL
STATE OF CALIFORNIA

Candlelight Preliminary Drainage Study

Overview

Candlelight is a 42.28 acre multi-family subdivision in the Otay Mesa area within the incorporated area of the City of San Diego. The property lies approximately one mile below freeway 905, contiguous to San Ysidro High School and abutting Caliente Avenue. There are two environmental preserve areas on the proposed project that will be undisturbed. These are the 15.78 acre Western Preserve and the 2.10 acre Eastern Preserve. Exhibit A illustrates the subdivision boundary, the two preserve areas and both the extension of Caliente Ave. and Public Street A.

The topography of the site is sloping Southwesterly on Lots 1 and 2 at about 2% into a finger of Spring Canyon which slopes Southerly. Lot 3 slopes Southeasterly at about 1% into another finger of Spring Canyon located on the far East of the project.

The goal of this project application is to obtain a Site Development Permit (SDP) and a tentative map. The required construction for this tentative map is the extension of Caliente Blvd. and Public Street A. The only grading proposed by this project is for the aforementioned two public roads. Ultimately multi- family development is proposed for this project. At such time additional grading permits and attendant drainage studies will be required.

Architectural Design Guidelines are being submitted as part of the Candlelight submittal package to satisfy the requirements of the Planned Development Permit. These guidelines have schematics of site plans that may or may not be utilized. For purposes of detention, hydro modification and bio retention these schematic plans were utilized for location of these facilities. The Water Quality Technical Report has exhibits and computations for these facilities.

It is recognized that in the future the location of detention basins and treatment facilities very might be changed for the ultimate development. The sizing however should remain the same.

This drainage study will analyze the handling of treated waters entering into Lot 1 from the adjoining High School to the North, uncollected waters flowing Southerly within Caliente Blvd. and the drainage systems crossing Caliente from Lot 2. It should be noted that waters emanating from the High School are from a detention basin and assumed to be treated. As such these waters plus waters generated from Caliente to the North of the project will be handled separately from on site waters. Exhibit B of this study illustrates the area draining into Candlelight from the high school.

The second part of the study will address waters flowing Southerly on Caliente and the inlet sizing. The drainage system handling waters crossing Caliente from Lot 2 will be analyzed at build out conditions. Exhibit B is the drainage map for this study and illustrates the <u>current</u> disposition of waters. Based on the topography, waters on Lot 3 currently flow Easterly into a finger of Spring Canyon. Construction of the public streets as proposed on this Tentative Map will not change or alter drainage flow of Lot 3.

Please note per Appendix 3 of the San Diego City Design manual, we used the SCS method to design the detention basin. Designing a detention basin requires a runoff hydrograph. The San Diego City Drainage Manual only provides peak flow data, therefore in accordance with Appendix 3 of the City of San Diego Drainage Manual, we used the SCS method which relies on the County rainfall maps and data.

System 1 Waters from High School

Based on topography taken by Hunsaker and Associates, the area from the High School draining into Candlelight is as shown on Exhibit B and is 20.4 acres. The overland flow is 1500' and the elevation differential is 13'.

The time of concentration is 13 minutes based on page 84 of the City's drainage manual.

The corresponding intensity is 3.1 inches per hour.

Coefficient of runoff is used as that for a multi family residence, or 0.70

Q from high school equals 44.27 cfs

Water from the High School enters the Candlelight property through two HDPE 18" pipes as shown on Exhibit B. It should be noted that the High School was built with the only municipal oversight being the State of California. As such construction documents including drainage studies are not available to the general public. Knowledge of the aforementioned 18" pipes is obtained through field review. Based on the attached Flow for Circular Pipe Flowing Full figure attached, the 44.27 cfs coming from the High School will require a 24" storm drain to handle this storm water at a 2.2% slope.

The following is an excerpt from the drainage study for Southview to the North. In particular that portion which addresses Caliente.

Caliente Avenue

Drainage area = 1.66 acres
Street slope = 1.0% at termination of road
Q=cia
C for road is 0.9
Intensity for area using 10 minute duration on 100 year storm
= 3.45 (City of San Diego drainage manual, page 83)
Q = 5.15 cfs
@ 5.15 cfs, slope =1.0%, depth of gutter flow = .37', less than 0.4, therefore ok (pg70a)
Note: Caliente will be extended as part of the Candlelight project, Tentative Map pending

Therefore no permanent solution designed at this time

Caliente waters to be collected at subdivision boundary and added to waters from High School.

Total waters in drain pipe = 32.8 + 5.15 + 5.15(two sides of Caliente) = 43.1 cfs

At an average of 2% gradient a 27" pipe will handle 43.1 cfs flowing full

System 2 Waters from Lot 2

Drainage system for waters from Lot 2 crossing Caliente is designed for ultimate buildout condition even though for purposes of this tentative map that is not the case since no grading is proposed (Other than on public streets) on this tentative map.

Lot 2 area = 7.15 acres
"C" for multi family = 0.7

Length of overland flow = 900'
Elevation difference = 8'
Time of concentration = 9 minutes
Corresponding intensity = 3.45

Q= cia
= 17.3 cfs

At 1.5% gradient assumed use 18" rcp

Note: Lot 3 will flow Easterly

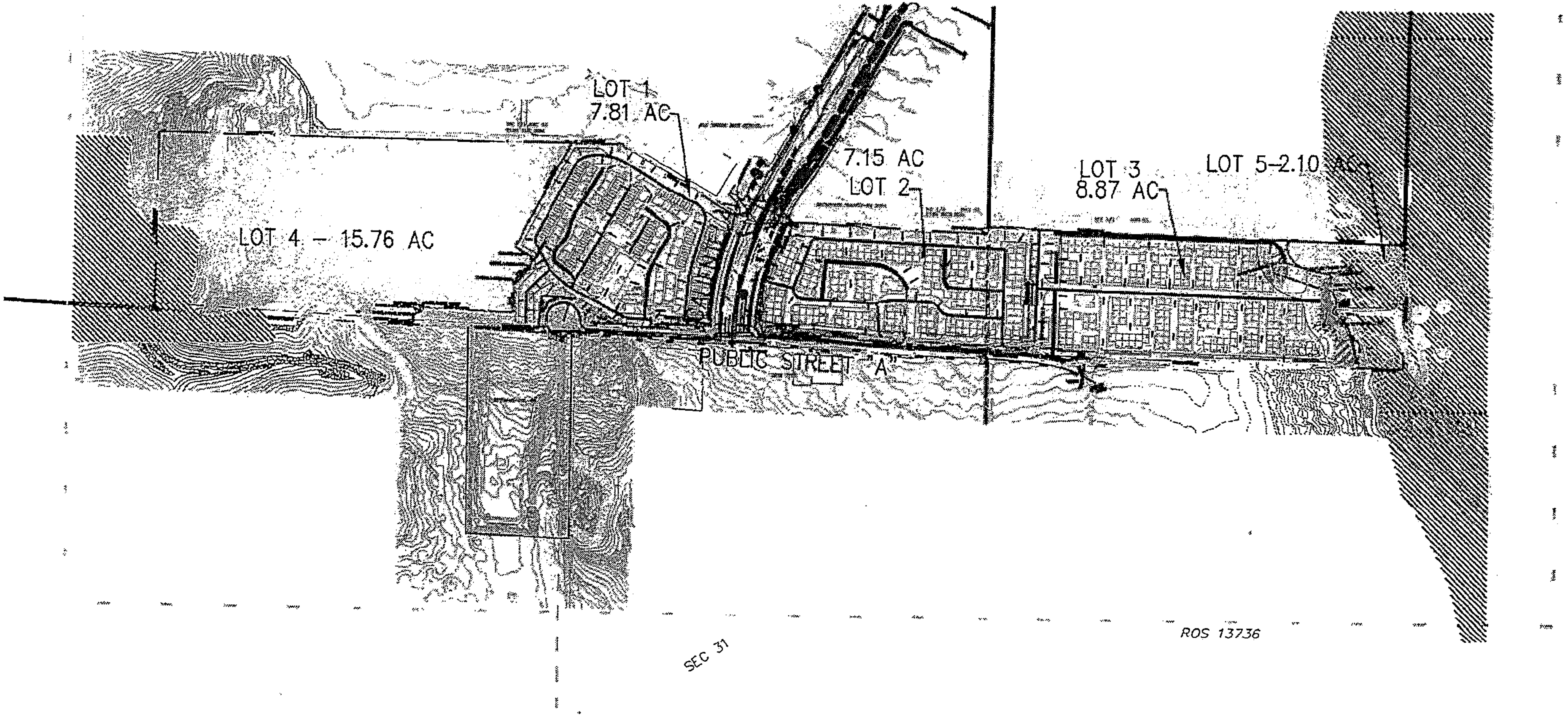
Evaluation of water flow in Caliente from upstream collection point:

Length of road: 380'
Width of road Westerly: 60'
Width of road Easterly: 80'
Area West side of road = 0.52 ac
Area East side of road = 0.70 ac

Easterly flow rate, Q
Use 10 min time of concentration for 3.45 "/hr
c= 0.9 for road
Q = 2.17 cfs for East; 1.61 cfs for West

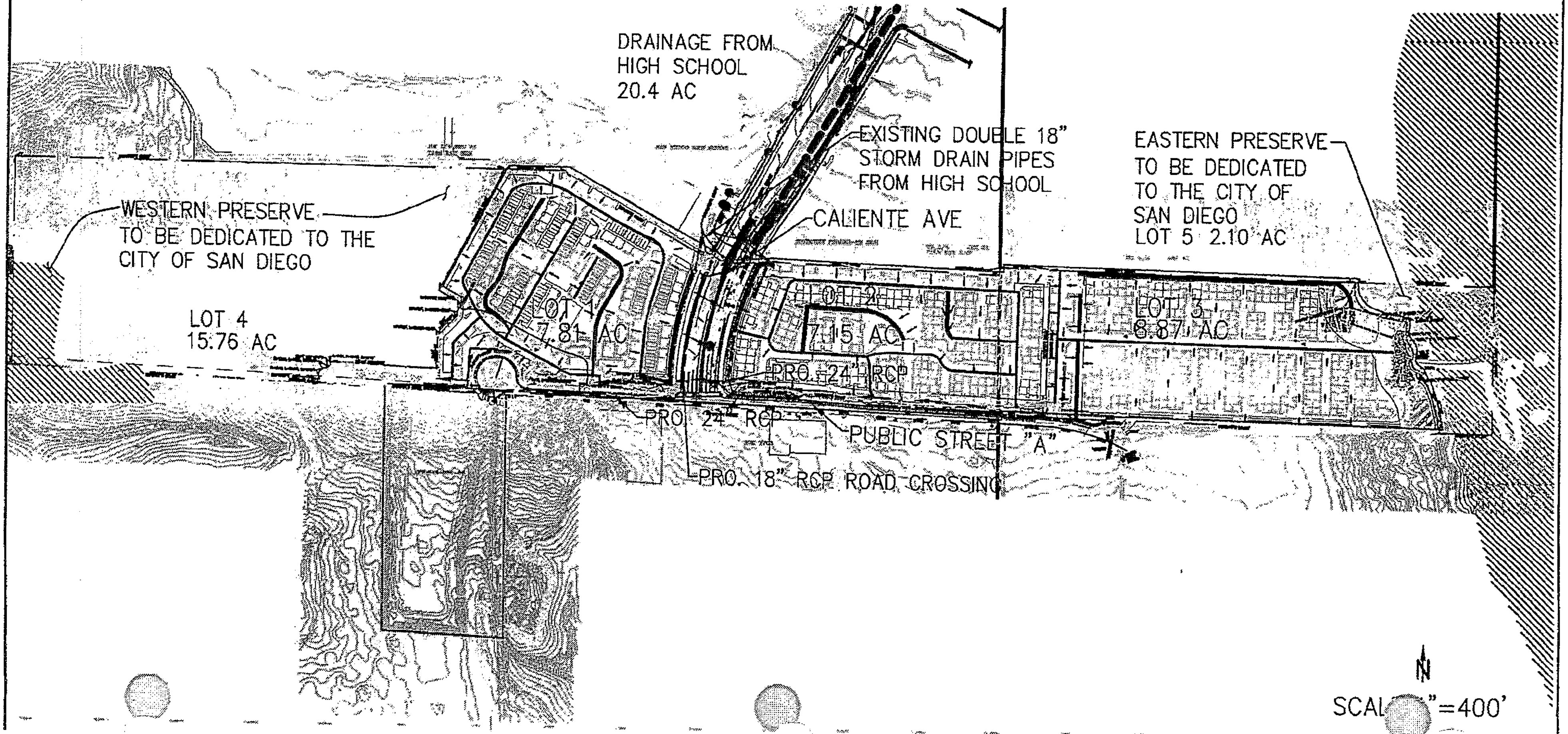
Street grade of Caliente at Southerly terminus: 4.00%
Depth of flow in gutter is 0.24' (Page 70, City Drainage Design Manual)
Less than 0.4', OK

CANDLELIGHT EXHIBIT "A"



SCALE:1"=500'

CANDLELIGHT
ON–SITE DRAINAGE MAP
EXHIBIT B



DRAINAGE EXHIBIT FOR:
CANDLELIGHT

WEST PORTION OF SITE

TO BIOFILTRATION 4

DMA	TREATMENT
OFF 2	DRAINS TO BIOFILTRATION 4
ST 2	DRAINS TO BIOFILTRATION 4
CAL 3	DRAINS TO BIOFILTRATION 4
CAL 4	DRAINS TO BIOFILTRATION 4
ST 1 EAST	DRAINS TO BIOFILTRATION 4
CAL 2	DRAINS TO BIOFILTRATION 4
ST 1 WEST	DRAINS TO BIOFILTRATION 4
TO HMP 4 TO DETENTIONING	

TO BIOFILTRATION 1

DMA	TREATMENT
ST 4 EAST	DRAINS TO BIOFILTRATION 1
OFF 1	DRAINS TO BIOFILTRATION 1
ST 4 WEST	DRAINS TO BIOFILTRATION 1
LOT 1	DRAINS TO BIOFILTRATION 1
TO HMP 1 TO DETENTION WEST	

TO BIOFILTRATION 2

DMA	TREATMENT
LOT 2	DRAINS TO BIOFILTRATION 2 THEN TO HMP 2 TO DETENTION WEST

EAST PORTION OF SITE

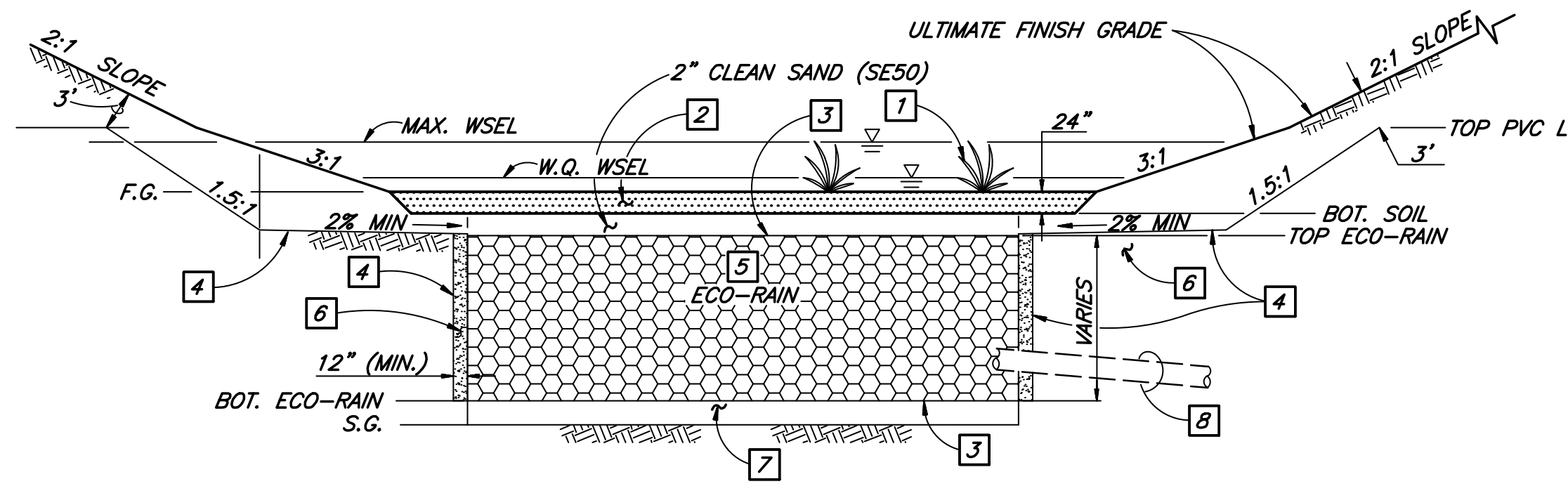
DMA	TREATMENT/TYPE
ST 3	DRAINS TO BIOFILTRATION 3
OFF 3	DRAINS TO BIOFILTRATION 3
LOT 3	DRAINS TO BIOFILTRATION 3
TO BIOFILTRATION 3	TO HMP 3/DETENTION EAST

REMAINDER AREAS

DMA	TREATMENT/TYPE
DETENTION WEST/ACCESS – SELF RETAINING	
TRAIL (LOT 3)	SELF RETAINING
LOT 4	OPEN SPACE – SELF MITIGATING
LOT 5	OPEN SPACE – SELF MITIGATING
CAL 1 EXIST. STREET BYPASS STORM DRAIN (NOT A PART)	

LEGEND

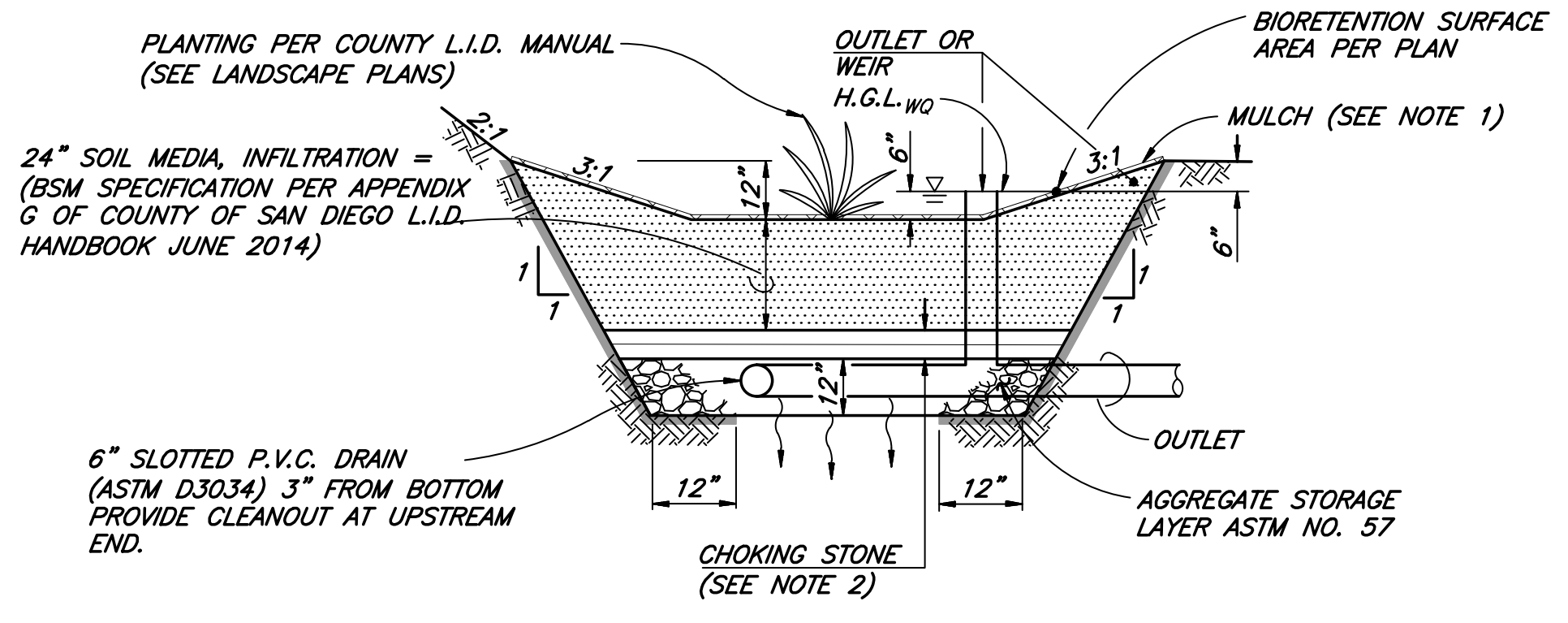
———-- ——	SUBDIVISION BOUNDARY
— SD — SD —	BYPASS STORM DRAIN
═══════□	PROPOSED STORM DRAIN
← ← ←	DIRECTION OF DRAINAGE
▬ ▬ ▬ ▬	DRAINAGE LIMITS
– – – – –	DETENTION (VAULT)
– – – – –	HMP (VAULT)
–○–○–○–○–○–	BIOFILTRATION BASIN
395	EXISTING CONTOUR
🟥	BIOFILTRATION (PARTIAL RETENTION) BASIN
🟩	UNDERGROUND HMP STORAGE
⬚	UNDERGROUND HMP/DETENTION STORAGE
▨	UNDERGROUND DETENTION STORAGE
▩	6' TRAIL (PERMEABLE SURFACE)



NOTES

1. PLANTING PALETTE PER COUNTY L.I.D. MANUAL (SEE LANDSCAPE CONSTRUCTION DRAWINGS.
2. 24" SOIL MEDIA (BSM SPECIFICATION PER APPENDIX G OF COUNTY OF SAN DIEGO L.I.D. HANDBOOK JUNE 2014)
3. "ECORAIN" STORAGE SYSTEM SHALL BE FULLY WRAPPED WITH PERMEABLE GEOFABRIC MIRAFI 140N, PER MANUFACTURER'S RECOMMENDATIONS.
4. 30 MIL. P.V.C. LINER SHALL BE FULLY WATER-TIGHT. ALL JOINTS SHALL OVERLAP 12" MIN. AND BE SEALED. LINER SHALL BE SEALED WITH MASTIC TO ALL STRUCTURES. ALL PENETRATIONS SHALL BE SEALED. INSTALL ON SIDES ONLY. BOTTOM SHALL BE UNLINED.
5. "ECO-RAIN" SPACE STORAGE SYSTEM. INSTALL PER MANUFACTURE'S SPECIFICATIONS AND GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.
6. BACKFILL WITH CLEAN SAND OR GRAVEL MATERIALS OR A MIX OF BOTH, FREE FROM LUMPS AND DEBRIS OR SHARP MATERIALS. COMPACT FILL IN LIFTS LESS THAN 12 INCHES TO 85% COMPACTION. SEE MANUFACTURER'S RECOMMENDATIONS.
7. BEDDING PER MANUFACTURER'S RECOMMENDATIONS
8. TO OUTLET CONTROL STRUCTURE.

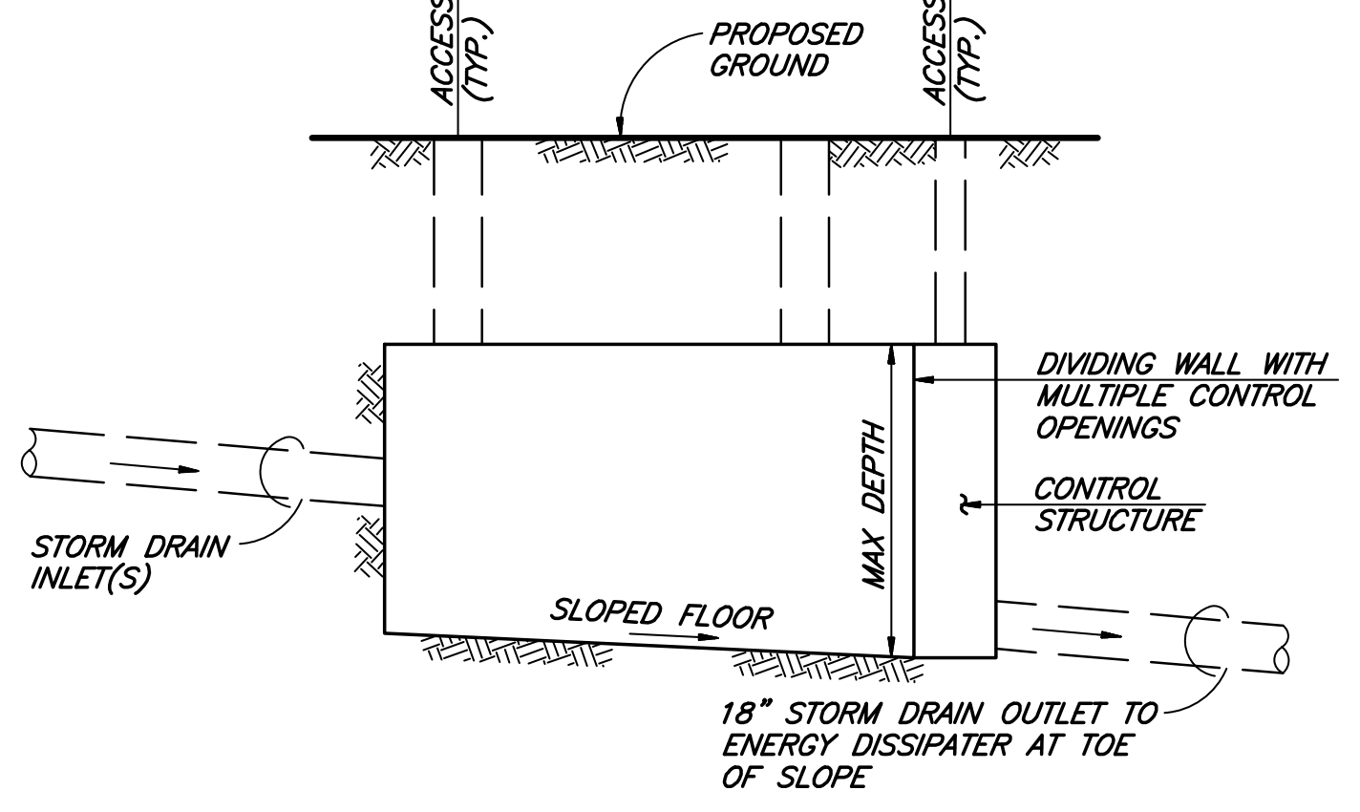
A – COMPOSITE BASIN 1, 2 & 4
NOT TO SCALE



NOTES

1. INSTALL 3" WELL AGED SHREDDED HARDWOOD MULCH THAT HAS BEEN STOCKED PILED OR STORED FOR AT LEAST 12 MONTHS. MULCH MUST BE NON-FLOATING.
2. CHOKING STONE TO BE 3" CLEAN AND WASHED SAND (ASTM NO. 33) OVER 3" LAYER OF ASTM NO. 8 STONE.

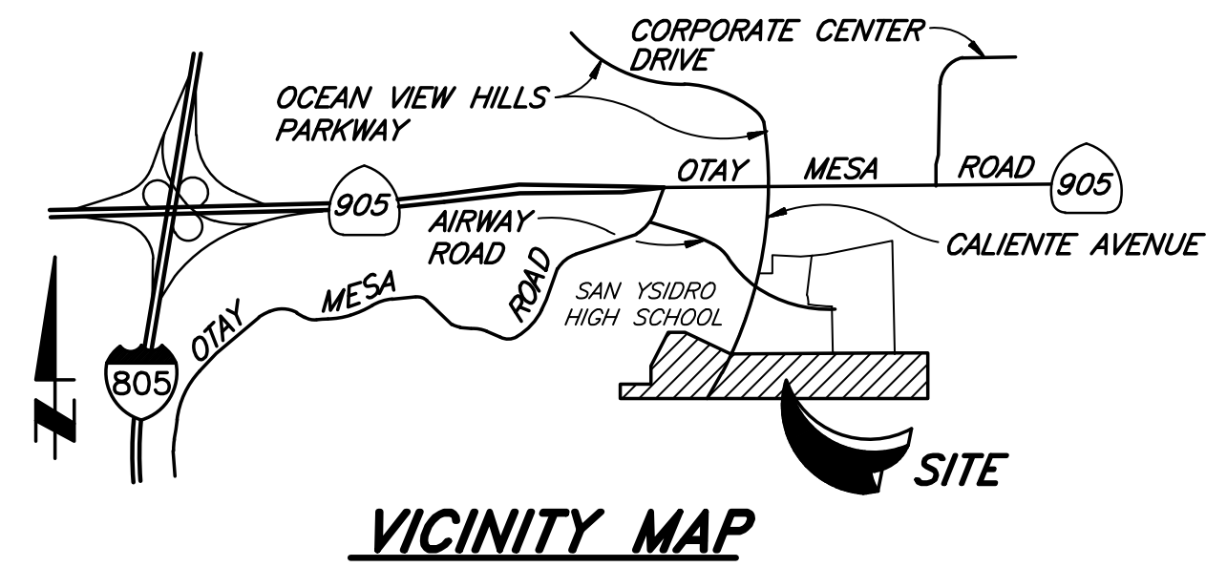
B – DETAIL ~ BIOFILTRATION BASIN 3
NOT TO SCALE



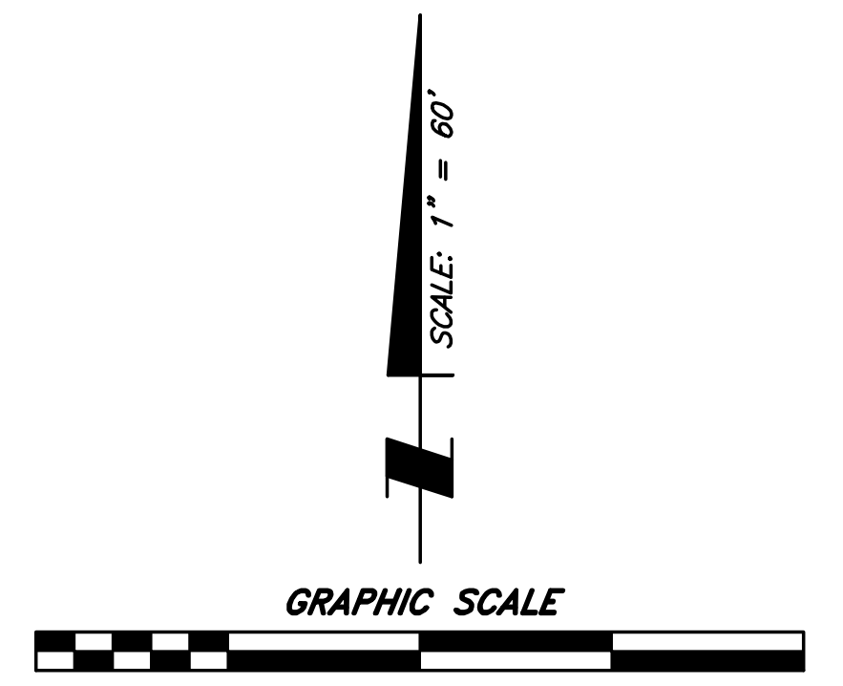
DETENTION SCHEDULE

STRUCTURE	DETENTION VOLUME (C.F.)	MAX DEPTH (FT.)	HMP VOLUME (C.F.)	HMP DEPTH
EAST	78,000	5.6	76,354	5.5
WEST	82,000	6.0	NONE	N/A

C – DETAIL ~ UNDERGROUND HMP/DETENTION STRUCTURE
NOT TO SCALE



VICINITY MAP
NOT TO SCALE
THOMAS BROTHERS PG. 1351, GRID A-2
2006 EDITION



~~10-3-17~~ 12-3-17

DRAINAGE STUDY
ADDENDUM #1

DRAINAGE EXHIBIT FOR:
CANDLELIGHT

REGISTERED PROFESSIONAL ENGINEER
ALLEN L. BUTCHER
No. 47107
Exp. 12-31-17
CIVIL
STATE OF CALIFORNIA

SB&O INC.
PLANNING ENGINEERING SURVEYING
3990 Ruffin Road, Suite 120
San Diego, Ca. 92123
858-560-1141
858-560-8157 Fax

ALLEN L. BUTCHER DATE

FILE NAME: D:\69902 CANDLELIGHT WQ CONSULT\03 DWG\DX\69902DX04-DRAINAGE EXHIBIT.DWG, PLOTTED BY: TONY PORCIONCULA ON 12/1/2017 10:23 AM

ATTACHMENT 6
GEOTECHNICAL AND GROUNDWATER INVESTIGATION REPORT

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

Project proposes Biofiltration with Partial Infiltration.

Infiltration testing shall be performed during the final design phase.

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GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. 07177-52-03
February 28, 2012

Schwerin & Associates
814 Morena Boulevard
San Diego, California 92110

Attention: Mr. Walter Schwerin

Subject: UPDATED GEOTECHNICAL LETTER
CANDLELIGHT
SAN DIEGO, CALIFORNIA

References:
1. *Geotechnical Investigation, Candlelight Villas – Phase 1, San Diego, California*, prepared by Geocon Incorporated, dated June 2, 2004 (Project No. 07177-52-02).
2. *Vesting Tentative Map, PDP and SDP Site/Grading Plan, Candlelight, Villas East, City of San Diego, California*, prepared by Schwerin & Associates, undated (Project No. 40329, Work Order No. 42-2966).

Dear Mr. Schwerin:

In accordance with your request, we have prepared this letter to update the referenced report dated June 2, 2004 and present supplemental preliminary design recommendations in accordance with the 2010 California Building Code (CBC). The site is located south of San Ysidro High School and east and west of Caliente Boulevard in the western portion of Otay Mesa in San Diego, California. We prepared the referenced geotechnical investigation report in 2004 associated with a planned residential development. Our investigation included excavating 27 backhoe trenches, performing laboratory tests, and providing recommendations for the previously-planned development. Based on discussions with you, we expect the new project will include multi-family and mixed use residential/retail structures; however, grading plans have not yet been developed for the construction of the development.

Based on our review of the referenced report and plans, the remaining recommendations in the referenced report remain applicable. We used the existing exploratory field and laboratory test data to prepare this update letter. Additional field investigation may be required when development plans are prepared. In addition, an updated geotechnical investigation report will be required when grading plans are available. Recommendations in the referenced report and this letter should be considered preliminary until we prepare an updated geotechnical investigation report when the grading plans for the project are available.

FAULTING AND SEISMICITY

A review of geologic literature and experience with the soil and geologic conditions in the general area indicate that known active, potentially active, or inactive faults are not located at the site. An active fault is defined by the California Geological Survey (CGS) as a fault showing evidence for activity within the last 11,000 years. The site is not located within a State of California Earthquake Fault Zone.

According to the computer program *EZ-FRISK* (Version 7.62), six known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. The nearest known active faults are the Newport-Inglewood and Rose Canyon Fault system, located approximately 8 miles from the site and is the dominant source of potential ground motion. Earthquakes that might occur on the Rose Canyon Fault Zone or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood Fault are 7.5 and 0.33g, respectively. The estimated deterministic maximum earthquake magnitude and peak ground acceleration for the Rose Canyon Fault are 6.9 and 0.26g, respectively. Table 1 lists the estimated maximum earthquake magnitude and peak ground acceleration for these and other faults in relationship to the site location. We used acceleration attenuation relationships developed by Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS, and Chiou-Youngs (2008) NGA acceleration-attenuation relationships in our analysis.

TABLE 1
DETERMINISTIC SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood	8	7.5	0.30	0.25	0.33
Rose Canyon	8	6.9	0.25	0.23	0.26
Coronado Bank	15	7.4	0.21	0.16	0.20
Palos Verdes Connected	15	7.7	0.23	0.17	0.23
Elsinore	44	7.9	0.12	0.08	0.10
Earthquake Valley	48	6.8	0.06	0.05	0.04

It is our opinion the site could be subjected to moderate to severe ground shaking in the event of an earthquake along any of the faults listed on Table 1 or other faults in the southern California/ northern

Baja California region. We do not consider the site to possess a greater risk than that of the surrounding developments.

We used the computer program *EZ-FRISK* to perform a probabilistic seismic hazard analysis. The computer program *EZ-FRISK* operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008) NGA USGS 2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2008) in the analysis. Table 2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
2% in a 50 Year Period	0.42	0.37	0.43
5% in a 50 Year Period	0.30	0.27	0.30
10% in a 50 Year Period	0.22	0.20	0.21

The California Geologic Survey (CGS) has a program that calculates the ground motion for a 10 percent of probability of exceedence in 50 years based on an average of several attenuation relationships. Table 3 presents the calculated results from the *Probabilistic Seismic Hazards Mapping Ground Motion* Page from the CGS website. The subject site is a Site Category C (soft rock).

TABLE 3
PROBABILISTIC SITE PARAMETERS FOR SELECTED FAULTS
CALIFORNIA GEOLOGIC SURVEY

Calculated Acceleration (g) Firm Rock	Calculated Acceleration (g) Soft Rock	Calculated Acceleration (g) Alluvium
0.23	0.25	0.29

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be evaluated in accordance with the 2010 California Building Code (CBC) guidelines or guidelines currently adopted by the City of San Diego.

SEISMIC DESIGN CRITERIA

We used the computer program *Seismic Hazard Curves and Uniform Hazard Response Spectra*, provided by the USGS. Table 4 summarizes site-specific design criteria obtained from the 2010 California Building Code (CBC; Based on the 2009 International Building Code [IBC]), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The planned buildings and improvements can be designed using a Site Class C where the fill soil is less than 20 feet or D for building pad with fill greater than 20 feet. The site class was determined in accordance with Section 1613.5.5 of the 2010 CBC.

TABLE 4
2010 CBC SEISMIC DESIGN PARAMETERS

Parameter	**Values**		**2010 CBC Reference**
Site Class	C	D	Table 1613.5.2
Fill Thickness, T (feet)	$T \leq 20$	$T > 20$	--
Spectral Response – Class B (short), S_S	1.032g	1.032g	Figure 1613.5(3)
Spectral Response – Class B (1 sec), S_1	0.386g	0.386g	Figure 1613.5(4)
Site Coefficient, F_A	1.000	1.087	Table 1613.5.3(1)
Site Coefficient, F_V	1.414	1.629	Table 1613.5.3(2)
Maximum Considered Earthquake Spectral Response Acceleration (short), S_{MS}	1.032g	1.122g	Section 1613.5.3 (Eqn 16-36)
Maximum Considered Earthquake Spectral Response Acceleration – (1 sec), S_{M1}	0.545g	0.628g	Section 1613.5.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.688g	0.748g	Section 1613.5.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.364g	0.419g	Section 1613.5.4 (Eqn 16-39)

Conformance to the criteria in Table 4 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a maximum level earthquake occurs. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

FOUNDATION AND CONCRETE SLABS-ON-GRADE RECOMMENDATIONS

The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in Table 5.

TABLE 5
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	T<20	--	EI≤50
II	20≤T<50	10≤D<20	50<EI≤90
III	T≥50	D≥20	90<EI≤130

Table 6 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 6
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

The embedment depths presented in Table 6 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively.

The concrete slab-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III.

Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that*

Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06). Concrete slabs on grade can be underlain by 4 inches of clean sand (3 inches for a 5-inch-thick slab. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.

The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI), Third Edition, as required by the 2010 California Building Code (CBC Section 1808.6). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented on Table 7 for the particular Foundation Category designated. The parameters presented in Table 7 are based on the guidelines presented in the PTI, Third Edition design manual.

TABLE 7
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) Third Edition Design Parameters	**Foundation Category**		
	I	**II**	**III**
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

Foundation systems for the building pads that possess a foundation Category I and a "very low" expansion potential (expansion index of 20 or less) can be designed using the method described in Section 1808 of the 2010 CBC. If post-tensioned foundations are planned, an alternative, commonly accepted design method (other than PTI Third Edition) can be used. However, the post-tensioned foundation system should be designed with a total and differential deflection of 1 inch. Geocon Incorporated should be contacted to review the plans and provide additional information, if necessary.

The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

If the structural engineer proposes a post-tensioned foundation design method other than PTI, Third Edition:

- The deflection criteria presented in Table 7 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

Our experience indicates post-tensioned slabs are susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. Current PTI design procedures primarily address the potential center lift of slabs but, because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning reduces the ability of the system to mitigate edge lift. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system.

Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces.

Isolated footings, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular foundation category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

For Foundation Category III, consideration should be given to using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

Foundation excavations should be observed by the geotechnical engineer (a representative of Geocon Incorporated) prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. If unexpected soil conditions are encountered, foundation modifications may be required.

Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in such concrete placement.

Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.
- If a swimming pool is proposed, Geocon Incorporated should be contacted to review the plans and the specific site conditions to provide additional recommendations, if necessary.
- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

The recommendations of this letter are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and, when in excess of 8 feet square, should be reinforced with 6 x 6 - W2.9/W2.9 (6 x 6 - 6/6) welded wire mesh placed in the middle of the slab to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based on the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete. Base or sand bedding is not required beneath the flatwork.

Even with the incorporation of the recommendations within this letter, exterior concrete flatwork has a potential of experiencing some movement due to swelling or settlement; therefore, welded wire mesh should overlap continuously in flatwork. Additionally, flatwork should be structurally connected to curbs, where possible.

Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

RETAINING WALLS AND LATERAL LOADS

Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 40 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal:vertical), an active soil pressure of 55 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an expansion index of 90 or less. For those buildings with finish-grade soils having an expansion index greater than 90 and/or where backfill materials do not conform to the criteria herein, Geocon Incorporated should be consulted for additional recommendations.

Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf should be added to the above active soil pressure. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted free-draining backfill material (EI of 50 or less) with no hydrostatic forces or imposed surcharge load. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

In general, wall foundations founded in properly compacted fill or formational materials should possess a minimum depth and width of one foot and may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within three feet below the base of the wall has an expansion index of 90 or less. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is expected.

The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the 2010 CBC. If the project possesses a seismic design category of D, E, or F, the proposed retaining walls should be designed with seismic lateral pressures. The seismic load exerted on the wall should be a triangular distribution with a pressure of 15H (where H is the height of the wall, in feet, resulting in pounds per square foot [psf]) exerted at the base of the wall and zero at the top of the wall. We used a peak site acceleration of 0.30g calculated from Section 1803.5.12 of the 2010 California Building Code ($S_{DS}/2.5$) and applying a pseudo-static coefficient of 0.5.

Footings that must be placed within seven feet of the top of slopes should be extended in depth such that the outer bottom edge of the footing is at least seven feet horizontally inside the face of the slope.

To resist lateral loads, a passive pressure exerted by an equivalent fluid weight of 350 pounds per cubic foot (pcf) should be used for the design of footings or shear keys poured neat in compacted fill. The passive pressure assumes a horizontal surface extending at least 5 feet, or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material in areas not protected by floor slabs or pavement should not be included in design for passive resistance.

If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.4 should be used for design.

The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet or other types of walls are planned, such as crib-type walls, Geocon Incorporated should be consulted for additional recommendations.

SITE DRAINAGE AND MOISTURE PROTECTION

Adequate site drainage is critical to reduce the potential for differential soil movement, erosion, and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures and the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The wall drains should extend to groundwater levels near the base of the wall. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

If detention basins, bioswales, retention basins, or water infiltration devices are being considered, Geocon Incorporated should be retained to provide recommendations pertaining to the geotechnical aspects of possible impacts and design. Distress may be caused to planned improvements and properties located hydrologically downstream. The distress depends on the amount of water to be detained, its residence time, soil permeability, and other factors. We have not performed a hydrogeology study at the site. Downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other impacts as a result of water infiltration. We opine the on-site soil is not conducive to infiltration based on the very dense nature of the fill and formational materials. The existing formational materials and fill soils can be classified as Hydrologic Soil Group D.

UPDATED GEOTECHNICAL INVESTIGATION

We should prepare an updated geotechnical investigation once development plans are available. The report should include recommendations for the planned development including foundations, retaining walls, seismic design criteria, and preliminary pavement design. The report should include a geologic map and geologic cross-sections, as necessary.

If you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Cristian A. Liang
Senior Staff Engineer

Shawn Foy Weedon
GE 2714

REGISTERED PROFESSIONAL ENGINEER
SHAWN WEEDON
No. 2714
Exp. 06/30/13
GEOTECHNICAL
★ STATE OF CALIFORNIA ★

CAL:SFW:dmc

(3) Addressee

GEOLOGIC MAP

CANDLELIGHT VILLAS PHASE 1
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 60'
DATE 06 - 02 - 2004
PROJECT NO. 07177 - 52 - 02
FIGURE 2
SHEET 1 OF 2

E:\2004\7177_AS1.DWG/aml

GEOLOGIC MAP

CANDLELIGHT VILLAS PHASE 1
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 60'	DATE 06 - 02 - 2004
PROJECT NO. 07177 - 52 - 02	FIGURE 3
SHEET 2 OF 2	

E:\2004\7177_AS1.DWG/aml

Appendix J

Sewer Studies

Schwerin & Assocs., Aug. 2013

PBS&J, Aug. 2006

Sewer Study Amendment

Candlelight Properties

Date:
November 18, 2012
Revised: April 9, 2013
Revised: June 28, 2013
Revised: August 13, 2013

Prepared by:
Schwerin & Associates
814 Morena Blvd, Ste 101
San Diego, CA 92110

I am a registered Civil Engineer and hereby state that this Sewer Study Amendment was prepared by me or under my supervision.

Walter T. Schwerin, RCE 22139

WALTER T. SCHWERIN
NO. 22139
EXP. 9/30/13

INTRODUCTION

The following is an amendment to an approved sewer study for the Candlelight Development. The original sewer study entitled "Candlelight Villas East Sewer Study" had been prepared by PBS&J Engineers fourth revision dated August 24, 2006. Since the original study was prepared ownership of the subject property has changed. Also the development plans have been modified somewhat. The previous application was for a 432 unit multi-family project, the current plans are for a maximum 476 unit multi-family project. The previous application had a specific design and site plan associated with it. The current application is processing concept only plans in accordance with the approved Precise Plan for this area.

This amended study provides a schematic layout and detail drawing (Exhibits 1 & 2) of the proposed sewer system, both private and public, for this development. This drawings depict two private on-site lift stations as well as a private gravity flow system within public street A. The initial sewer study called for a single private lift station as opposed to two lift stations. The incorporation of the second station eliminates the need for thousands of feet of sewer main with a depth in excess of 20' as specified within the previous design.

It should be noted that the Southview project to the North has had its discretionary actions approved in September, 2012. The offsite sewer collection system referred to in the original report, i.e. the 18" trunk sewer line in Airway Road beginning at the intersection of Caliente and Airway has now been built as opposed to being in design stage as noted in the original report. The Southview project no longer is designed to share a pump station with Candlelight and will use the 12" Public gravity sewer main in Airway Road to convey their effluent to the Otay Mesa Trunk sewer. Note: per the Southview Sewer study, the 12 in Public sewer main in Airway Road and the Otay Mesa Truck sewer have been confirmed to be able to handle effluent from Candlelight, Southview and Southview East. All other design criteria as specified in the original report is still applicable.

LOCATION

Candlelight is located in the Otay Mesa area within the incorporated limits of the City of San Diego. It is approximately one mile Southerly of the recently completed 905 freeway, bisected by Caliente Ave., an arterial road. It is approximately 2 miles Northerly of the international border with Mexico and 3 miles Westerly of Interstate 805. Property is contiguous to, and immediately Southerly of San Ysidro High School. The project is bounded to the North by Southview, an approved multi family subdivision (PTS 2204). To the South of Candlelight exists a paper subdivision with one acre lots. Immediately contiguous to, and running parallel to the Southerly boundary of Candlelight is a paper street with no improvements.

Table 1 Proposed Sewer Generation

Development	Land Use	Gross acreage	Net acreage	Dwelling Units	Population	Sewage Generation (gpd)
Candlelight	Multi-family	24.19	23.83	476	1425	114,000
Southview	Multi-family			525	1575	126,000
Total				1,000	3000	240,000

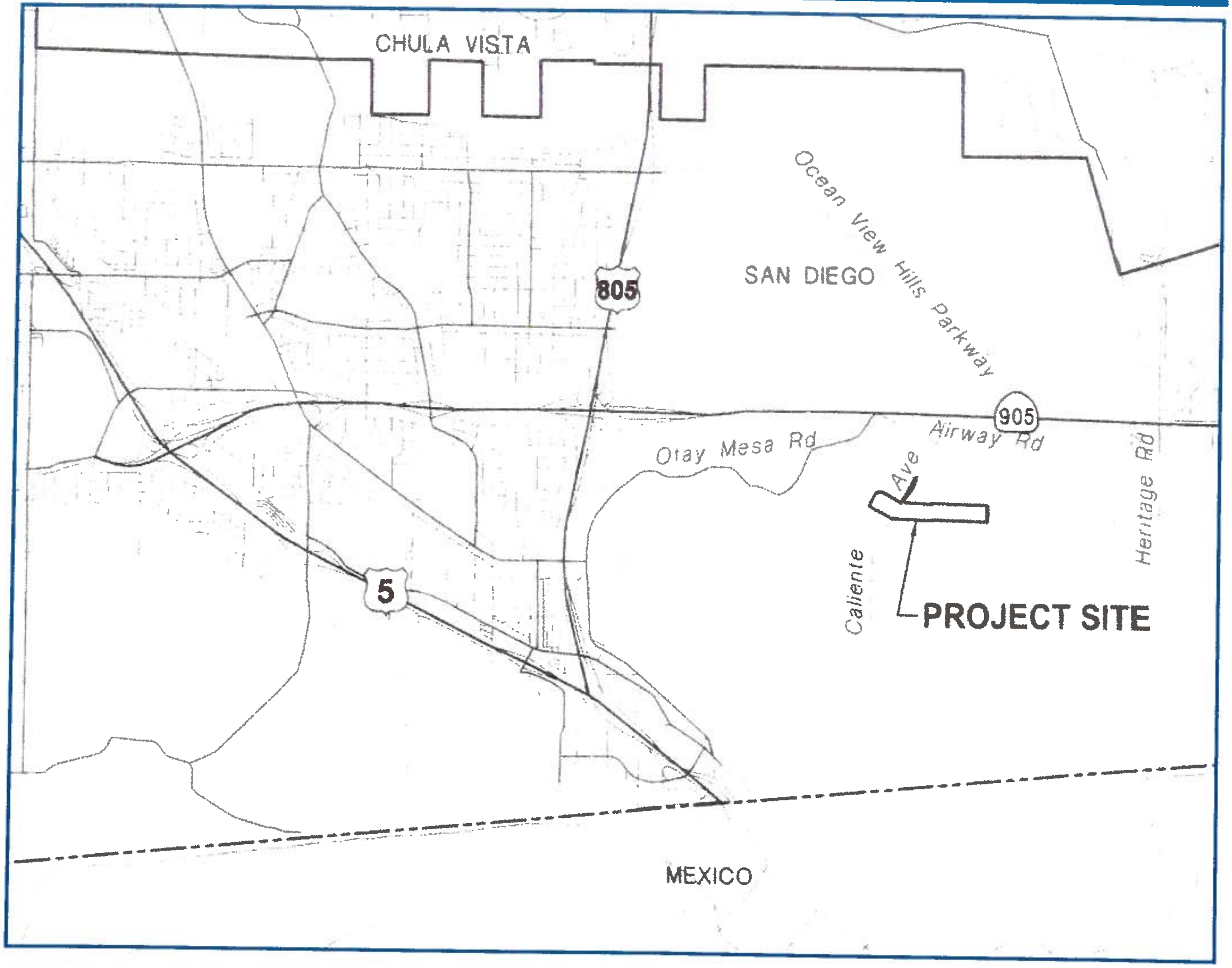
On Site Private Sewer System

A difference between the initial sewer study and this amended sewer study is the addition of a second private lift station located within lot 3. It should be noted that in general, the topography of lot 3 is 5' lower than the topography of lot 1. Furthermore, the distance from the Easterly areas of lot 3 to Caliente is in excess of 1500'. A sewer system attempting to gravity flow from lot 3 to lot 1 would need to have its collection components at a depth of 25' plus. This was the case on the previous design/submittal. It is felt for reasons of both cost and maintenance that a second private lift station and eliminating excessive depth of sewer mains would be the preferred choice. The below table illustrates that the private sewer system in Public Street A conforms to City standards.

Reach	No. of Units	Pop. (x3)	Peak Factor	Flow, mgd	Flow, cfs
Smh 2-smh 3	134	402	2.79	.090	.139
Smh 3-smh 4	241	723	2.60	.150	.233
Smh 4-smh 5	341	1023	2.47	.202	.313
Smh 5- lift station	341	1023	2.47	.202	.313

Reach	Line size	Dn (in)	Dn/D	Design Slope	Velocity(fps)
Smh 2-smh 3	8	2.1	.26	0.6%	1.96
Smh 3-smh 4	8	2.8	.35	0.5%	2.1
Smh 4-smh 5	8	3.4	.425	0.5%	2.27
Smh 5- lift station	8	3.4	.425	0.5%	2.27

AUGUST 2006



Candlelight Villas East Sewer Study

Prepared for:

D·R·HORTON
America's Builder
SAN DIEGO DIVISION

PBS&J

City Project No. 40329

PBS&J
An employee-owned company

August 24, 2006

Ms. Barbara Salvini
City of San Diego, Metropolitan Wastewater Department
Development Review Section
600 B Street, Suite 2210
San Diego, CA 92101

SUBJECT: CANDLELIGHT VILLAS EAST SEWER STUDY – 4th REVISION

Dear Ms. Salvini,

On behalf of our client DR Horton – San Diego Division (DR Horton), PBS&J is pleased to submit three copies of the *Candlelight Sewer Study-Revision No. 4* for City of San Diego (City) Staff review. This report provides City Staff with the background information on the sewer system for the proposed Candlelight Villas East Development including sewage generation, sewer design criteria, existing and proposed sewer facilities, hydraulic analyses of the existing and proposed sewer facilities, and recommendations in accordance with the City of San Diego *Sewer Design Guide* 2004.

INTRODUCTION

PBS&J has been authorized by DR Horton to prepare this sewer study for their proposed Candlelight Villas East Development (Project). The purpose of this study is to determine on-site sewer facilities required for the Project and to review potential impacts to existing off-site sewer facilities and identify upgrades if necessary. The study identifies recommended pipe sizes and alignments and also provides calculated peak depth of flow (dn), dn/pipe diameter (D) ratio, and pipe velocities.

BACKGROUND

The Project is located in the City's Otay Mesa area along Caliente Road south of Airway Road as shown on Figure 1. The Project is bordered by the proposed "Southview Apartments" (Southview) development to the north and a future development to the south.

Sewer service for the Project will be provided by the City of San Diego. The Project lies within the Otay Mesa Sewer Basin as depicted on Figure 2 and will ultimately be served by the City's planned Otay Mesa Trunk Sewer system as identified in the *Otay Mesa Trunk Sewer Master Plan* (June 2004) (*OMTS Plan*) and associated technical studies prepared by PBS&J. Existing and planned regional sewer facilities have been sized to adequately convey projected sewer flows from the Project.

The Candlelight Development currently includes the construction of 432 Multi-Family dwelling units (DUs) with an equivalent dwelling unit (EDU) sewer capacity of 370.

SEWAGE GENERATION AND DESIGN CRITERIA

The following City of San Diego *Sewer Design Guide* (2004) criteria were utilized in this analysis:

Sewage generation *(Section 1.3.2.2)*	80 gallons per day (gpd) per capita
Population per Dwelling Unit *(Table 1-1)*	3.0 – Zone RM-2-5
Peaking Factor (PFDW) *(Figure 1-1)*	6.2945 × (population)$^{-0.1342}$
Manning's "n" *(Section 1.3.3.1)*	0.013
Minimum velocity *(Section 1.3.3.1)*	2 feet per second (fps)
Minimum Slope at less than 2 fps *(Section 1.3.3.1)*	1.0 percent
Maximum dn/D ratio *(Section 1.3.3.3)*	0.5 (for new sewer mains 15-inches and smaller) 0.75 (for new sewer mains 18-inches and larger)
Net acres *(Table 1-1)*	0.8 × gross acres

Sewage generation for the Project was estimated based on the proposed Vesting Tentative Map, City of San Diego Project No. 40239, dated 10/20/05 provided by Hunsaker and Associates, Inc. and the *Sewer Design Guide*. Table 1 below summarizes the estimated sewage generation and flows for the Project. The average daily flow from the Project is estimated to be approximately 104,400 gpd.

Based on *OMTS Plan* and the area topography, it is understood that a portion of the adjacent Southview development's (TM 25169) sewer will gravity flow south into the Project. The sewer flow generation from Southview has been included in Table 1 below and is depicted on Figure 3, Proposed Sewer System.

Table 1. Proposed Sewer Generation

Development	Land Use	Gross Acreage (acres)	Net Acreage (acres)	Dwelling Units	EDU	Population	Sewage Generation (gpd)
Candlelight	Multi-Family	28.125	22.5	432	370	1,296	103,680
Southview	Multi-Family	--	--	525*	450	1,575	126,000
Total				957	**820**	**2,871**	**229,680**

* From Sewer Study for Southview, TM 25169, prepared by Schwerin & Associates, Incorporated dated July 14, 2006 and Schwerin & Associates letter dated July 26, 2006 (Appendix C).

EXISTING SEWER FACILITIES

At present, there are no existing sewer facilities within the Project boundary.

ON-SITE PRIVATE SEWER COLLECTION SYSTEM

Gravity Sewer System (Private)
The proposed on-site sewer collection system is depicted on Figure 3. The system will consist of private 8-inch and 10-inch diameter gravity mains. All private gravity sewer mains located within proposed public streets will require a dedicated private sewer easement.

One small area of the Project, highlighted on Figure 3, will gravity flow directly into the proposed 18-inch public gravity sewer main in Caliente Avenue. The remaining units will flow to the proposed private sewer lift station.

Sewer Lift Station (Private)
A private sewer lift station will be located near the southeastern Project boundary. The sewer lift station will collect gravity flows from the Project excluding those areas described above and 525 multi-family dwelling units proposed as part of the Southview development. The lift station will pump the wastewater through a private force main located within the private development streets to the private gravity sewer system that connects the system to the proposed 18-inch public trunk sewer in Caliente Avenue.

The Southview development has agreed to coordinate with the Candlelight development and contribute their fair share to fund the design and construction of the proposed private sewer lift station through a private participation agreement with D.R. Horton (see Schwerin & Associates letter dated July 26, 2006 in Appendix C).

A private Homeowners Association Agreement is required between Candlelight and Southview for the operation and maintenance of the joint sewer and sewer pump station facilities. A copy of the development's CC&Rs is required at the time of plan check submittal.

Preliminary engineering calculations have been prepared in accordance with the *Sewer Design Guide* to demonstrate that the sewer retention time in the force main does not exceed the maximum 4-hours allowed by the City. These calculations are included in Appendix D for reference.

OFF-SITE SEWER COLLECTION SYSTEM

Figure 4 illustrates the off-site sewer collection system as described below.

Airway Road and Caliente Avenue Trunk Sewer
As part of the *OMTS Plan*, an 18-inch trunk sewer is planned in Airway Road and Caliente Avenue. As shown on Figure 3, the 18-inch trunk sewer will connect flows from the west Otay Mesa area, including the Candlelight Villas East Development, to the existing 42-inch trunk sewer in Otay Mesa Road.

Originally identified as a component of the SR-905 construction, Caltrans would build the 18-inch trunk sewer in Airway Road and remove the SYHS 10-inch sewer flowing north that is impacted by proposed grading activities. The SR-905 Project is being delayed due to funding restrictions and the schedule for construction of the Airway Road trunk sewer is uncertain. Therefore, it will be necessary for D.R. Horton to construct the Airway Road and Caliente Avenue 18-inch trunk sewer to serve the Project.

The City is currently evaluating different funding options for design and construction of the next phases of the *OMTS*. Currently, all public sewer main facilities 18 inches in diameter and larger are considered included in the pre-existing Otay International Center (OIC) Agreement. Design and construction of qualifying *OMTS* facilities would be reimbursed according to the agreement or potentially a separate *OMTS* funding agreement if established by the City. D.R. Horton will also work with Caltrans to secure the funding, construct the trunk sewer, abandon the existing 10-inch main, and redirect the San Ysidro High School wastewater flows down to Airway Road.

With the Airway Road and Caliente Avenue 18-inch trunk sewer in operation, sewer flows will be diverted west to Otay Mesa Road where the main connects to the existing 42-inch *OMTS - Phase 2A*. The 42-inch *OMTS* is extended in Otay Mesa Road southwest to Mesa Place where it is temporarily connected to an existing 10-inch sewer main. The existing 10-inch sewer main extends southwest and is gradually upsized until it connects with the San Ysidro Interceptor Sewer on the west side of Interstate 5. MWWD is currently preparing the design for Phase 2B1 of the *OMTS* project and scheduling construction in their CIP budget for the near future. As part of the *OMTS Phase 2B1* construction, MWWD will upsize the entire reach from the end of Phase 2A to the San Ysidro Interceptor Sewer providing the ultimate sewer system capacity necessary for the Project.

OMTS Phase 2B1 – Hydraulic Analysis
Currently, the *OMTS Phase 2B1* is not funded. It is uncertain if City Council, given the current financial climate, will support City participation in front funding the facility.

In the event that the *OMTS Phase 2B1* construction is delayed, PBS&J analyzed the available capacity in the existing system as part of the regional sewer system analysis. The PBS&J report dated May 18, 2005 and included in Appendix A concludes that **2,300 EDUs** of capacity are available in the existing system that connects to the San Ysidro Interceptor Sewer. Therefore, there is sufficient capacity for the Project on an interim basis until Phase 2B1 is constructed.

Future Dual Public Sewer Force Mains
As part of the *OMTS* system, dual 12-inch force mains will be constructed with the improvements to Caliente Avenue. As shown on Figure 3, the 12-inch force mains will extend from the project boundary to a connection with the proposed 18-inch trunk sewer in Caliente Avenue. The 12-inch force mains are also shown on the cross section views for Caliente Avenue located in Appendix B.

Additionally, Figure 3 shows dual 6-inch public sewer force mains constructed with the future southern widening of Public Street "A". The 6-inch force mains are also illustrated on the cross section views for Public Street "A" located in Appendix B. The future development to the south will be required to widen Public Street "A" to its ultimate improved width. At that time, the dual 6-inch force mains can be installed and extended to the public sewer pump station located on the property.

GENERAL CRITERIA AND ENVIRONMENTAL CONSTRAINTS

The following design criteria and constraints apply to the Project and should be incorporated into the design documents where appropriate. No environmental assessments have been included as part of this study.

- On-site private mains shall be designed and constructed to the California Uniform Plumbing Code as adopted by the City of San Diego.
- A separate plumbing permit must be obtained for on-site private mains.
- Private pump stations shall not be located in the public right-of-way.
- Design capacity for private pump stations shall be determined in the same manner as required by the *Sewer Design Guide* for public pump stations.
- Wet well and force main detention times shall not exceed 4-hours. Locate the pump station to use minimum lengths for force mains to reduce detention time.
- Private sewer pump stations require separate City structural, mechanical, and electrical permits from the Building Development Review Division.
- All private sewer pump stations shall be adequately sized and designed with sufficient redundancy measures as determined by the DESIGN ENGINEER and comply with all applicable local, state and federal regulations which may apply.
- A letter of agreement shall be recorded against each lot served by the pump station (Property Title Information).
- Construction of sewer facilities shall not occur outside of the limits of disturbance identified in the Environmental Impact Report.
- Edge-to-edge separation between sewer and water mains shall conform with the State Department of Health's *Guidance Memo No. 2003-02: Guidance Criteria for the Separation of Water Mains and Non-potable Pipelines* (rev October 16, 2003). (Minimum separation is 10-feet edge-to-edge.)

HYDRAULIC ANALYSIS

The results of the hydraulic analysis are presented in Table 2 and graphically depicted in Figure 3. Proposed street cross-sections are presented in Appendix B.

RESULTS AND CONCLUSIONS

The proposed on-site sewer facilities for the Project meet the *Sewer Design Guide* requirements. The dn/D ratio is less than 0.5 for all segments, and the velocity during peak flow is greater than 2.0 feet per second (fps) except where the *Sewer Design Guide* allows an exception for the velocity criteria for slopes greater than 1%.

If you have any questions or comments, please feel free to call me anytime at 858-514-1027 or cell 760-525-7670.

Cordially,

REGISTERED PROFESSIONAL ENGINEER
TODD D. ENGSTRAND
C 62867
EXP. ______
CIVIL
STATE OF CALIFORNIA

Todd D. Engstrand, P.E.
Senior Project Manager

Attachments

c: Ann Sasaki, MWWD
Craig Whittemore, MWWD
Eric Ruby, DR Horton
Jeramey Harding, T&B Planning (4 copies)
John Klein, Hunsaker & Associates
Jenny Bileck, PBS&J
File 491096

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TABLE 2

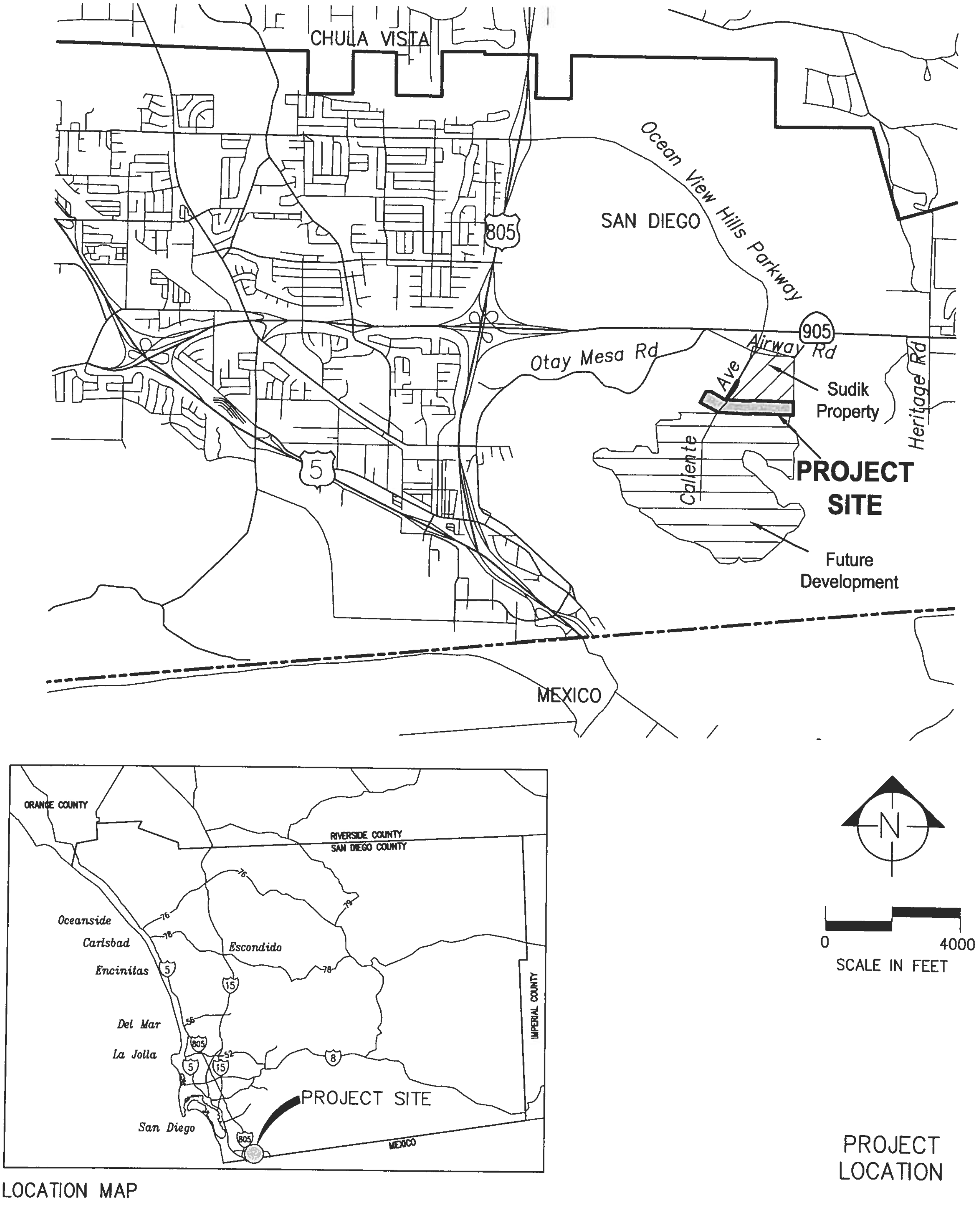
SEWER STUDY SUMMARY
CANDLELIGHT EAST VILLAS DEVELOPMENT

PBS&J Project No. : 491096

For: DR Horton
By: PBS&J

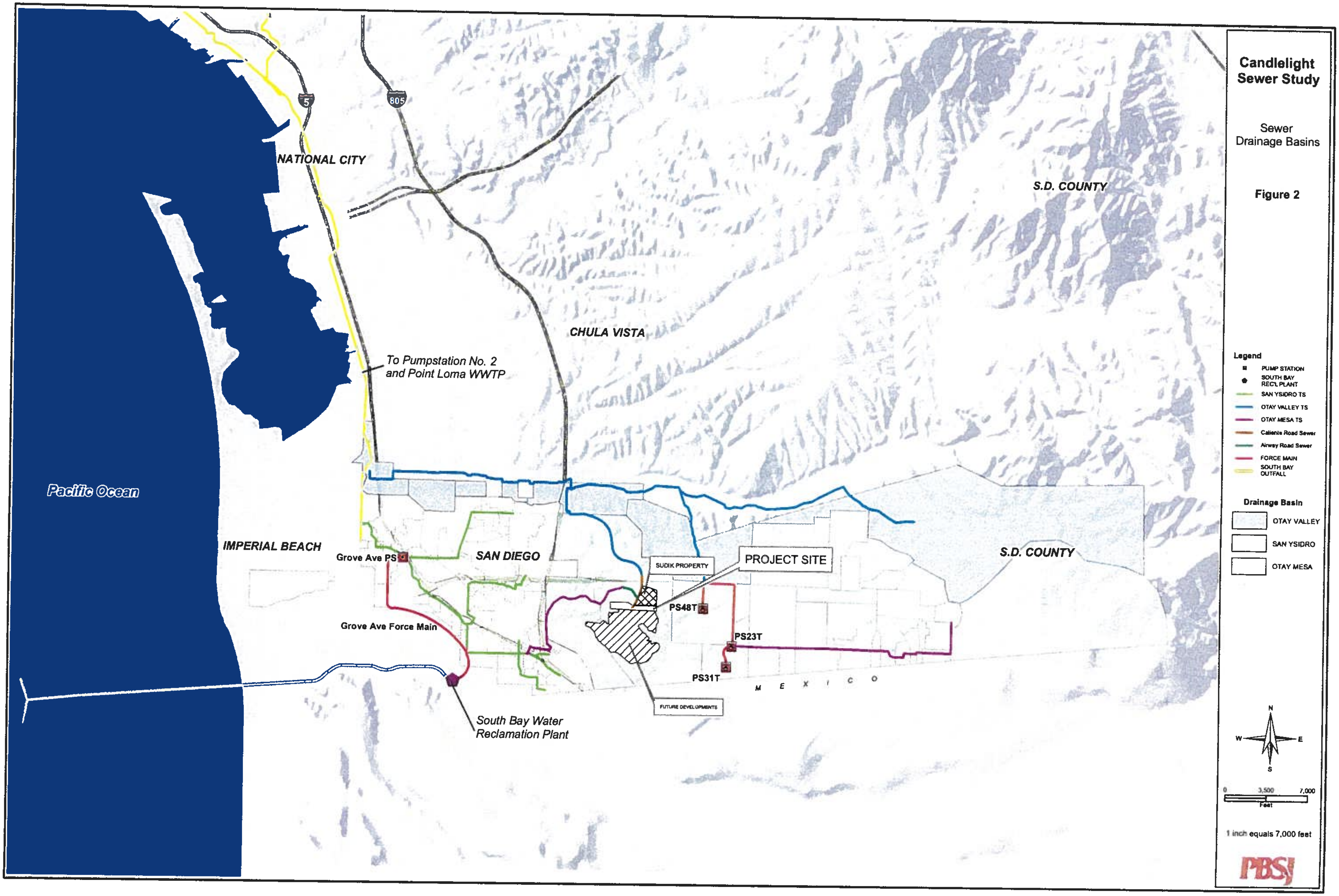
9/13/2006

Line No.	From MH	To MH	Population per DU	In-Line DU	Population Served		Peak/Ave Ratio	Peak Design Flow		Line Size (inches)	Design Slope (%)	dn	dn/D	Velocity (fps)	Comments
					In-Line	Total		(mgd)	(cfs)						
P1	1	2	3	27	81	81.0	3.49	0.02	0.03	8	1	0.08	0.12	1.5	
P2	2	3	3	16	48	129.0	3.28	0.03	0.05	8	1	0.09	0.14	1.7	
P11	3	6	3	16	48	177.0	3.14	0.04	0.07	8	1	0.11	0.16	1.9	
P3	4	5	3	28	84	84.0	3.47	0.02	0.04	8	1.1	0.08	0.11	1.6	
P4	5	6	3	42	126	210.0	3.07	0.05	0.08	8	1.2	0.11	0.17	2.1	
P5	6	7	3	16	48	435.0	2.79	0.10	0.15	8	0.9	0.16	0.24	2.3	
P20	7	21	3	0	0	435.0	2.79	0.10	0.15	8	0.82	0.17	0.25	2.2	
P6	21	8	3	0	0	435.0	2.79	0.10	0.15	8	0.7	0.17	0.26	2.1	
P7	9	8	3	12	36	471.0	2.76	0.10	0.16	8	4.9	0.11	0.17	4.2	
P8	8	10	3	16	48	519.0	2.72	0.11	0.17	8	0.7	0.19	0.28	2.2	
P10	11	10	3	48	144	144.0	3.23	0.04	0.06	8	5.1	0.07	0.10	3.1	
P9	10	19	3	0	0	663.0	2.63	0.14	0.22	8	0.5	0.23	0.34	2.0	
P12	19	12	3	32	96	759.0	2.58	0.16	0.24	8	0.5	0.24	0.36	2.1	
P13	13	12	3	32	96	96.0	3.41	0.03	0.04	8	5.4	0.06	0.08	2.9	
P14	12	14	3	6	18	873.0	2.54	0.18	0.27	8	0.4	0.28	0.41	2.0	
P15	14	16	3	60	180	1053.0	2.47	0.21	0.32	8	0.7	0.26	0.39	2.6	
P17	16	17	3	36	108	1161.0	2.44	0.23	0.35	8	0.7	0.27	0.41	2.6	
P25	28	17	3	546	1638	2799.0	2.17	0.49	0.75	10	1.6	0.30	0.36	4.3	+525 DU's from Southview
P19	17	PS	3	12	36	2835.0	2.17	0.49	0.76	10	0.7	0.37	0.45	3.2	Into Priv Sewer Lift Station
Total				**945**		**2835.0**		**0.49**	**0.76**						
P21	22	23	3	12	36	36.0	3.89	0.50	0.78	10	0.5	0.42	0.50	2.8	Peak flow includes design flow of 340 gpm (0.76 cfs) from Sewer Lift Station
P22	23	25	3	0	0	0.0	3.89	0.50	0.78	10	0.8	0.36	0.44	3.4	
P23	25	26	3	0	0	0.0	3.89	0.50	0.78	18	0.5	0.27	0.18	2.4	
P24	26	27	3	0	0	0.0	3.89	0.50	0.78	18	0.5	0.27	0.18	2.4	
P26	27	EXST	3	0	0	0.0	3.89	0.50	0.78	18	0.5	0.27	0.18	2.4	Connection to Exst OMTS MH Airway Rd and Otay Mesa Rd
Total				**957**		**2871.0**		**0.50**	**0.78**						



PROJECT LOCATION

FIGURE 1



Candlelight Sewer Study

Sewer Drainage Basins

Figure 2

TABLE 3

MANHOLE ELEVATIONS

MH ID	Rim Elev (Feet)	Invert Elev (Feet)	Depth (Feet)
1	522.8	516.80	6.00
2	522.6	516.40	6.20
3	520.0	514.25	5.75
4	524.2	517.20	7.00
5	521.9	514.80	7.10
6	517.4	512.30	5.10
7	519.0	510.59	8.41
21	518.5	509.73	8.77
9	521.8	513.70	8.10
8	519.1	507.56	11.54
11	524.7	516.60	8.10
10	522.2	505.61	16.59
19	523.8	504.86	18.94
13	524.2	516.00	8.20
12	523.4	504.09	19.31
14	520.6	502.31	18.29
16	516.3	499.97	16.33
28	518.3	503.30	15.00
17 [4]	514.1	498.79	15.31
PS	512.0	497.24	14.76
22	525.8	520.80	5.00
23	526.8	520.05	6.75
24	528.0	519.57	8.43
25	527.6	518.93	8.67
26 [3]	538.1	514.45	23.60
27 [3]	536.1	513.62	22.46

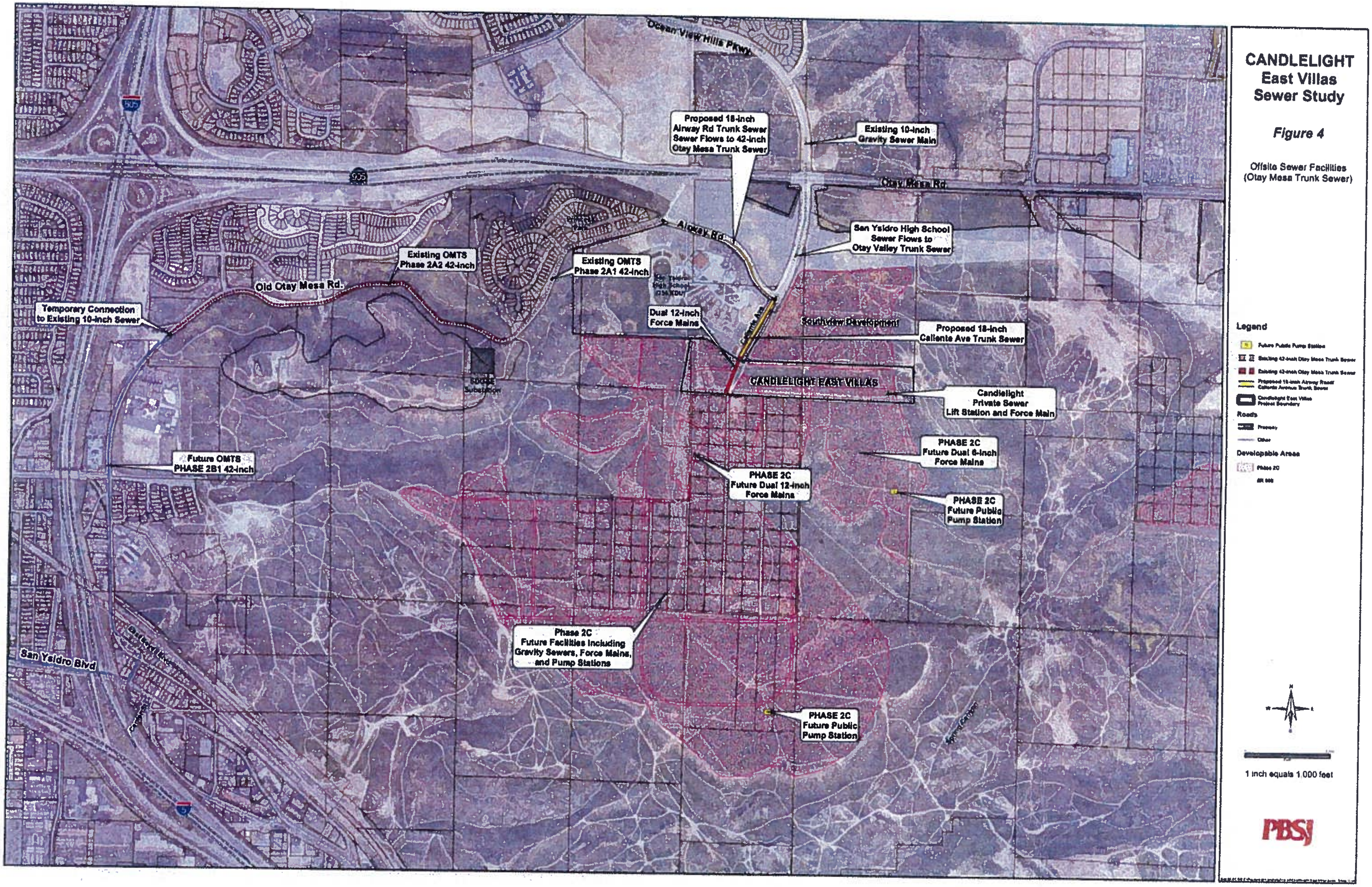
Notes :

1. All other private sewer manhole elevations indicated on Figure 3 are shown on the Candlelight TM.
2. All proposed public manholes deeper than 25-feet require a vault structure with dual manholes per the Sewer Design Guide, Section 2.3.10.
3. Depth required per approved Improvement Plan 33423-D.
4. Final invert elevation to be coordinate with Southview Development. Minimum invert elevation required for a 1% slope equals 501.59-feet.

CANDLELIGHT East Villas Sewer Study

Figure 4

Offsite Sewer Facilities (Otay Mesa Trunk Sewer)



Appendix A
Off-site Regional Sewer Analysis

THE CITY OF SAN DIEGO

July 6, 2005

Todd Engstrand
PBS&J
9275 Sky Park Court, Suite 200
San Diego, CA 92123

RECEIVED
JUL 11 2005

SUBJECT: Candlelight Development Offsite Sewer Capacity Analysis

Dear Mr. Engstrand,

We have completed the review of Candlelight Development Offsite Sewer Capacity Analysis dated May 18, 2005. We have also conducted a separate capacity evaluation for the Otay Valley Trunk Sewer (OVTS) based on our current planning and the information provided in the subject report. We concur with the subject report that the OVTS can accommodate the diverted flows up to 1,450 EDUs from the new developments planned in the west Otay Mesa area until January 2009, at which time we anticipate the City of Chula Vista's flow starts to be diverted to the OVTS.

In addition, we find it acceptable for the Candlelight Development (450 Multi-Family dwelling units) to continuously discharge its sewage to the OVTS through 2012, give the condition of flow redirection from City of Chula Vista; however, the capacity constraint would not allow the flow of the entire 1450 EDUs to be discharged till the same time. It is understood that the proposed flow of Candlelight Development will be routed to the OVTS on a temporary basic until the Otay Mesa Trunk Sewer Phase 2B is constructed by 2008, as estimated in the analysis. It is recommended that the Developers in the area should include an alternative plan in the sewer studies for the acceptance of the Land Development Review Section in case of further delay of the Otay Mesa Trunk Sewer Phase 2B1 project and Caltrans Airway Road pipeline project.

If you have any questions, please call me at (858)292-6476 or Associate Civil Engineer Huy T. Nguyen at 292-6487.

Sincerely,

Guann Hwang
Senior Civil Engineer

cc: Barbara Salvini, Senior Civil Engineer, Land Development Review Section, MWWD.

Metropolitan Wastewater Department
9192 Topaz Way • San Diego, CA 92123
Tel (858) 292-6300 Fax (858) 292-6310

PBS&J
An employee-owned company

May 18, 2005

Guann Hwang
City of San Diego
Metropolitan Wastewater Department
9192 Topaz Way
San Diego, CA 92123-1119

Re: Candlelight Development Off-Site Sewer Capacity Analysis

Dear Mr. Hwang,

BACKGROUND

PBS&J presented the results of our initial off-site sewer capacity analysis to the Metropolitan Wastewater Department (MWWD) Staff in a March 24, 2005 memorandum. As a follow up to that letter and at our request, MWWD Staff met with our modeling experts in a workshop to discuss the off-site sewer options for the Candlelight Development. From that workshop, MWWD requested PBS&J perform additional analyzes of the existing Otay Valley Trunk Sewer based on new information provided. We have completed the additional analysis and incorporated the results into this updated off-site sewer capacity letter for the Candlelight Development.

INTRODUCTION

DR Horton Homes – Western Pacific Series (DR Horton) is currently planning the development of their Candlelight Project (Project) located in the City of San Diego's (City's) Otay Mesa area. The Project is located along Caliente Road south of Airway Road as shown on the attached Exhibit 1. DR Horton has contracted PBS&J to provide sewer system planning and analysis consulting services. PBS&J has analyzed the on-site sewer system, and we are now reviewing the off-site sewer system collection options. The purpose of this letter is to provide analysis results of the available off-site sewer capacity in the existing sewer system including the Otay Valley Trunk Sewer and sewer connections to the San Ysidro Interceptor sewer. It is proposed that this additional available capacity be utilized on a temporary basis until the upgrades to the Otay Mesa Trunk Sewer are made which will provide permanent sewer capacity to support the Project.

PROJECT DESCRIPTION

The Candlelight Development currently includes the construction of 450 multi-family dwelling units (DUs) with an equivalent dwelling unit (EDU) sewer capacity of 386. Based on current projections, DR Horton anticipates an absorption rate of 16 units per month, starting in mid-September, 2006; therefore, at this rate, Project build out is estimated by January 2009. To be conservative for purposes of this analysis, the entire 386 EDUs were utilized for sewer flow projections.

Due to timing of sewer infrastructure construction in the Otay Mesa Area, two sewer service phases are proposed. The two phases are described below.

Phase A – Temporary Connection to Otay Valley Trunk Sewer
It is currently proposed that the Candlelight Development will connect sewer flows to an existing manhole located at the intersection of Caliente Road and Airway Road as shown on Exhibit 1 attached. Flows into this existing manhole include only the San Ysidro High School (SYHS) at this time. The Project's sewer will flow north in the existing 10-inch main across SR-905 and into Ocean View Hills Parkway. The sewer in Ocean View Hills Parkway collects and conveys flows to a northern connection with Otay Valley Trunk Sewer. Caltrans as a component of the SR-905 highway construction will ultimately remove the 10-inch gravity main flowing north, from the SYHS across SR-905 to Ocean View Hills Parkway. Caltrans will provide sewer service to the SYHS by constructing an 18-inch pipeline in Airway Road from Caliente to Old Otay Mesa Road prior to the massive grading operation. Caltrans is being delayed due to funding restrictions and the Airway Road sewer pipeline is expected for installation in the 2007-2008 timeframe.

Phase B – Completion of Otay Mesa Trunk Sewer in Airway Road
Upon Caltrans completion of the Airway Road pipeline, the City is currently scheduled to construct the Phase 2B1 portion of the Otay Mesa Trunk Sewer Project (OMTS) in Old Otay Mesa Road to the San Ysidro interceptor connector located on the west side of I-5. With the Airway Road section in operation, sewer flows will be diverted west to Otay Mesa Road where the main connects to the existing Phase 2A OMTS 42-inch trunk sewer. The 42-inch OMTS is extended in Otay Mesa Road southwest to Mesa Place where it is temporarily connected to the existing 10-inch sewer main. The existing 10-inch sewer main extends southwest and is gradually upsized until it connects with the San Ysidro Interceptor Sewer on the west side of Interstate 5. As part of the Phase 2B1 construction, the City plans to ultimately upsize the entire reach from the end of Phase 2A to the San Ysidro Interceptor Sewer providing up to 34 MGD of capacity from Otay Mesa. Once this portion of the OMTS is completed, permanent sewer capacity for the Candlelight Development will be established. Based on our current

understanding of the OMTS funding and schedule, it is believed this portion will be completed by early 2008. The Phase B portion of the Project is shown on Exhibit 1.

METHODOLOGY & ASSUMPTIONS

The Otay Mesa Trunk Sewer Info-works hydraulic model (model), which was the basis for the adopted Otay Mesa Trunk Sewer Master Plan Update and Alignment Study dated June 2004, was utilized to determine available EDU capacity for the temporary off-site sewage flow. The 2005 and 2010 models were updated for the East Otay Mesa to reflect current flow conditions at Pump Station 23T. Pump Station 23T data was provided for a two-week period in the month of January 2005 by Jim Haghgouy at the City of San Diego Metropolitan Wastewater Department. The peak inflow into the Station was 0.65 mgd and the peak pump flow rate was 3.3 mgd.

CAPACITY ANALYSIS

Gravity sewer capacities were based upon a depth-to-diameter ratio of less than 0.75, per the City of San Diego Sewer Design Guide, 2001. The City's Sewer Design Guide Section # 1.3.3.3 can be found as an attachment.

FLOW MONITORING

At our suggestion, DR Horton authorized an in-field flow monitoring study to confirm current 2005 sewer flow rates. PBS&J contracted with MGD Technologies (MGD) to provide actual sewer flow rate data at three selected manholes for a one-week period. The selected manhole sites are identified on Exhibit 1. The meter flow rate data generally correlates with the model. The 2005 and 2010 model scenarios were updated to reflect metered flow conditions. Table 1 below summarizes the average and peak sewer flows at each of the three metered sites.

Table 1 – Metered Flow Results

	Location	Average Flow (mgd)	Peak Flow (mgd)
Meter Site 01 – M33S11	Rios Av. (Otay Valley TS)	2.863	4.721
Meter Site 02 – M34S164	Palm Av. (Otay Valley TS)	0.319	0.884
Meter Site 03 - M37S66	Center St (San Ysidro Interceptor Sewer)	0.258	0.556

Complete meter data for the three sites is included on the attached compact disc for your information. Additionally, a scatter plot of the flow data for each site has been generated to evaluate relationships with the model as well as Manning's Equation. The plots are provided as an attached to this letter. Daily flow patterns are graphed along with model results for each meter site to analyze model projections. These graphs are also included as a letter attachment for your information.

WORKSHOP WITH MWWD

On May 5th, 2005, a workshop between MWWD (Guann Hwang, Huy Nguyen, and Akram Bassyouni) and PBS&J (Craig Close, Dan Brogadir, and Kyle McCarty) was conducted to confirm preliminary model results for the Candlelight Development's off-site sewer options. MWWD Staff generally agreed with the model results, which show that temporary sewer flows from the Candlelight Development north to the Otay Valley Trunk Sewer is possible on a temporary basis. MWWD staff informed our team of a new City of Chula Vista agreement that would introduce an additional 2.75 mgd of wastewater with a peak of 4.0 mgd into the Otay Valley Trunk Sewer. It is anticipated that the additional sewer flows will be introduced in 2009. It is likely that the Otay Mesa Trunk Sewer (OMTS) in Airway Road will be constructed by that time, and Candlelight sewer flows will be diverted to the west and south into the ultimate gravity sewer system (OMTS). MWWD expressed concerns about peak wet weather flows in the Otay Valley Trunk Sewer, and informed our team that their RDI/I analysis at Meter CV10 showed a wet weather peaking factor of one and a half. Based on MWWD input, a further analysis was conducted to evaluate the capacity of the Otay Valley Trunk Sewer using a peak wet weather factor of 1.5 and 2.75 mgd and 4.0 mgd inflows from the City of Chula Vista. Additionally, the Otay Mesa Trunk Sewer was reanalyzed utilizing the updated 1.5 peak wet weather factor.

UPDATED OTAY VALLEY TRUNK SEWER MODEL

By incorporating the field flow monitoring data in conjunction with information provided by MWWD at the May 5, 2005 workshop, PBS&J updated the Otay Valley Trunk Sewer model to analyze peak wet weather capacity and 2009 flows from the City of Chula Vista. The peak day diurnal pattern taken from the flow metering data was used to evaluate the additional capacity.

SANDAG VERSUS MODEL GROWTH PROJECTIONS

MWWD typically uses SANDAG growth projections to perform capacity analyses of its sewer collection system. PBS&J concurs with MWWD that in most cases this is the best-forecast information to be used for planning purposes. However in the performance of the OMTS alignment study, PBS&J compared projection information from various other planning sources to the SANDAG projections to confirm the sewer flow projections that were used in the comprehensive phasing analysis. As documented in the June 2004 OMTS Master Plan Update and Alignment Study, it was concluded that the SANDAG projection for the period of 2005 to 2010 were overly aggressive based on input from actual development sewer studies, historical growth rates, and input from the ongoing update of the Otay Mesa Community Plan. The SAN DAG projections include a 37.26% increase in sewer flows in the Otay Valley Trunk Sewer up to 2010 and then a very gradual increase thereafter. PBS&J with input from City Planning and the Development Community has projected a more gradual increase in the 2005 to 2010 period with slightly higher annual growth after 2010 as compared to SANDAG forecasts. MWWD and the City Planning Department accepted this adjusted growth rate for the purposes of planning the development growth and associated sewer flows. The actual growth on Otay Mesa in the past year supports the more gradual annual growth projections accounted for in our model.

The result of using the lower projections in the 2005 to 2010 period provides available capacity in the Otay Valley Trunk Sewer system to accommodate development until the next phases of the OMTS can be constructed.

SUMMARY

The results of our analysis are shown in the Table 2 below:

Table 2 – Candlelight Off-Site Sewer Capacity

Scenario	Description	Available Capacity (EDUs)
2005	Phase A - Otay Valley Trunk Sewer	3,000
2010	Phase A - Otay Valley Trunk Sewer (Additional 4.0 mgd flow from Chula Vista)	0
2010	Phase A – Otay Valley Trunk Sewer (No additional flow from Chula Vista)	1,450
2005	Phase B - Otay Mesa Road Sewer to San Ysidro Interceptor Sewer	2,500
2010	Phase B - Otay Mesa Road Sewer to San Ysidro Interceptor Sewer	2,300

Available Capacity is based upon a peak wet weather flow analysis.

Data tables from the various model runs are attached for your review and information.

The results of the dynamic sewer modeling analysis supported by the field sewer flow monitoring data, as summarized above, demonstrates that the Otay Valley Trunk Sewer system does have available capacity to accommodate the conveyance of additional sewer flows up to an estimated 1,450 EDU's. Based on a generation rate of 280 gpd, the resulting average flow rate of 0.4 MGD is recommended to be routed to the Otay Valley Trunk Sewer until the Otay Mesa Trunk Sewer Phase 2B1 is constructed. As mentioned, the Phase 2B1 construction is programmed to be funded in FY 2007 with completion in 12 months after contract authorization.

Once Phase 2B1 is in service in 2007, flows from the west Otay Mesa would then be diverted to the San Ysidro Interceptor freeing up capacity again in the Otay Valley Trunk Sewer to accommodate the diversion of sewer flows from the City of Chula Vista.

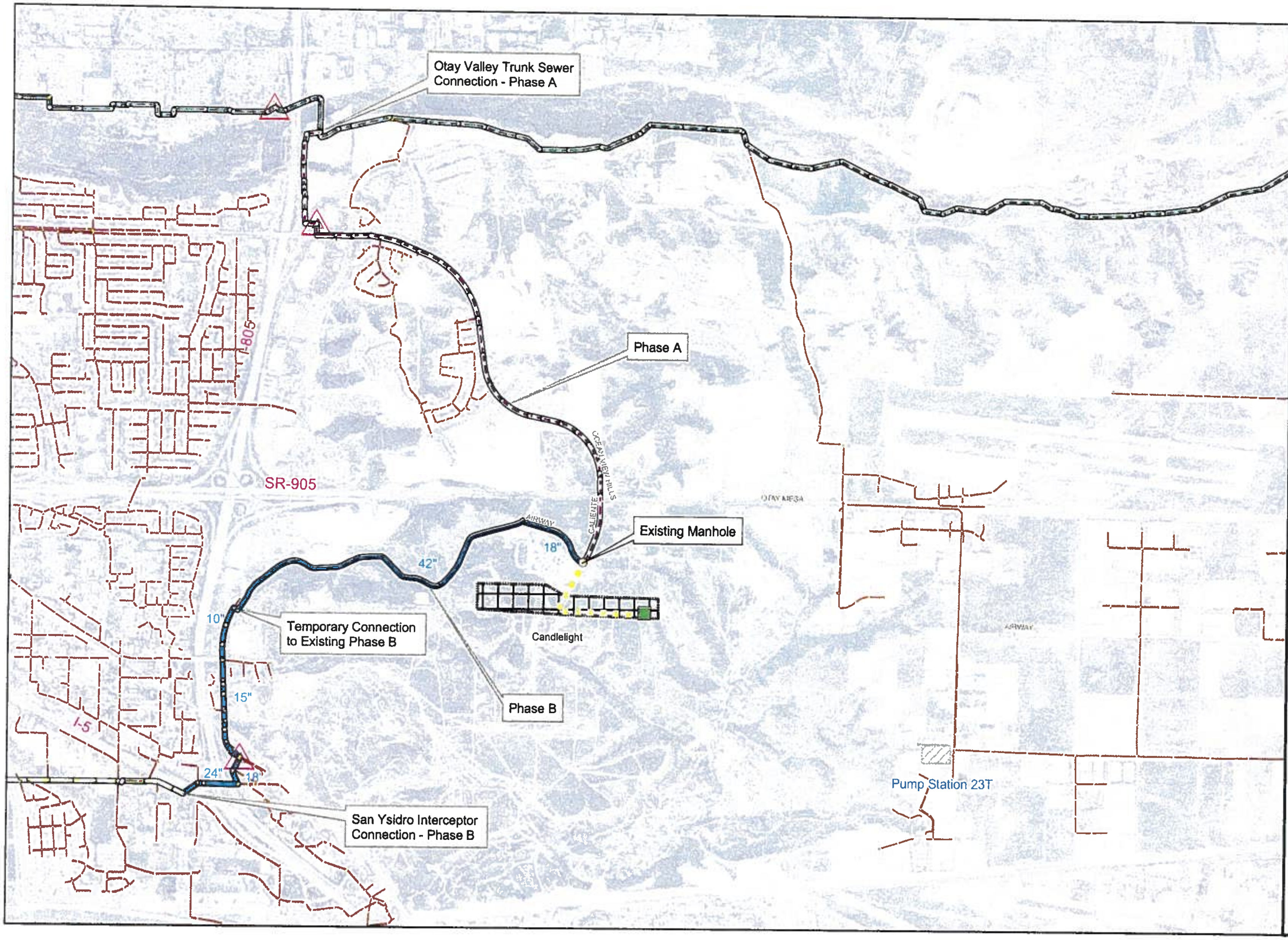
Completion of the sewer study is critical to the Project's approval process and overall schedule. We must identify and describe the off-site sewer collection system in order to finish the study. PBS&J is requesting MWWD's concurrence and approval to divert flows from new development planned on the west Otay Mesa up to a threshold of 1,450 EDUs based on the analysis presented herein. With this issue resolved, we will be able to complete and submit the Candlelight Sewer Study. We truly appreciate the assistance of MWWD Staff in this matter. If you have any questions or comments, please feel free to call me anytime at 858-514-1027 or cell 760-525-7670.

Cordially,

Todd Engstrand, P.E.
Project Manager

Attachments: Exhibit 1
Scatter Plots – Flow Metering Data
Daily Flow Pattern Graphs
Model Output Data Tables
City of San Diego Sewer Design Guide Section 1.3.3.3
Field Flow Monitoring Data – Compact Disc

c:
Craig Whittemore, MWWD
Allan Navarro, MWWD
Paul Buehler, City of San Diego
Kurt Bausbek, DR Horton
Kim Molina, DR Horton
Craig Close, PBS&J
Dan Brogadir, PBS&J
Kyle McCarty, PBS&J
File 491096.02



Candlelight Development
Offsite Sewer Capacity Analysis

Exhibit 1

Legend

- △ Metering Locations
- ● Existing Manhole
- Existing Mains
- Otay Valley Trunk Sewer
- San Ysidro Interceptor
- Phase A
- Phase B
- Candlelight

Candlelight Facilities

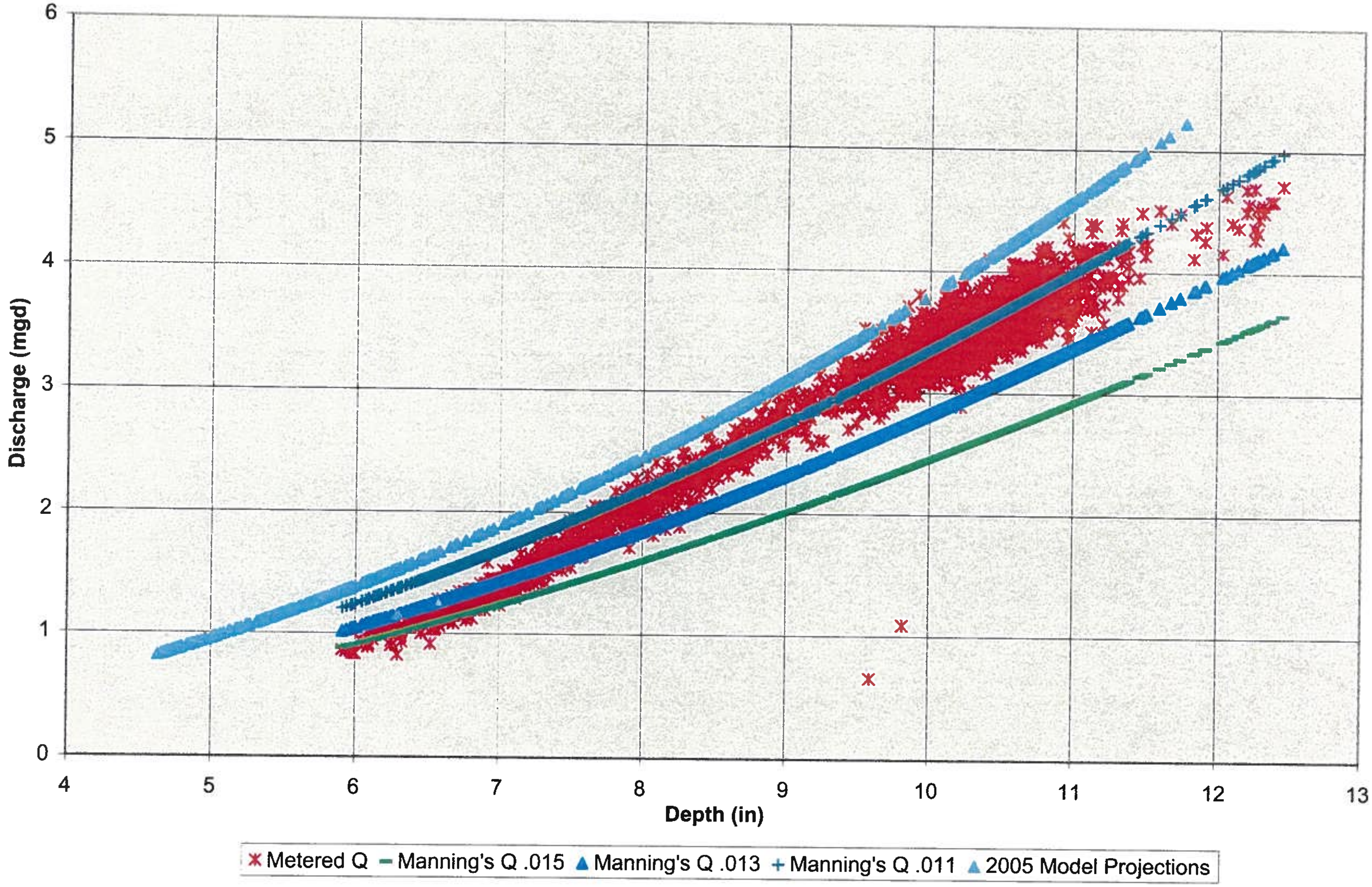
- 🟩 Private Pump Station
- ● ● Private Forcemain

N
W E
S

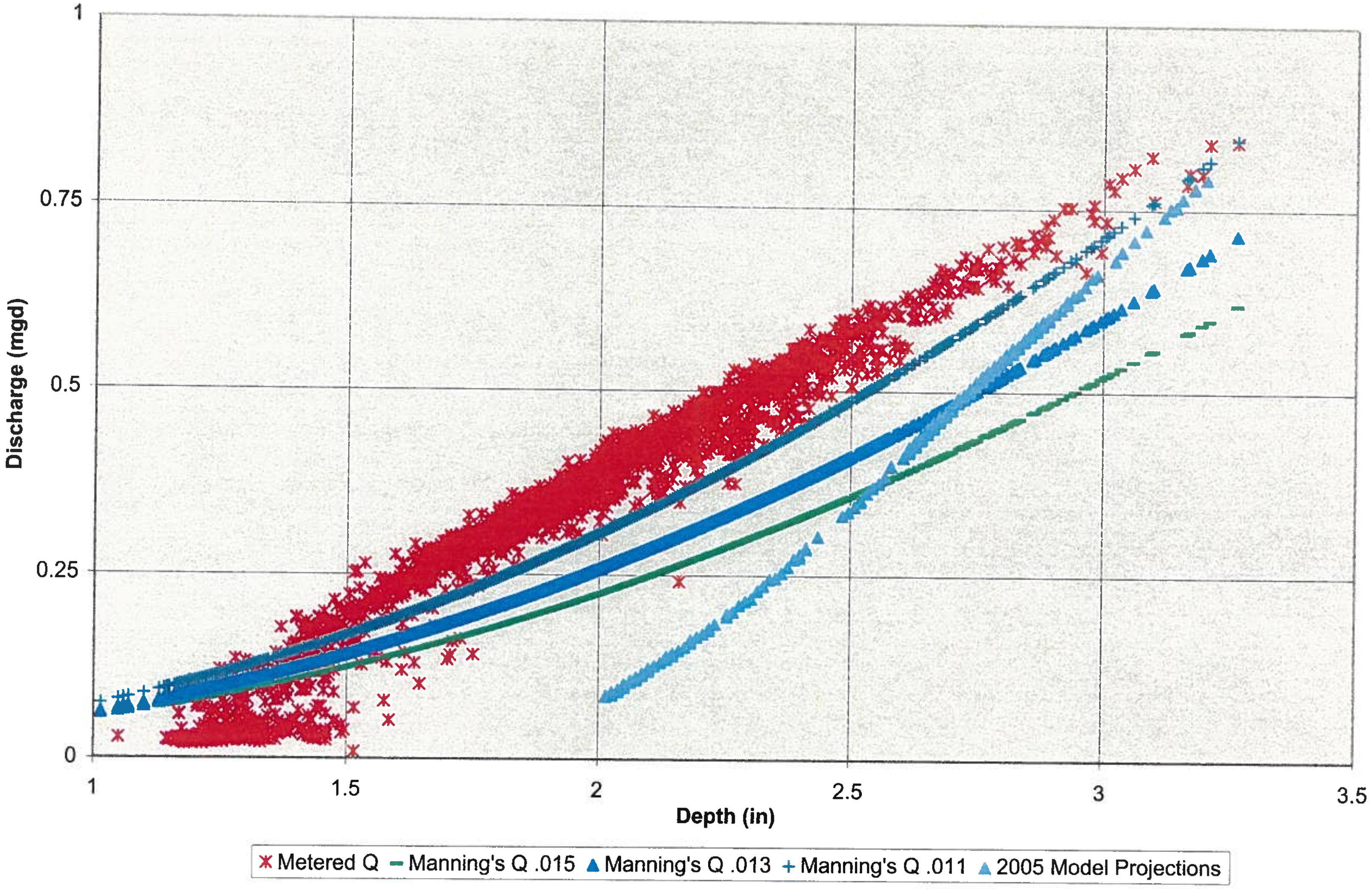
1 inch equals 2,000 feet

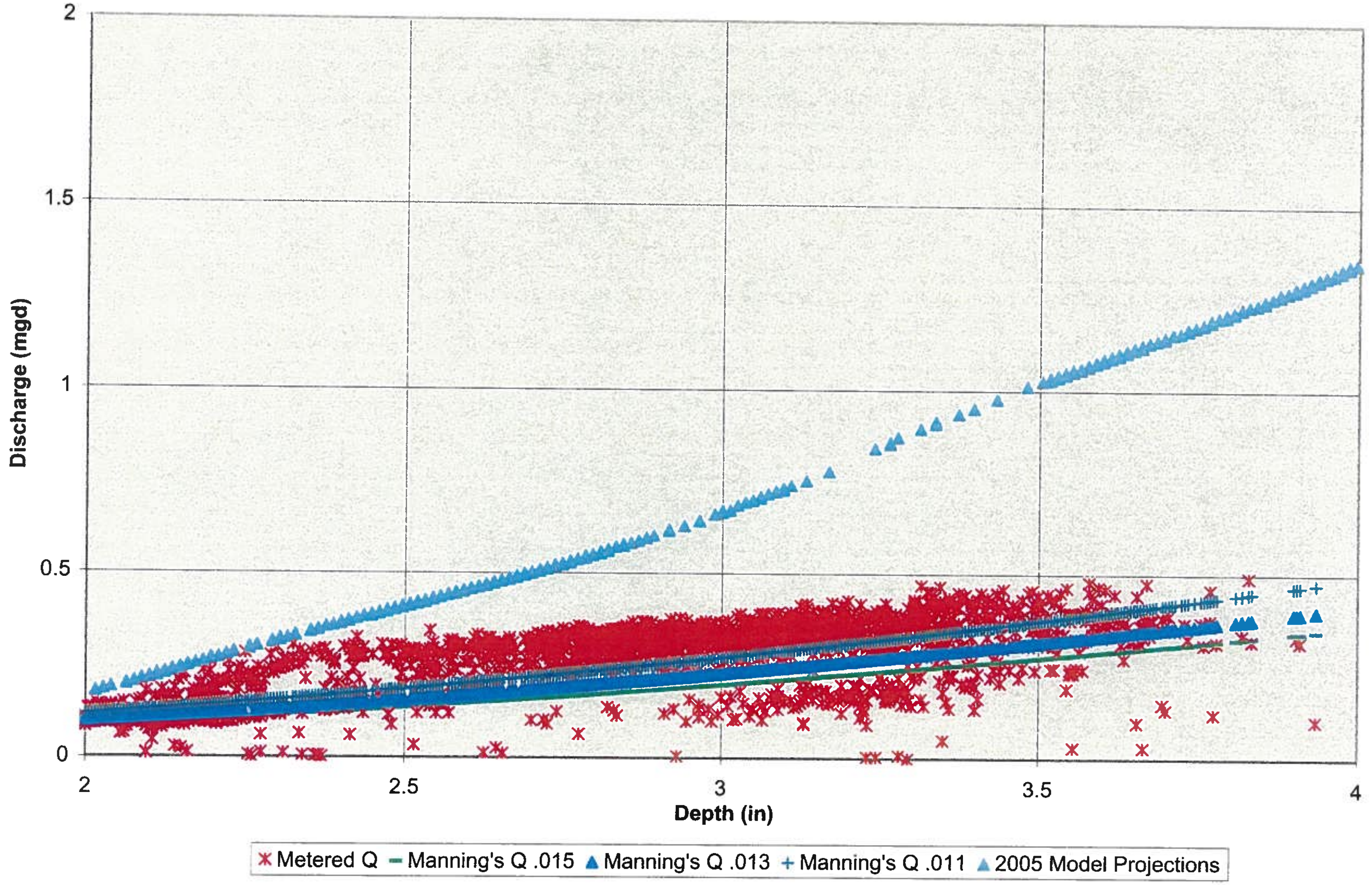
PBSJ

Meter Site 01 - Rios Av.
M33S11



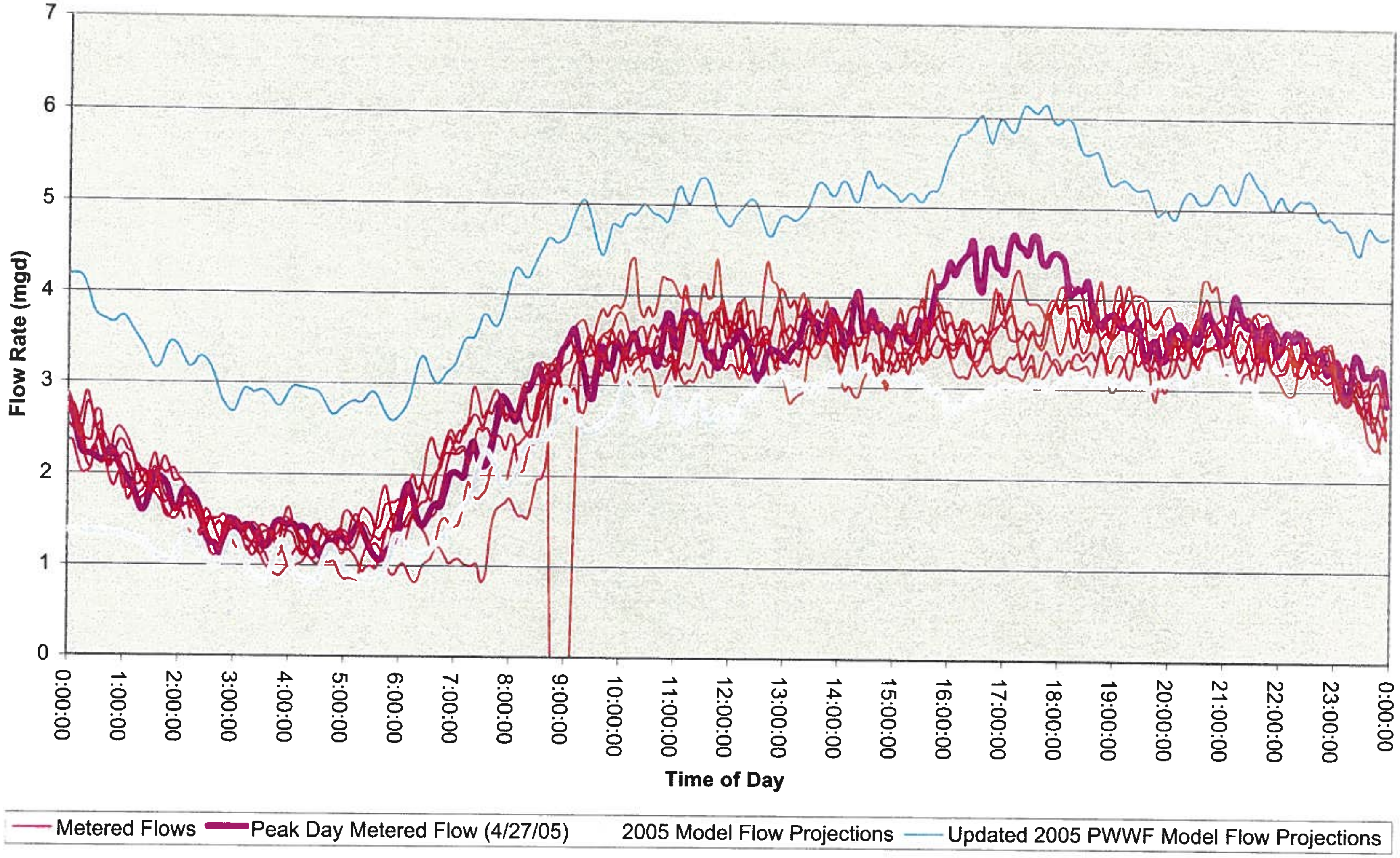
Meter Site 02 - Kaiser Parking Lot
M34S164



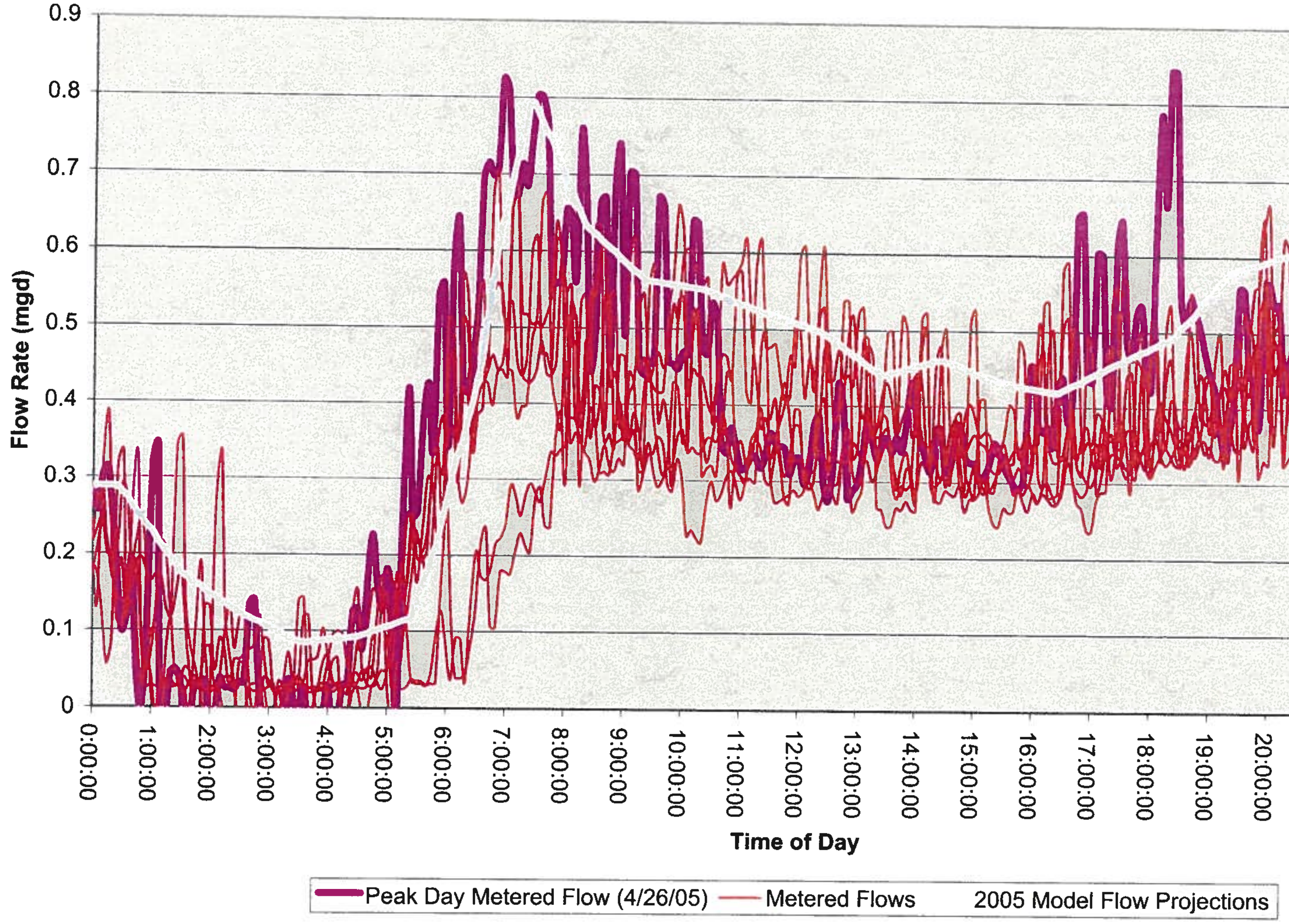


Meter Site 03 - Center Street
M37S66

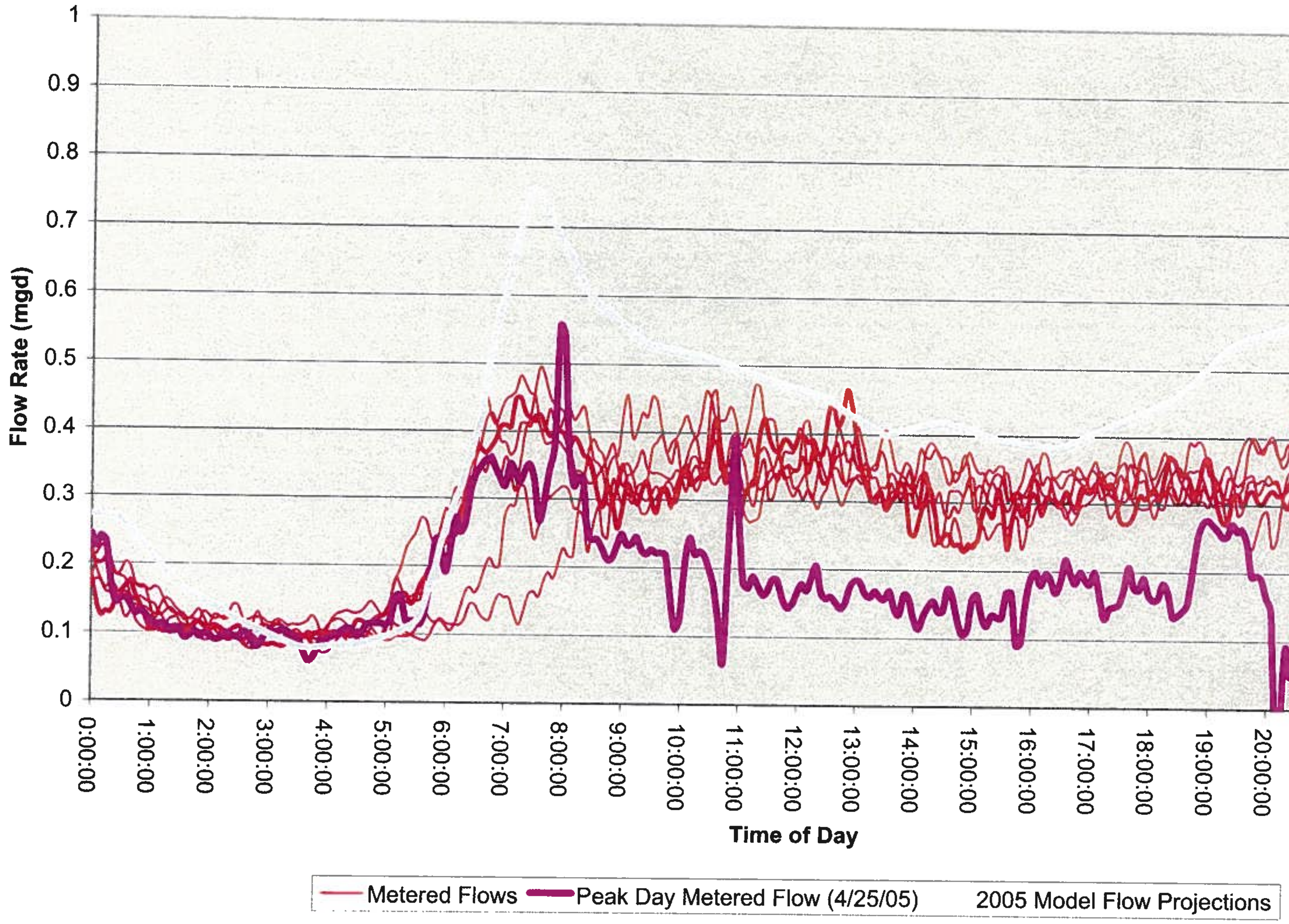
Meter Site 01 - Rios Av.
M33S11



Meter Site 02 - Kaiser Parking Lot
M34S164



Meter Site 03 - Center St.
M37S66



PHASE A - 2005 PWWF SCENARIO

Upstream MHID	Downstream MHID	Diameter (in)	Slope (%)	Depth (in)	Peak Flow (cfs)	Velocity (fps)	depth/ Dia. (%)
M33S15	M33S20	27	0.24	12.85	6.20	5.14	47.60%
M33S20	M33S19	27	0.43	12.88	6.20	5.13	47.69%
M33S19	M33S18	27	1.09	14.15	6.19	4.55	52.40%
M33S18	M33S14	27	0.33	15.10	6.19	4.19	55.91%
M33S14	M33S7	27	0.29	15.44	6.18	4.09	57.20%
M33S7	M33S9	27	0.19	14.83	6.18	4.32	54.93%
M33S9	M33S10	27	0.24	16.88	6.17	3.68	62.53%
M33S10	M33S8	27	0.19	12.82	6.16	5.13	47.47%
M33S8	M33S13	27	0.70	14.24	6.16	4.48	52.76%
M33S13	M33S12	27	0.25	15.64	6.16	3.99	57.91%
M33S12	M33S11	27	0.24	12.80	6.15	5.12	47.42%
M33S11	M33S6	27	0.27	12.97	6.15	5.05	48.04%
M33S6	M33S4	27	0.27	13.43	6.15	4.85	49.73%
M33S4	M33S5	27	0.17	13.79	6.15	4.68	51.07%
M33S5	M33S2	27	0.27	13.03	6.15	5.01	48.27%
M33S2	M33S3	27	0.09	13.00	6.15	5.02	48.13%
M33S3	M33S1	27	0.29	13.08	6.15	4.98	48.44%
M33S1	M33S21	27	0.14	12.79	6.15	5.13	47.38%
M33S21	L33S2	27	0.42	12.82	6.15	5.11	47.47%
L33S2	L33S1	27	0.99	11.41	6.14	5.98	42.27%
L33S1	L33S4	27	0.49	12.61	6.14	5.22	46.71%
L33S4	L33S3	27	1.55	9.56	6.14	7.54	35.42%
L33S3	L33S18	27	1.72	9.36	6.14	7.77	34.67%
L33S18	L33S5	27	0.93	10.55	6.14	6.60	39.07%
L33S5	L33S19	27	1.33	9.84	6.14	7.25	36.44%
L33S19	L33S23	27	3.08	15.01	6.14	4.19	55.60%
L33S23	L33S21	27	0.28	12.79	6.14	5.12	47.38%
L33S21	L33S14	27	0.34	12.80	6.14	5.11	47.42%
L33S14	L33S13	27	0.46	12.80	6.14	5.11	47.42%
L33S13	L33S17	27	0.36	12.80	6.14	5.11	47.42%
L33S17	L33S16	27	0.46	12.78	6.13	5.12	47.33%
L33S16	L33S42	27	0.47	12.78	6.13	5.12	47.33%
L33S42	L33S44	27	0.19	13.04	6.13	4.99	48.31%
L33S44	L33S43	27	0.26	13.28	6.13	4.88	49.20%
L33S43	L33S47	27	0.21	14.00	6.13	4.56	51.87%
L33S47	L33S46	27	0.25	12.78	6.13	5.12	47.33%
L33S46	L33S70	27	1.73	11.74	6.13	5.72	43.47%
L33S70	L33S68	27	0.44	12.79	6.13	5.11	47.38%
L33S68	L33S6	27	0.69	12.01	6.13	5.54	44.49%
L33S6	L33S39	27	0.39	12.79	6.13	5.11	47.38%
L33S39	L33S36	27	0.45	12.79	6.12	5.11	47.38%
L33S36	L33S64	27	0.51	12.43	6.12	5.30	46.04%
L33S64	L33S12	27	0.47	12.72	6.12	5.15	47.11%
L33S12	K33S39	27	0.48	13.32	6.12	4.85	49.33%
K33S39	K33S40	27	0.41	13.43	6.12	4.79	49.73%
K33S40	K33S42	27	0.39	13.40	6.12	4.80	49.64%
K33S42	K33S41	27	0.39	12.78	6.12	5.11	47.33%
K33S41	K33S36	27	0.36	12.78	6.12	5.11	47.33%
K33S36	K33S38	27	0.38	13.43	6.12	4.79	49.73%
K33S38	K33S37	27	0.39	13.49	6.12	4.77	49.96%
K33S37	K33S35	27	0.37	12.78	6.12	5.11	47.33%
K33S35	K33S14	27	0.30	12.77	6.12	5.11	47.29%
K33S14	K33S15	27	0.37	13.38	6.11	4.81	49.56%
K33S15	K33S16	27	0.40	13.99	6.11	4.58	51.82%
K33S16	K33S17	27	0.12	14.03	6.11	4.56	51.96%
K33S17	K33S11	27	0.26	15.14	6.11	4.12	56.09%
K33S11	K33S21	27	0.27	13.80	6.11	4.65	51.11%
K33S21	K33S20	27	0.17	14.04	6.11	4.55	52.00%
K33S20	K33S4	27	0.26	15.07	6.11	4.14	55.82%
K33S4	K33S2	27	0.13	15.72	6.11	3.94	58.22%
K33S2	J33S25	30	0.15	16.81	6.10	3.34	56.04%
J33S25	J33S27	30	0.15	16.85	6.10	3.33	56.16%
J33S27	J33S5	30	0.15	16.68	6.10	3.37	55.60%
J33S5	J33S66	30	0.15	14.39	6.10	4.07	47.96%
J33S66	J33S13	30	0.17	15.54	6.10	3.68	51.80%
J33S13	J33S38	30	0.15	12.35	6.10	4.96	41.16%

2005 Scenario: Existing Metered Wednesday 4/26 flow + PWWF (Base Flow - .5xADF)

PHASE A - 2005 PWWF SCENARIO - ADDITIONAL 3,000 EDU

Upstream MHID	Downstream MHID	Diameter (in)	Slope (%)	Depth (in)	Peak Flow (cfs)	Velocity (fps)	depth/ Dia. (%)
M33S15	M33S20	27	0.24	14.54	7.86	5.57	53.87%
M33S20	M33S19	27	0.43	14.57	7.86	5.56	53.96%
M33S19	M33S18	27	1.09	16.66	7.86	4.77	61.69%
M33S18	M33S14	27	0.33	17.69	7.84	4.40	65.51%
M33S14	M33S7	27	0.29	18.44	7.84	4.19	68.31%
M33S7	M33S9	27	0.19	17.90	7.84	4.37	66.31%
M33S9	M33S10	27	0.24	19.78	7.83	3.89	73.24%
M33S10	M33S8	27	0.19	14.51	7.82	5.56	53.73%
M33S8	M33S13	27	0.70	16.86	7.82	4.65	62.44%
M33S13	M33S12	27	0.25	18.38	7.80	4.20	68.09%
M33S12	M33S11	27	0.24	14.89	7.79	5.39	55.16%
M33S11	M33S6	27	0.27	15.55	7.79	5.12	57.60%
M33S6	M33S4	27	0.27	15.98	7.79	4.94	59.20%
M33S4	M33S5	27	0.17	16.25	7.79	4.82	60.18%
M33S5	M33S2	27	0.27	15.40	7.79	5.15	57.02%
M33S2	M33S3	27	0.09	15.24	7.79	5.21	56.44%
M33S3	M33S1	27	0.29	15.02	7.79	5.30	55.64%
M33S1	M33S21	27	0.14	14.47	7.79	5.56	53.60%
M33S21	L33S2	27	0.42	14.50	7.79	5.54	53.69%
L33S2	L33S1	27	0.99	13.31	7.79	6.22	49.29%
L33S1	L33S4	27	0.49	14.46	7.79	5.57	53.56%
L33S4	L33S3	27	1.55	10.80	7.79	8.11	40.00%
L33S3	L33S18	27	1.72	10.73	7.79	8.18	39.73%
L33S18	L33S5	27	0.93	11.92	7.79	7.12	44.13%
L33S5	L33S19	27	1.33	11.24	7.79	7.68	41.64%
L33S19	L33S23	27	3.08	17.45	7.79	4.43	64.62%
L33S23	L33S21	27	0.28	14.47	7.78	5.55	53.60%
L33S21	L33S14	27	0.34	14.48	7.78	5.55	53.64%
L33S14	L33S13	27	0.46	14.48	7.78	5.54	53.64%
L33S13	L33S17	27	0.36	14.48	7.78	5.54	53.64%
L33S17	L33S16	27	0.46	14.76	7.78	5.44	54.67%
L33S16	L33S42	27	0.47	15.08	7.78	5.29	55.87%
L33S42	L33S44	27	0.19	15.56	7.78	5.08	57.64%
L33S44	L33S43	27	0.26	15.76	7.78	4.99	58.36%
L33S43	L33S47	27	0.21	16.37	7.78	4.77	60.62%
L33S47	L33S46	27	0.25	14.47	7.77	5.55	53.60%
L33S46	L33S70	27	1.73	13.61	7.77	5.99	50.40%
L33S70	L33S68	27	0.44	14.48	7.77	5.54	53.64%
L33S68	L33S6	27	0.69	13.93	7.77	5.82	51.60%
L33S6	L33S39	27	0.39	14.47	7.77	5.54	53.60%
L33S39	L33S36	27	0.45	14.48	7.77	5.54	53.64%
L33S36	L33S64	27	0.51	14.24	7.77	5.66	52.76%
L33S64	L33S12	27	0.47	14.68	7.77	5.47	54.36%
L33S12	K33S39	27	0.48	15.43	7.77	5.12	57.16%
K33S39	K33S40	27	0.41	15.54	7.77	5.07	57.56%
K33S40	K33S42	27	0.39	15.50	7.77	5.09	57.42%
K33S42	K33S41	27	0.39	14.47	7.77	5.54	53.60%
K33S41	K33S36	27	0.36	14.44	7.77	5.55	53.47%
K33S36	K33S38	27	0.38	15.53	7.77	5.08	57.51%
K33S38	K33S37	27	0.39	15.54	7.77	5.07	57.56%
K33S37	K33S35	27	0.37	14.46	7.76	5.54	53.56%
K33S35	K33S14	27	0.30	14.48	7.76	5.53	53.64%
K33S14	K33S15	27	0.37	15.48	7.76	5.09	57.33%
K33S15	K33S16	27	0.40	16.49	7.76	4.72	61.07%
K33S16	K33S17	27	0.12	16.44	7.76	4.74	60.89%
K33S17	K33S11	27	0.26	17.57	7.76	4.39	65.07%
K33S11	K33S21	27	0.27	16.32	7.76	4.78	60.44%
K33S21	K33S20	27	0.17	16.46	7.76	4.73	60.98%
K33S20	K33S4	27	0.26	17.89	7.76	4.29	66.27%
K33S4	K33S2	27	0.13	18.37	7.76	4.17	68.04%
K33S2	J33S25	30	0.15	19.48	7.75	3.56	64.92%
J33S25	J33S27	30	0.15	19.54	7.75	3.55	65.12%
J33S27	J33S5	30	0.15	19.38	7.75	3.58	64.60%
J33S5	J33S66	30	0.15	17.05	7.75	4.17	56.84%
J33S66	J33S13	30	0.17	18.14	7.75	3.86	60.48%
J33S13	J33S38	30	0.15	13.98	7.75	5.35	46.60%

2005 + 3,000 EDU Scenario: Existing Metered Wednesday 4/26 flow + PWWF (Base Flow - .5xADF) + 3,000 EDU PWWF

PHASE A - 2010 PWWF SCENARIO - ADDITIONAL 4.0 MGD FROM CHULA VISTA

Upstream MHID	Downstream MHID	Diameter (in)	Slope (%)	Depth (in)	Peak Flow (cfs)	Velocity (fps)	depth/ Dia. (%)
M33S15	M33S20	27	0.24	13.75	7.05	5.36	50.93%
M33S20	M33S19	27	0.43	13.76	7.05	5.36	50.98%
M33S19	M33S18	27	1.09	15.44	7.05	4.64	57.20%
M33S18	M33S14	27	0.33	16.40	7.04	4.33	60.76%
M33S14	M33S7	27	0.29	16.88	7.03	4.17	62.53%
M33S7	M33S9	27	0.19	16.27	7.03	4.35	60.27%
M33S9	M33S10	27	0.24	18.25	7.02	3.81	67.60%
M33S10	M33S8	27	0.19	13.70	7.01	5.35	50.76%
M33S8	M33S13	27	0.70	15.77	7.01	4.57	58.40%
M33S13	M33S12	27	0.25	17.21	7.00	4.05	63.73%
M33S12	M33S11	27	0.24	13.70	6.99	5.35	50.76%
M33S11	M33S6	27	0.27	14.29	6.99	5.07	52.93%
M33S6	M33S4	27	0.27	14.66	6.99	4.91	54.31%
M33S4	M33S5	27	0.17	15.00	6.99	4.78	55.56%
M33S5	M33S2	27	0.27	15.23	6.99	4.81	56.40%
M33S2	M33S3	27	0.09	15.36	6.99	4.81	56.89%
M33S3	M33S1	27	0.29	17.52	6.99	4.79	64.89%
M33S1	M33S21	27	0.14	18.24	6.99	4.92	67.56%
M33S21	L33S2	27	0.42	17.32	10.98	6.31	64.13%
L33S2	L33S1	27	0.99	16.91	10.98	6.49	62.62%
L33S1	L33S4	27	0.49	17.33	10.98	6.31	64.18%
L33S4	L33S3	27	1.55	13.00	10.98	8.97	48.13%
L33S3	L33S18	27	1.72	13.67	10.98	8.54	50.62%
L33S18	L33S5	27	0.93	14.75	10.98	7.66	54.62%
L33S5	L33S19	27	1.33	13.46	10.98	8.58	49.87%
L33S19	L33S23	27	3.08	23.41	10.98	4.70	86.71%
L33S23	L33S21	27	0.28	17.30	10.98	6.31	64.09%
L33S21	L33S14	27	0.34	17.32	10.98	6.31	64.13%
L33S14	L33S13	27	0.46	17.40	10.97	6.29	64.44%
L33S13	L33S17	27	0.36	17.82	10.97	6.22	66.00%
L33S17	L33S16	27	0.46	18.68	10.97	5.84	69.20%
L33S16	L33S42	27	0.47	20.69	10.96	5.31	76.62%
L33S42	L33S44	27	0.19	21.01	10.96	5.19	77.82%
L33S44	L33S43	27	0.26	21.05	10.96	5.14	77.96%
L33S43	L33S47	27	0.21	21.42	10.96	5.02	79.33%
L33S47	L33S46	27	0.25	17.29	10.96	6.31	64.04%
L33S46	L33S70	27	1.73	16.92	10.96	6.47	62.67%
L33S70	L33S68	27	0.44	17.30	10.96	6.30	64.09%
L33S68	L33S6	27	0.69	17.29	10.96	6.30	64.04%
L33S6	L33S39	27	0.39	17.29	10.96	6.30	64.04%
L33S39	L33S36	27	0.45	17.30	10.96	6.30	64.09%
L33S36	L33S64	27	0.51	17.40	10.95	6.29	64.44%
L33S64	L33S12	27	0.47	18.56	10.95	5.86	68.76%
L33S12	K33S39	27	0.48	19.72	10.95	5.45	73.02%
K33S39	K33S40	27	0.41	19.78	10.95	5.43	73.24%
K33S40	K33S42	27	0.39	19.73	10.95	5.44	73.07%
K33S42	K33S41	27	0.39	18.55	10.95	5.82	68.71%
K33S41	K33S36	27	0.36	18.80	10.95	5.73	69.64%
K33S36	K33S38	27	0.38	19.81	10.95	5.42	73.38%
K33S38	K33S37	27	0.39	20.09	10.94	5.40	74.40%
K33S37	K33S35	27	0.37	19.75	10.94	5.77	73.16%
K33S35	K33S14	27	0.30	20.27	10.94	5.70	75.07%
K33S14	K33S15	27	0.37	27.90	10.85	5.37	103.33%
K33S15	K33S16	27	0.40	36.78	10.84	4.79	136.22%
K33S16	K33S17	27	0.12	36.28	10.84	4.81	134.36%
K33S17	K33S11	27	0.26	33.58	10.84	4.55	124.36%
K33S11	K33S21	27	0.27	31.16	10.84	4.82	115.42%
K33S21	K33S20	27	0.17	31.03	10.84	4.79	114.93%
K33S20	K33S4	27	0.26	29.06	10.84	4.37	107.64%
K33S4	K33S2	27	0.13	28.99	10.84	4.29	107.38%
K33S2	J33S25	30	0.15	27.73	10.83	3.68	92.44%
J33S25	J33S27	30	0.15	26.62	10.83	3.71	88.72%
J33S27	J33S5	30	0.15	25.48	10.83	3.80	84.92%
J33S5	J33S66	30	0.15	22.26	10.83	4.29	74.20%
J33S66	J33S13	30	0.17	23.21	10.83	4.11	77.36%
J33S13	J33S38	30	0.15	16.64	10.83	5.99	55.48%

2010 Scenario: Existing Metered Wednesday 4/26 flow + PWWF (Base Flow - .5xADF) + Growth(2010-2005) PWWF

Growth for the OTVS between 2010 - 2005 was calculated at 1,550 EDU

PHASE B - 2005 SCENARIO - ADDITIONAL 2,500 EDU

Upstream MHID	Downstream MHID	Diameter (in)	Slope (%)	Depth (in)	Peak Flow (cfs)	Velocity (fps)	depth/ Dia. (%)
N35SD5	N35SD6	18	0.49	7.92	2.99	3.98	44.00%
N35SD6	PH 2A2 7	42	2.68	5.72	3.07	3.90	13.63%
PH 2A2 7	PH 2A2 10	42	5.72	5.34	3.07	4.32	12.71%
PH 2A2 10	PH 2A2 11	42	7.13	5.24	3.07	4.44	12.49%
PH 2A2 11	PH 2A2 13	42	4.58	5.45	3.07	4.20	12.97%
PH 2A2 13	PH 2A2 15	42	4.55	5.45	3.07	4.20	12.97%
PH 2A2 15	PH 2A2 16	42	3.36	5.60	3.07	4.03	13.34%
PH 2A2 16	PH 2A2 17	42	5.60	5.35	3.07	4.31	12.74%
PH 2A2 17	PH 2A2 18	42	5.22	5.38	3.07	4.27	12.80%
PH 2A2 18	PH 2A2 19	42	6.18	5.30	3.07	4.36	12.63%
PH 2A2 19	PH 2A2 20	42	5.30	5.38	3.07	4.28	12.80%
PH 2A2 20	PH 2A2 21	42	3.43	5.59	3.07	4.04	13.31%
PH 2A2 21	PH 2A2 22	42	4.66	5.44	3.07	4.21	12.94%
PH 2A2 22	PH 2A2 23	42	0.54	6.10	3.07	3.55	14.51%
PH 2A2 23	PH 2A2 24	42	0.56	6.06	3.07	3.58	14.43%
PH 2A2 24	PH 2A2 25	42	3.56	5.53	3.07	4.09	13.17%
PH 2A2 25	M36S27	42	3.84	5.51	3.07	4.27	13.11%
M36S27	M36S5	10	7.00	5.53	3.07	10.14	55.32%
M36S5	M36S20	10	7.01	7.04	3.07	7.46	70.44%
M36S20	M36S25	12	2.14	6.85	3.14	6.76	57.10%
M36S25	M36S116	12	3.08	6.12	3.14	7.79	51.00%
M36S116	M36S115	12	6.21	5.28	3.14	9.43	44.00%
M36S115	M36S107	12	5.34	5.22	3.14	9.56	43.50%
M36S107	M36S75	12	5.60	5.21	3.14	9.60	43.40%
M36S75	M37S59	15	6.22	4.78	3.14	9.31	31.84%
M37S59	M37S66	15	6.05	4.76	3.14	9.36	31.76%
M37S66	M37S95	18	0.10	8.26	3.25	4.11	45.87%
M37S95	M37S104	15	1.09	7.51	3.25	5.29	50.08%
M37S104	M37S93	24	0.65	7.04	3.37	4.43	29.35%
M37S93	M37S120	24	0.64	6.92	3.35	4.46	28.85%
M37S120	M37S117	24	0.69	8.70	3.35	3.26	36.25%

PHASE B - 2010 SCENARIO - ADDITIONAL 2,300 EDU

Upstream MHID	Downstream MHID	Diameter (in)	Slope (%)	Depth (in)	Peak Flow (cfs)	Velocity (fps)	depth/ Dia. (%)
N35SD5	N35SD6	18	0.49	7.93	2.99	3.98	44.07%
N35SD6	PH 2A2 7	42	2.68	5.72	3.08	3.90	13.63%
PH 2A2 7	PH 2A2 10	42	5.72	5.34	3.07	4.32	12.71%
PH 2A2 10	PH 2A2 11	42	7.13	5.24	3.07	4.44	12.49%
PH 2A2 11	PH 2A2 13	42	4.58	5.45	3.07	4.20	12.97%
PH 2A2 13	PH 2A2 15	42	4.55	5.45	3.07	4.20	12.97%
PH 2A2 15	PH 2A2 16	42	3.36	5.60	3.07	4.03	13.34%
PH 2A2 16	PH 2A2 17	42	5.60	5.35	3.07	4.31	12.74%
PH 2A2 17	PH 2A2 18	42	5.22	5.38	3.07	4.27	12.80%
PH 2A2 18	PH 2A2 19	42	6.18	5.30	3.07	4.37	12.63%
PH 2A2 19	PH 2A2 20	42	5.30	5.38	3.07	4.28	12.80%
PH 2A2 20	PH 2A2 21	42	3.43	5.59	3.07	4.04	13.31%
PH 2A2 21	PH 2A2 22	42	4.66	5.44	3.07	4.21	12.94%
PH 2A2 22	PH 2A2 23	42	0.54	6.11	3.07	3.55	14.54%
PH 2A2 23	PH 2A2 24	42	0.56	6.06	3.07	3.59	14.43%
PH 2A2 24	PH 2A2 25	42	3.56	5.53	3.07	4.10	13.17%
PH 2A2 25	M36S27	42	3.84	5.52	3.07	4.27	13.14%
M36S27	M36S5	10	7.00	5.53	3.07	10.14	55.32%
M36S5	M36S20	10	7.01	7.06	3.07	7.47	70.56%
M36S20	M36S25	12	2.14	6.86	3.14	6.76	57.20%
M36S25	M36S116	12	3.08	6.16	3.17	7.81	51.30%
M36S116	M36S115	12	6.21	5.32	3.17	9.43	44.30%
M36S115	M36S107	12	5.34	5.26	3.18	9.61	43.80%
M36S107	M36S75	12	5.60	5.23	3.18	9.66	43.60%
M36S75	M37S59	15	6.22	4.82	3.18	9.34	32.16%
M37S59	M37S66	15	6.05	4.80	3.18	9.39	32.00%
M37S66	M37S95	18	0.10	8.30	3.29	4.12	46.13%
M37S95	M37S104	15	1.09	7.55	3.28	5.31	50.32%
M37S104	M37S93	24	0.65	7.08	3.41	4.44	29.50%
M37S93	M37S120	24	0.64	6.95	3.38	4.48	28.95%
M37S120	M37S117	24	0.69	8.76	3.38	3.27	36.50%

1.3.3 Pipe Sizing Criteria

1.3.3.1 Hydraulic Requirements

Manning's formula for open channel flow shall be used to calculate flow in gravity sewer mains. Manning's coefficient of roughness "n" shall be assumed to be 0.013 for all types of sewer pipe. Sewer grades shall be designed for velocities of 3 to 5 feet per second (fps) where possible. This is extremely important in areas where peak flow will not be achieved for many years. The minimum allowable velocity is 2 fps at calculated peak design flow, excluding infiltration. Sewer mains that do not sustain 2 fps at peak flow shall be designed to have a minimum slope of 1 percent. The maximum allowable velocity shall be 10 fps and shall be avoided by adjusting slopes or by utilizing a vertical curve to transition to lower velocities per sections 2.2.4 and 2.2.9.4. If the Senior Civil Engineer approves a velocity greater than 10 fps the pipe shall be upgraded to SDR (standard dimension ratio)18 PVC (polyvinyl chloride), concrete encased VC (vitrified clay), or PVC lined, reinforced concrete pipe.

1.3.3.2 Slope

Slope shall be calculated as the difference in elevation at each end of the pipe divided by the horizontal length of the pipe.

1.3.3.3 Depth of Flow

New sewer mains of all sizes shall be sized to carry the projected peak dry weather flow at a depth of flow not greater than ½ of the inside diameter of the pipe (d_n/D not to exceed 0.5). Existing mains 18 inches in diameter and larger will be permitted to flow at a projected peak dry weather flow of not greater than 3/4 the inside diameter of the pipe (d_n/D not to exceed 0.75). Existing sewer mains less than 18 inches in diameter will be permitted to carry the projected peak dry weather flow at a depth of flow not greater than ½ of the inside diameter of the pipe (d_n/D not to exceed 0.5).

In developed areas, the calculated dry weather peak flow from any new development will be added to the field measured dry weather peak flow to determine if the projected d_n/D will comply with the above stated parameters or a comprehensive sewer study of the area shall be prepared.

1.3.3.4 Minimum Pipe Sizes

The size of a sewer pipe is defined as the inside diameter of the pipe. Sewer mains shall be a minimum of 8 inches in diameter in residential areas, and a minimum of 10 inches in diameter in commercial, industrial, and high-rise building areas per Council Policy 600-04.

PBS&J
An employee-owned company

March 24, 2005

Guann Hwang
City of San Diego
Metropolitan Wastewater Department
9192 Topaz Way
San Diego, CA 92123-1119

Re: Candlelight Development Off-Site Sewer Capacity Analysis

Dear Mr. Hwang,

INTRODUCTION

DR Horton Homes – Western Pacific Series (DR Horton) is currently planning the development of their Candlelight Project (Project) located in the City of San Diego's (City's) Otay Mesa area. The Project is located along Caliente Road south of Airway Road as shown on the attached Exhibit 1. DR Horton has contracted PBS&J to provide sewer system planning and analysis consulting services. PBS&J has analyzed the onsite sewer system, and we are now reviewing the offsite sewer system collection options. The purpose of this letter is to provide analysis results of the available off-site sewer capacity in the existing sewer system including the Otay Valley Trunk Sewer and sewer connections to the San Ysidro Interceptor sewer. It is proposed that this additional available capacity be utilized on a temporary basis until the upgrades to the Otay Mesa Trunk Sewer are made which will provide permanent sewer capacity to support the Project.

PROJECT DESCRIPTION

The Candlelight Development currently includes the construction of 450 Multi-Family dwelling units (DU's) with an equivalent dwelling unit (EDU) sewer capacity of 386. Based on current projections, DR Horton anticipates an absorption rate of 16 units per month, starting in mid-September, 2006. Therefore at this rate, Project build out is estimated by January 2009. To be conservative for purposes of this analysis, the entire 386 EDU's were utilized for sewer flow projections.

Due to timing of sewer infrastructure construction in the Otay Mesa Area, two sewer service phases are proposed. The two phases are described below.

Phase A – Temporary Connection to Otay Valley Trunk Sewer

It is currently proposed that the Candlelight Development will connect sewer flows to an existing manhole located at the intersection of Caliente Road and Airway Road as shown on Exhibit 1 attached. Flows into this existing manhole include only the San Ysidro High School at this time. The Project's sewer will flow north in the existing 10-inch main across SR-905 and into Ocean View Hills Parkway. The sewer in Ocean View Hills Parkway collects and conveys flows to a northern connection with Otay Valley Trunk Sewer. Caltrans as a component of the SR-905 highway construction will ultimately remove the 10-inch gravity main flowing north, from the SYHS across SR-905 to Ocean View Hills Parkway. Caltrans will provide sewer service to the SYHS by constructing an 18-inch pipeline in Airway Road from Calinete to Old Otay Mesa Road prior to the massive grading operation. Caltrans is being delayed due to funding restrictions and the Airway Road sewer pipeline is expected for installation in the 2007-2008 timeframe.

Phase B – Completion of Otay Mesa Trunk Sewer in Airway Road
Upon Caltrans completion of the Airway Road pipeline, the City is currently scheduled to construct the Phase 2B1 portion of the Otay Mesa Trunk Sewer Project (OMTS) in Old Otay Mesa Road to the San Ysidro interceptor connector located on the west side of I-5. With the Airway Road section in operation, sewer flows will be diverted west to Otay Mesa Road where the main connects to the existing Phase 2A OMTS 42-inch trunk sewer. The 42-inch OMTS is extended in Otay Mesa Road southwest to Mesa Place where it is temporarily connected to the existing 10-inch sewer main. The existing 10-inch sewer main extends southwest and is gradually upsized until it connects with the San Ysidro Interceptor Sewer on the west side of Interstate 5. As part of the Phase 2B1 construction the City plans to ultimately upsize the entire reach from the end of Phase 2A to the San Ysidro Interceptor Sewer providing up to 34 MGD of capacity from Otay Mesa. Once this portion of the OMTS is completed, permanent sewer capacity for the Candlelight Development will be established. Based on our current understanding of the OMTS funding and schedule, it is believed this portion will be completed by early 2008. The Phase B portion of the Project is shown on Exhibit 1.

METHODOLOGY & ASSUMPTIONS

The Otay Mesa Trunk Sewer Info-works hydraulic model, which was the basis for the adopted Otay Mesa Trunk Sewer Master Plan Update and Alignment Study dated June 2004, was utilized to determine available EDU capacity for the temporary off-site sewage flow. The 2005 and 2010 models were updated for the East Otay Mesa to reflect current flow conditions at Pump Station 23T. Pump Station 23T data was provided for a two-week period in the month of January 2005 by Jim Haghgouy at the City of San Diego Metropolitan Wastewater Department. The peak inflow into the Station was 0.65 mgd and the peak pump flow rate was 3.3 mgd.

CAPACITY ANALYSIS

Gravity sewer capacities were based upon a depth-to-diameter ratio of less than 0.75, per City of San Diego Sewer Design Guide, 2001. The City's Sewer Design Guide Section # 1.3.3.3 can be found in Appendix I.

FLOW MONITORING

At our suggestion, DR Horton authorized an in-field flow monitoring study to confirm current 2005 sewer flow rates. PBS&J contracted with MGD Technologies (MGD) to provide actual sewer flow rate data at three selected manholes for a one-week period. The selected manhole sites are identified on Exhibit 1. MGD will begin the flow monitoring within the next two weeks. Results of the monitoring will be made available by mid-April.

SUMMARY

The results of our analysis are shown in the following Table:

CANDLELIGHT OFFSITE SEWER CAPACITY

Scenario	Description	Available Capacity (EDUs)
2005	Phase A - Otay Valley Trunk Sewer	5,000
2010	Phase A - Otay Valley Trunk Sewer	4,000
2005	Phase B - Otay Mesa Road Sewer	2,500
2010	Phase B - Otay Mesa Road Sewer	2,300

Data from the model runs is attached for your review and information.

Completion of the sewer study is critical to the Project's approval process and overall schedule. We must identify and describe the offsite sewer collection system in order to finish the study. We would appreciate an opportunity to workshop with MWWD Staff and confirm the results of our analysis at your earliest convenience. Thank you for your assistance in this matter. If you have any questions or comments, I can be reached at 858-514-1027 or cell 760-525-7670.

Cordially,

Todd Engstrand, P.E.
Project Manager

Attachments:	Exhibit 1 Model Output Data City of San Diego Sewer Design Guide Section 1.3.3.3 (for reference)

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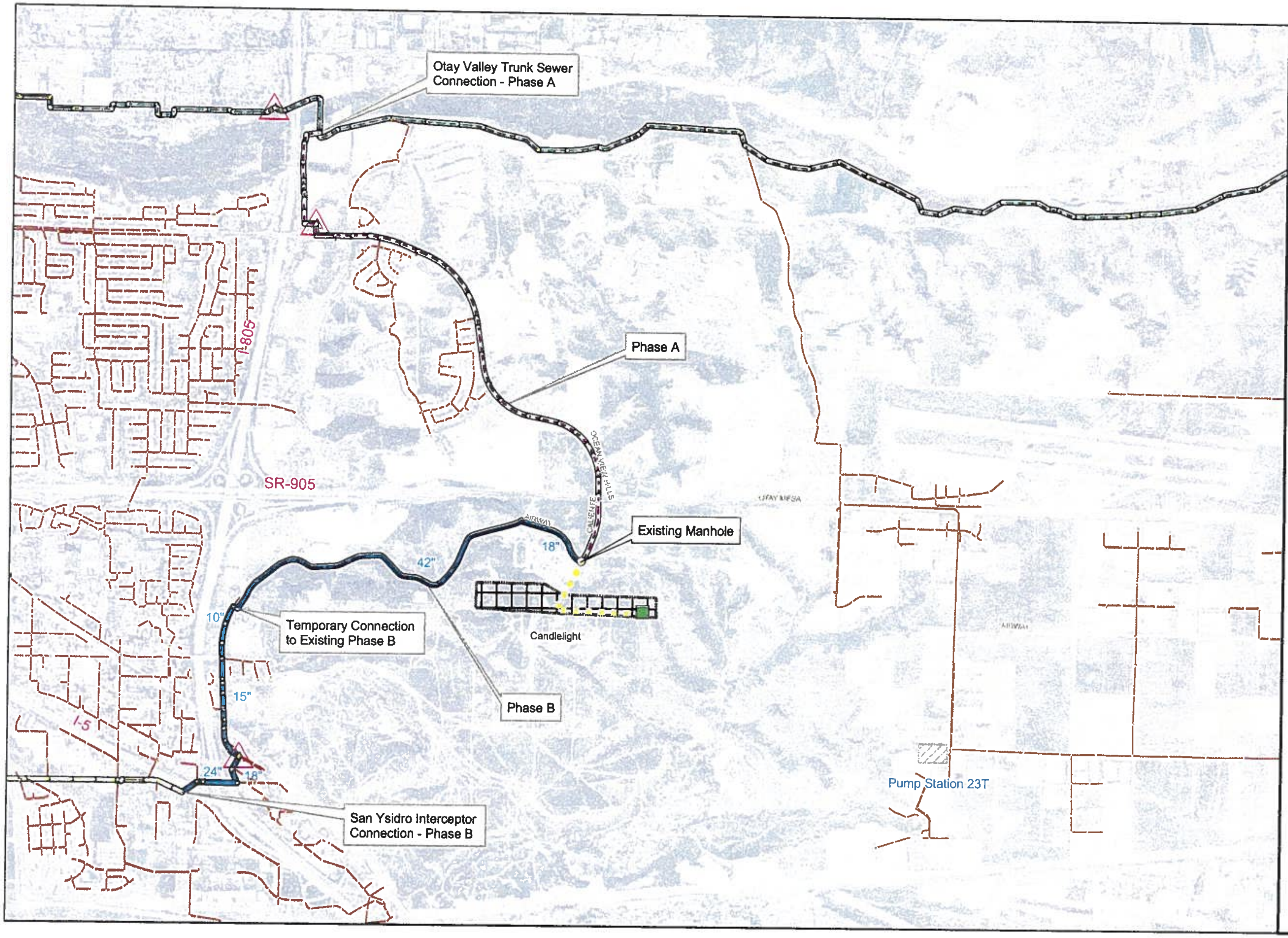
Candlelight Development Offsite Sewer Capacity Analysis

Exhibit 1



PHASE A - 2005 SCENARIO - ADDITIONAL 5,000 EDU

Upstream MHID	Downstream MHID	Diameter (in)	Slope (%)	Depth (in)	Peak Flow (cfs)	Velocity (fps)	depth/ Dia. (%)
N35S023	N35S016	15	0.75	11.00	5.09	5.27	73.36%
N35S016	N34S010	15	2.44	7.67	5.09	8.06	51.12%
N34S010	M34S182	15	5.39	6.26	5.09	10.47	41.76%
M34S182	M34S162	18	5.98	5.71	5.09	10.57	31.73%
M34S162	M33S15	18	6.14	13.48	5.09	3.99	74.87%
M33S15	M33S20	27	0.24	11.81	8.14	4.87	43.73%
M33S20	M33S19	27	0.43	11.82	8.14	4.86	43.78%
M33S19	M33S18	27	1.64	20.29	8.13	2.54	75.16%
M33S18	M33S14	27	0.04	13.48	8.10	4.09	49.91%
M33S14	M33S7	27	0.29	13.79	8.10	3.98	51.07%
M33S7	M33S9	27	0.19	13.21	8.09	4.23	48.93%
M33S9	M33S10	27	0.24	15.18	8.08	3.52	56.22%
M33S10	M33S8	27	0.19	11.74	8.05	4.86	43.47%
M33S8	M33S13	27	0.70	12.76	8.20	4.44	47.24%
M33S13	M33S12	27	0.25	14.22	8.18	3.86	52.67%
M33S12	M33S11	27	0.24	11.83	8.17	4.88	43.82%
M33S11	M33S6	27	0.27	11.83	8.17	4.87	43.82%
M33S6	M33S4	27	0.27	12.07	8.16	4.75	44.71%
M33S4	M33S5	27	0.17	12.41	8.16	4.58	45.96%
M33S5	M33S2	27	0.27	11.92	8.16	4.83	44.13%
M33S2	M33S3	27	0.09	11.92	8.16	4.82	44.13%
M33S3	M33S1	27	0.29	12.02	8.16	4.77	44.53%
M33S1	M33S21	27	0.14	11.81	8.16	4.88	43.73%
M33S21	L33S2	27	0.42	11.83	8.15	4.86	43.82%
L33S2	L33S1	27	0.99	10.34	8.15	5.81	38.31%
L33S1	L33S4	27	0.49	11.54	8.15	5.02	42.76%
L33S4	L33S3	27	1.55	8.92	8.15	7.12	33.02%
L33S3	L33S18	27	1.72	8.50	8.15	7.60	31.47%
L33S18	L33S5	27	0.93	9.70	8.15	6.35	35.91%
L33S5	L33S19	27	1.33	9.25	8.15	6.76	34.27%
L33S19	L33S23	27	3.08	13.57	8.15	4.07	50.27%
L33S23	L33S21	27	0.28	11.83	8.17	4.87	43.82%
L33S21	L33S14	27	0.34	11.83	8.17	4.87	43.82%
L33S14	L33S13	27	0.46	11.71	8.17	4.94	43.38%
L33S13	L33S17	27	0.36	11.83	8.16	4.87	43.82%
L33S17	L33S16	27	0.46	11.74	8.16	4.92	43.47%
L33S16	L33S42	27	0.47	11.64	8.16	4.97	43.11%
L33S42	L33S44	27	0.19	11.84	8.16	4.87	43.87%
L33S44	L33S43	27	0.26	11.93	8.16	4.82	44.18%
L33S43	L33S47	27	0.21	12.59	8.16	4.49	46.62%
L33S47	L33S46	27	0.25	11.82	8.16	4.87	43.78%
L33S46	L33S70	27	1.73	10.62	8.15	5.62	39.33%
L33S70	L33S68	27	0.44	11.81	8.15	4.88	43.73%
L33S68	L33S6	27	0.69	10.87	8.15	5.44	40.27%
L33S6	L33S39	27	0.39	11.83	8.15	4.87	43.82%
L33S39	L33S36	27	0.45	11.78	8.15	4.89	43.64%
L33S36	L33S64	27	0.51	11.47	8.15	5.07	42.49%
L33S64	L33S12	27	0.47	11.60	8.15	4.98	42.98%
L33S12	K33S39	27	0.48	12.12	8.14	4.71	44.89%
K33S39	K33S40	27	0.41	12.25	8.14	4.64	45.38%
K33S40	K33S42	27	0.39	12.20	8.13	4.66	45.20%
K33S42	K33S41	27	0.39	11.81	8.13	4.86	43.73%
K33S41	K33S36	27	0.36	11.81	8.13	4.86	43.73%
K33S36	K33S38	27	0.38	12.24	8.12	4.64	45.33%
K33S38	K33S37	27	0.39	12.50	8.12	4.51	46.31%
K33S37	K33S35	27	0.37	11.94	8.31	4.90	44.22%
K33S35	K33S14	27	0.30	11.94	8.31	4.90	44.22%
K33S14	K33S15	27	0.37	12.35	8.30	4.68	45.73%
K33S15	K33S16	27	0.40	12.61	8.29	4.55	46.71%
K33S16	K33S17	27	0.12	12.64	8.29	4.54	46.80%
K33S17	K33S11	27	0.26	13.76	8.28	4.07	50.98%
K33S11	K33S21	27	0.27	12.46	8.28	4.62	46.13%
K33S21	K33S20	27	0.17	12.65	8.28	4.53	46.84%
K33S20	K33S4	27	0.26	13.60	8.27	4.13	50.36%
K33S4	K33S2	27	0.13	14.17	8.27	3.91	52.49%
K33S2	J33S25	30	0.15	15.31	8.26	3.28	51.04%
J33S25	J33S27	30	0.15	15.37	8.30	3.28	51.24%
J33S27	J33S5	30	0.15	15.29	8.29	3.30	50.96%
J33S5	J33S66	30	0.15	13.07	8.29	4.04	43.56%
J33S66	J33S13	30	0.17	14.18	8.29	3.63	47.28%
J33S13	J33S38	30	0.15	11.54	8.28	4.76	38.48%

PHASE A - 2010 SCENARIO - ADDITIONAL 4,000 EDU

Upstream MHID	Downstream MHID	Diameter (in)	Slope (%)	Depth (in)	Peak Flow (cfs)	Velocity (fps)	depth/ Dia. (%)
N35S023	N35S016	15	0.75	10.40	4.55	5.06	69.36%
N35S016	N34S010	15	2.44	7.31	4.55	7.66	48.72%
N34S010	M34S182	15	5.39	5.88	4.54	10.18	39.20%
M34S182	M34S162	18	5.98	5.38	4.54	10.24	29.87%
M34S162	M33S15	18	6.14	13.37	4.54	3.70	74.27%
M33S15	M33S20	27	0.24	11.74	8.05	4.85	43.47%
M33S20	M33S19	27	0.43	11.76	8.05	4.84	43.56%
M33S19	M33S18	27	1.64	20.17	8.05	2.53	74.71%
M33S18	M33S14	27	0.04	13.42	8.02	4.07	49.69%
M33S14	M33S7	27	0.29	13.70	8.02	3.97	50.76%
M33S7	M33S9	27	0.19	13.12	8.02	4.23	48.58%
M33S9	M33S10	27	0.24	15.10	8.00	3.51	55.91%
M33S10	M33S8	27	0.19	11.68	7.98	4.84	43.24%
M33S8	M33S13	27	0.70	12.68	8.13	4.44	46.98%
M33S13	M33S12	27	0.25	14.14	8.11	3.86	52.36%
M33S12	M33S11	27	0.24	11.78	8.10	4.86	43.64%
M33S11	M33S6	27	0.27	11.78	8.10	4.86	43.64%
M33S6	M33S4	27	0.27	12.02	8.10	4.74	44.53%
M33S4	M33S5	27	0.17	12.36	8.10	4.57	45.78%
M33S5	M33S2	27	0.27	11.84	8.09	4.84	43.87%
M33S2	M33S3	27	0.09	11.86	8.09	4.82	43.91%
M33S3	M33S1	27	0.29	11.96	8.09	4.76	44.31%
M33S1	M33S21	27	0.14	11.76	8.09	4.87	43.56%
M33S21	L33S2	27	0.42	11.78	8.09	4.85	43.64%
L33S2	L33S1	27	0.99	10.31	8.09	5.79	38.18%
L33S1	L33S4	27	0.49	11.51	8.09	5.01	42.62%
L33S4	L33S3	27	1.55	8.88	8.09	7.10	32.89%
L33S3	L33S18	27	1.72	8.47	8.09	7.58	31.38%
L33S18	L33S5	27	0.93	9.66	8.09	6.33	35.78%
L33S5	L33S19	27	1.33	9.22	8.08	6.74	34.13%
L33S19	L33S23	27	3.08	13.52	8.08	4.06	50.09%
L33S23	L33S21	27	0.28	11.78	8.10	4.86	43.64%
L33S21	L33S14	27	0.34	11.78	8.10	4.86	43.64%
L33S14	L33S13	27	0.46	11.68	8.10	4.92	43.24%
L33S13	L33S17	27	0.36	11.78	8.10	4.86	43.64%
L33S17	L33S16	27	0.46	11.69	8.10	4.91	43.29%
L33S16	L33S42	27	0.47	11.60	8.10	4.96	42.98%
L33S42	L33S44	27	0.19	11.77	8.10	4.87	43.60%
L33S44	L33S43	27	0.26	11.87	8.09	4.81	43.96%
L33S43	L33S47	27	0.21	12.54	8.09	4.48	46.44%
L33S47	L33S46	27	0.25	11.77	8.09	4.86	43.60%
L33S46	L33S70	27	1.73	10.57	8.09	5.61	39.16%
L33S70	L33S68	27	0.44	11.76	8.09	4.86	43.56%
L33S68	L33S6	27	0.69	10.82	8.09	5.43	40.09%
L33S6	L33S39	27	0.39	11.78	8.09	4.85	43.64%
L33S39	L33S36	27	0.45	11.74	8.09	4.88	43.47%
L33S36	L33S64	27	0.51	11.42	8.08	5.05	42.31%
L33S64	L33S12	27	0.47	11.58	8.08	4.96	42.89%
L33S12	K33S39	27	0.48	12.06	8.08	4.71	44.67%
K33S39	K33S40	27	0.41	12.19	8.08	4.64	45.16%
K33S40	K33S42	27	0.39	12.14	8.08	4.66	44.98%
K33S42	K33S41	27	0.39	11.77	8.07	4.85	43.60%
K33S41	K33S36	27	0.36	11.76	8.07	4.85	43.56%
K33S36	K33S38	27	0.38	12.18	8.06	4.64	45.11%
K33S38	K33S37	27	0.39	12.44	8.06	4.50	46.09%
K33S37	K33S35	27	0.37	11.90	8.25	4.88	44.09%
K33S35	K33S14	27	0.30	11.89	8.25	4.89	44.04%
K33S14	K33S15	27	0.37	12.29	8.24	4.68	45.51%
K33S15	K33S16	27	0.40	12.56	8.23	4.54	46.53%
K33S16	K33S17	27	0.12	12.59	8.23	4.53	46.62%
K33S17	K33S11	27	0.26	13.72	8.22	4.06	50.80%
K33S11	K33S21	27	0.27	12.40	8.22	4.61	45.91%
K33S21	K33S20	27	0.17	12.59	8.22	4.52	46.62%
K33S20	K33S4	27	0.26	13.52	8.21	4.12	50.09%
K33S4	K33S2	27	0.13	14.11	8.21	3.91	52.27%
K33S2	J33S25	30	0.15	15.25	8.20	3.27	50.84%
J33S25	J33S27	30	0.15	15.32	8.24	3.27	51.08%
J33S27	J33S5	30	0.15	15.24	8.24	3.29	50.80%
J33S5	J33S66	30	0.15	13.01	8.23	4.03	43.36%
J33S66	J33S13	30	0.17	14.12	8.23	3.62	47.08%
J33S13	J33S38	30	0.15	11.50	8.22	4.75	38.32%

PHASE B - 2005 SCENARIO - ADDITIONAL 2,500 EDU

Upstream MHID	Downstream MHID	Diameter (in)	Slope (%)	Depth (in)	Peak Flow (cfs)	Velocity (fps)	depth/ Dia. (%)
N35SD5	N35SD6	18	0.49	7.92	2.99	3.98	44.00%
N35SD6	PH 2A2 7	42	2.68	5.72	3.07	3.90	13.63%
PH 2A2 7	PH 2A2 10	42	5.72	5.34	3.07	4.32	12.71%
PH 2A2 10	PH 2A2 11	42	7.13	5.24	3.07	4.44	12.49%
PH 2A2 11	PH 2A2 13	42	4.58	5.45	3.07	4.20	12.97%
PH 2A2 13	PH 2A2 15	42	4.55	5.45	3.07	4.20	12.97%
PH 2A2 15	PH 2A2 16	42	3.36	5.60	3.07	4.03	13.34%
PH 2A2 16	PH 2A2 17	42	5.60	5.35	3.07	4.31	12.74%
PH 2A2 17	PH 2A2 18	42	5.22	5.38	3.07	4.27	12.80%
PH 2A2 18	PH 2A2 19	42	6.18	5.30	3.07	4.36	12.63%
PH 2A2 19	PH 2A2 20	42	5.30	5.38	3.07	4.28	12.80%
PH 2A2 20	PH 2A2 21	42	3.43	5.59	3.07	4.04	13.31%
PH 2A2 21	PH 2A2 22	42	4.66	5.44	3.07	4.21	12.94%
PH 2A2 22	PH 2A2 23	42	0.54	6.10	3.07	3.55	14.51%
PH 2A2 23	PH 2A2 24	42	0.56	6.06	3.07	3.58	14.43%
PH 2A2 24	PH 2A2 25	42	3.56	5.53	3.07	4.09	13.17%
PH 2A2 25	M36S27	42	3.84	5.51	3.07	4.27	13.11%
M36S27	M36S5	10	7.00	5.53	3.07	10.14	55.32%
M36S5	M36S20	10	7.01	7.04	3.07	7.46	70.44%
M36S20	M36S25	12	2.14	6.85	3.14	6.76	57.10%
M36S25	M36S116	12	3.08	6.12	3.14	7.79	51.00%
M36S116	M36S115	12	6.21	5.28	3.14	9.43	44.00%
M36S115	M36S107	12	5.34	5.22	3.14	9.56	43.50%
M36S107	M36S75	12	5.60	5.21	3.14	9.60	43.40%
M36S75	M37S59	15	6.22	4.78	3.14	9.31	31.84%
M37S59	M37S66	15	6.05	4.76	3.14	9.36	31.76%
M37S66	M37S95	18	0.10	8.26	3.25	4.11	45.87%
M37S95	M37S104	15	1.09	7.51	3.25	5.29	50.08%
M37S104	M37S93	24	0.65	7.04	3.37	4.43	29.35%
M37S93	M37S120	24	0.64	6.92	3.35	4.46	28.85%
M37S120	M37S117	24	0.69	8.70	3.35	3.26	36.25%

PHASE B - 2010 SCENARIO - ADDITIONAL 2,300 EDU

Upstream MHID	Downstream MHID	Diameter (in)	Slope (%)	Depth (in)	Peak Flow (cfs)	Velocity (fps)	depth/ Dia. (%)
N35SD5	N35SD6	18	0.49	7.93	2.99	3.98	44.07%
N35SD6	PH 2A2 7	42	2.68	5.72	3.08	3.90	13.63%
PH 2A2 7	PH 2A2 10	42	5.72	5.34	3.07	4.32	12.71%
PH 2A2 10	PH 2A2 11	42	7.13	5.24	3.07	4.44	12.49%
PH 2A2 11	PH 2A2 13	42	4.58	5.45	3.07	4.20	12.97%
PH 2A2 13	PH 2A2 15	42	4.55	5.45	3.07	4.20	12.97%
PH 2A2 15	PH 2A2 16	42	3.36	5.60	3.07	4.03	13.34%
PH 2A2 16	PH 2A2 17	42	5.60	5.35	3.07	4.31	12.74%
PH 2A2 17	PH 2A2 18	42	5.22	5.38	3.07	4.27	12.80%
PH 2A2 18	PH 2A2 19	42	6.18	5.30	3.07	4.37	12.63%
PH 2A2 19	PH 2A2 20	42	5.30	5.38	3.07	4.28	12.80%
PH 2A2 20	PH 2A2 21	42	3.43	5.59	3.07	4.04	13.31%
PH 2A2 21	PH 2A2 22	42	4.66	5.44	3.07	4.21	12.94%
PH 2A2 22	PH 2A2 23	42	0.54	6.11	3.07	3.55	14.54%
PH 2A2 23	PH 2A2 24	42	0.56	6.06	3.07	3.59	14.43%
PH 2A2 24	PH 2A2 25	42	3.56	5.53	3.07	4.10	13.17%
PH 2A2 25	M36S27	42	3.84	5.52	3.07	4.27	13.14%
M36S27	M36S5	10	7.00	5.53	3.07	10.14	55.32%
M36S5	M36S20	10	7.01	7.06	3.07	7.47	70.56%
M36S20	M36S25	12	2.14	6.86	3.14	6.76	57.20%
M36S25	M36S116	12	3.08	6.16	3.17	7.81	51.30%
M36S116	M36S115	12	6.21	5.32	3.17	9.43	44.30%
M36S115	M36S107	12	5.34	5.26	3.18	9.61	43.80%
M36S107	M36S75	12	5.60	5.23	3.18	9.66	43.60%
M36S75	M37S59	15	6.22	4.82	3.18	9.34	32.16%
M37S59	M37S66	15	6.05	4.80	3.18	9.39	32.00%
M37S66	M37S95	18	0.10	8.30	3.29	4.12	46.13%
M37S95	M37S104	15	1.09	7.55	3.28	5.31	50.32%
M37S104	M37S93	24	0.65	7.08	3.41	4.44	29.50%
M37S93	M37S120	24	0.64	6.95	3.38	4.48	28.95%
M37S120	M37S117	24	0.69	8.76	3.38	3.27	36.50%

1.3.3 Pipe Sizing Criteria

1.3.3.1 Hydraulic Requirements

Manning's formula for open channel flow shall be used to calculate flow in gravity sewer mains. Manning's coefficient of roughness "n" shall be assumed to be 0.013 for all types of sewer pipe. Sewer grades shall be designed for velocities of 3 to 5 feet per second (fps) where possible. This is extremely important in areas where peak flow will not be achieved for many years. The minimum allowable velocity is 2 fps at calculated peak design flow, excluding infiltration. Sewer mains that do not sustain 2 fps at peak flow shall be designed to have a minimum slope of 1 percent. The maximum allowable velocity shall be 10 fps and shall be avoided by adjusting slopes or by utilizing a vertical curve to transition to lower velocities per sections 2.2.4 and 2.2.9.4. If the Senior Civil Engineer approves a velocity greater than 10 fps the pipe shall be upgraded to SDR (standard dimension ratio)18 PVC (polyvinyl chloride), concrete encased VC (vitrified clay), or PVC lined, reinforced concrete pipe.

1.3.3.2 Slope

Slope shall be calculated as the difference in elevation at each end of the pipe divided by the horizontal length of the pipe.

1.3.3.3 Depth of Flow

New sewer mains of all sizes shall be sized to carry the projected peak dry weather flow at a depth of flow not greater than ½ of the inside diameter of the pipe (d_n/D not to exceed 0.5). Existing mains 18 inches in diameter and larger will be permitted to flow at a projected peak dry weather flow of not greater than 3/4 the inside diameter of the pipe (d_n/D not to exceed 0.75). Existing sewer mains less than 18 inches in diameter will be permitted to carry the projected peak dry weather flow at a depth of flow not greater than ½ of the inside diameter of the pipe (d_n/D not to exceed 0.5).

In developed areas, the calculated dry weather peak flow from any new development will be added to the field measured dry weather peak flow to determine if the projected d_n/D will comply with the above stated parameters or a comprehensive sewer study of the area shall be prepared.

1.3.3.4 Minimum Pipe Sizes

The size of a sewer pipe is defined as the inside diameter of the pipe. Sewer mains shall be a minimum of 8 inches in diameter in residential areas, and a minimum of 10 inches in diameter in commercial, industrial, and high-rise building areas per Council Policy 600-04.

Appendix B
Cross Sections

Appendix C
Correspondence

THE CITY OF SAN DIEGO

RECEIVED
AUG 18 2006

August 11, 2006

Mr. Todd D. Engstrand
PBS&J
9275 Sky Court, Suite 200
San Diego, CA 921123

Dear Mr. Engstrand:

Subject: Sewer Study for Revised Candlelight Villas East (WO 422966)

We have reviewed the above sewer study dated June 15, 2006 which was received by our offices June 16, 2006 along with the Calculations for the Proposed Private Pump Station and the Phase 2C Public Sewer Pump Station. We have held this study pending the outcome of the sewer pump station evaluation. A separate letter has been sent to respond to the pump station issues. Our comments regarding the study are as follows:

Sewer Study Comments:

1. Show the gravity sewer from the adjacent Southview property. Coordinate with Walter Schwerin for the point of connection to your project. A private homeowners association agreement must be entered into between Candlelight and Southview for the joint sewer and sewer pump station facilities. Please provide also a copy of the CC&R's at time of plan check.

2. If you are going to include meeting minutes in the project's report please use the amended version.

3. Page 3 of 5:
   After paragraph 3: All public facilities 18" and larger are included in the OIC Agreement and will be reimbursed according to the agreement.
   After paragraph 5: Currently Phase 2B1 is not funded. It is uncertain if City Council , given the current financial climate will support City participation in front funding the facility.

4. Page 4 of 5: Please include as part of the Candlelight project construction of 2 sets of force mains in Caliente Road: a) First set :6" force mains, Bachmann Property pump station., b) second set: 12" force mains Mesa South East Pump Station: Show these in the cross sections for all streets affected.

5. TABLE 3:
   Note at bottom: Provide dual manholes for mains deeper than 20 feet. See street cross sections. Note: Show change in cross sections to include moving dual private force mains out of the public right-of-way. Show future public sewer in road out side of project. Show deep sewer in Airway Road per Sewer Design Guide Chapter 3 spacing.

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Phase A 2010/Phase B 2005/Phase B 2010: The manhole to manhole tables show the 27" and 30" pipe segments over 75% d/D for pipe allowed only 75% d/D. Please modify the report to show your flows in the Otay Mesa Trunk Sewer.

6. Proposed Sewer System Sewer Study Figure #3:
   A. Revise exhibit per above comments.
   B. Ensure that all mains are labeled either public or private.
   C. Show the point of future connection from the Southview project.

7. Show a phasing plan for the Otay Mesa Trunk Sewer 10" main replacement and thresholds of development to trigger replacement. Assume that the school .will flow in this main due to highway construction.

TM Comments:

8. TM Sheet S-2, S-3, & S-4 of S-10: Cross Sections and Plan View 9 (dated 7/6/06):
   A. In most Private Drives you show 3' between two gravity sewer mains. Please provide justification for the two mains. More than 3' distance is required between the private force main and private gravity main. Whether private or public all separation requirements must be adhered to.

   B. Public Street "A": The private gravity sewer in Public Street "A" must have an Encroachment Removal and Maintenance Agreement.

   C. Reverse flows in Private Driveway "W" to head westerly to Private Driveway "V" then southerly to a point of connection in Public Street "A" and extend the sewer main easterly to the manhole at Caliente and Public Street "A". Remove the connection at the easterly end of Private Driveway "W" where it crosses southeasterly across Caliente. Skewed crossings are not allowed per the City's Sewer Design Guide.

   D. Regarding the sewer main extending northwesterly from the west end of Private Driveway "T": No private easements are allowed in public rights-of-way. You will need an Encroachment Removal and Maintenance Agreement for private utilities in public streets. The connection should go north on private property on the west side of Bldg. 40 then make a perpendicular connection to the 18" sewer main in Caliente at a manhole.

We look forward to working with you all in partnership to see this plan to completion. If you have any questions or require any additional information please call me at 619-533-5106.

Sincerely,

Barbara A.B. Salvini

BARBARA A.B. SALVINI
Senior Civil Engineer

BES/jmb

cc:
Chris Toth, Deputy Director, Metropolitan Wastewater Department
Robert Ferrier, Assistant Director, Metropolitan Wastewater Department
Ann Sasaki, Deputy Director, Metropolitan Wastewater Department
Isam Hireish, Senior Civil Engineer, Metropolitan Wastewater Department
Hushmand Yazdani, Associate Engineer-Civil, Metropolitan Wastewater Department
Mehdi Rastakhiz, Associate Engineer-Civil, Metropolitan Wastewater Department
Janet Buttmann, Assistant Engineer-Civil, Metropolitan Wastewater Department
Todd Engstrand, PBS&J, 9275 Sky Park Court, Suite 200, San Diego, CA 92123
James Strayer, PBS&J
Mark Elliott, PBSJ
D.R. Horton, 1010 S, Coast Hwy, 101 Suite 101, Encinitas, CA 92024
Sandra Teasely, DPM, Development Services Department

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THE CITY OF SAN DIEGO

July 5, 2006

JUL 24 2006

Mr. Todd D. Engstrand
PBS&J
9275 Sky Court, Suite 200
San Diego, CA 921123

Dear Mr. Engstrand:

Subject: Sewer Study for Candlelight Villas East (WO 422966)

We have reviewed the above sewer study dated June 15, 2006 which was received by our offices June 16, 2006. Our comments are as follows.

1. Show the gravity sewer from the adjacent Southview property. Coordinate with Walter Schwerin for the point of connection to your project. Any main on your project's site that carries Southview flows will be public mains.

2. If you are going to include meeting minutes in the project's report please use the amended version.

3. Provide the pump station calculations for the private and public modified basins and detention times.

4. Page 3 of 5:
<u>After paragraph 3</u>: All 18" and larger facilities are included in the OIC Agreement and will be reimbursed according to the agreement.
<u>After paragraph 5</u>: Currently Phase 2B1 is not funded. It is uncertain if City Council , given the current financial climate will support City participation in front funding the facility.
<u>After Paragraph 6</u>: In the future since you will be picking up flows from Southview, there will be two projects where the capacity will have to be studied to accommodate both Candlelight and Southview, Please revise the calculations to include both projects for future flows to the public pump station.

5. Page 4 of 5: FUTURE DUAL 12 IN FORCE MAINS: Show these in the cross sections for all streets affected.

Under GENERAL CRITERIA AND ENVIRONMENTAL CONSTRAINTS: Bullet 5: should read "Wet well and force main detention times shall not exceed 4-hours. Locate the pump station to use minimum lengths for force mains to reduce detention time." See City of San Diego Sewer Design Guide Section 1.5.2.
Include the analysis in the next report as this will determine is the small Pump Station will be permanent or temporary. You must demonstrate that the public Pump station and Private

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Pump Station at ultimate development will not have flows older than 4 hours. We believe that based on the large flat service area most likely the pump station within the project will need to be temporary. This is a discretionary issue. If this is the case, the developer will need to ether build the public pump station now, or will need to enter into a deferred improvement agreement.

6. **TABLE 3:**
Note at bottom: Provide dual manholes for mains deeper than 20 feet. See sheet cross sections. Note: Show change in cross sections to include moving dual private force mains out of the public right-of-way. Show future public sewer in road out side of project. Show deep sewer in Airway Road per Sewer Design Guide Chapter 3 spacing. Show dual 12" force mains, etc.

Phase A 2010/Phase B 2005/Phase B 2010: The manhole to manhole tables show the 27" and 30" pipe segments over 75% d/D for pipe allowed only 75% d/D. Pipe segments should be increased to a larger size. Additionally, if pipe segments showing velocity greater than 8 fps make a perpendicular connection to another pipe, two manholes at 45 degrees angle or a vertical curve used should be used to minimize standing wave. Please provide calculations to demonstrate laminar flow.

7. Sheet S-2 of S-9: Cross Sections:
In Private Drive "D" you show 3' between two gravity sewer mains. Please provide justification for the two mains. Why is one public main not used for both projects' flows since there is a space constraint?

Public Street "A": Show future public and private sewer in the street.

Public Street "A": Move private force main to private property. You show 5' between the two sewers. Are they both force mains? Coordinate dual force main construction with Walter Schwerin, engineer for Southview. He has consulted with Kevin Curtin for Southview to install force mains in Caliente and Airway.

8. Proposed Sewer System Figure #3:
   A. Revise exhibit per above comments.
   B. Ensure that all mains are labeled either public or private.
   C. Show the point of future connection from the Southview project.

9. Show a phasing plan for the Otay Mesa Trunk Sewer 10" main replacement and thresholds of development to trigger replacement assume school .will flow in this main due to highway construction.

We look forward to working with you all in partnership to see this plan to completion. If you have any questions or require any additional information please call me at 619-533-5106.

Sincerely,

Barbara A.B. Sal

BARBARA A.B. SALVINI
Senior Civil Engineer

BES/jmb

cc: Chris Toth, Deputy Director, Metropolitan Wastewater Department
Robert Ferrier, Assistant Director, Metropolitan Wastewater Department
Ann Sasaki, Deputy Director, Metropolitan Wastewater Department
Isam Hireish, Senior Civil Engineer, Metropolitan Wastewater Department
Hushmand Yazdani, Associate Engineer-Civil, Metropolitan Wastewater Department
Mehdi Rastakhiz, Associate Engineer-Civil, Metropolitan Wastewater Department
Janet Buttmann, Assistant Engineer-Civil, Metropolitan Wastewater Department
Todd Engstrand, PBS&J, 9275 Sky Park Court, Suite 200, San Diego, CA 92123
James Strayer, PBS&J
Mark Elliott, PBSJ
D.R. Horton, 1010 S, Coast Hwy, 101 Suite 101, Encinitas, CA 92024

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Schwerin & Assoc.
Civil Engineering • Planning
Engineered Construction
814 Morena Blvd., Ste. 101, San Diego, CA 92110
Phone (619) 220-4969 Fax (619) 220-7029

July 26, 2006

Kevin M. Curtin
D.R. Horton Inc.
5790 Fleet Street
Suite 210
Carlsbad, Ca. 92008

Re: Southview

Dear Kevin:

Thank you for the time afforded me Monday. At that time a possible long term sewer solution for both Southview and Candlelight was discussed. You have suggested that your development construct a permanent, private sewer pump station on your property. This pump station would have the capacity to handle the effluent from the Easterly portion of the Southview ownership as well as the effluent from Candlelight. This is a suggestion we endorse. It is recognized that a collection system sufficiently sized to handle Southview's flows would be made available at our common propertyline. This collection system would then discharge to the aforementioned pump station.

Please note that our needs would be primarily for our Easterly ownership, which is yet to be mapped. We would anticipate that 450 multi-family units would be developed in this Easterly property plus possibly another 75 multi-family units in our current project. Please further note that our development is not "dependant" on this pump station, but we feel that it is more efficient and more cost effective to participate with you.

Accordingly, we would be prepared to financially contribute to this station based on a fee that is proportional to our usage. Obviously, there remains the need for further discussion on this matter. We did, however wish to state in writing our interest.

If there are any questions or comments, please feel free to call.

Sincerely,
Schwerin & Associates

Walter T.

Walter T. Schwerin PE
WTS/pc

Cc/ Clem Abrams

PBS&J
An employee-owned company

June 15, 2006

Barbara Salvini
City of San Diego
MWWD - Development Services Section
600 B St. MS922
San Diego, CA 92101-4502

SUBJECT: CANDLELIGHT VILLAS EAST SEWER STUDY – Fourth Submittal

Dear Ms. Salvini:

On behalf of our Client, DR Horton, PBS&J submits the third revision to the Candlelight East Villas (Project) Sewer Study (*Study*). The Study has been updated to address comments received at recent meetings City of San Diego Metropolitan Wastewater Staff on December 15, 2005, March 17, 2006 and then again on May 25, 2006. Copies of the minutes published for the March 17th and May 25th meetings are included in Appendix C for reference.

The following summarizes the revisions to this *Study*:

1. Private Sewer System and Future Public Pump Station. A **permanent** private sewer system is now proposed, and the previous future gravity sewer connection to the public pump station south of the Project has been eliminated. Since the Project will not utilize the public pump station, discussions of its future use have been removed from the *Study*. Therefore, the comment requiring construction of the southern public pump station is no longer applicable.

   As required by City Staff, the private sewer pump station and force main will be located outside of the proposed public right-of-way.

2. Airway Road and Caliente Avenue Trunk Sewer.

   City Staff has indicated that capacity within the Otay Valley Trunk Sewer may not be available as originally concluded by the hydraulic analysis report included in Appendix A of the *Study*.

   Therefore, it will be necessary to construct the 18-inch trunk sewer in both Airway Road and Caliente Avenue as part of the Otay Mesa Trunk Sewer Master Plan.

   The discussions under the Offsite Sewer Collection System section and Figure 3 have been updated to reflect this change.

3. Future Pump Station Force Mains. The dual 12-inch force mains for the future public pump station south of the Project will be installed in Caliente Avenue to the limits of the roadway improvements. Figure 3, Proposed Sewer System, has been updated to show construction of the dual 12-inch force mains in Caliente Avenue.

As this is the fourth submittal of the *Study*, we request that the comment letter prepared by the MWWD – Development Services Section first be reviewed and approved by Deputy Director, Ann Sasaki, prior to being returned.

Through coordination efforts with MWWD Staff, we believe that all outstanding issues related to the *Study* have been adequately addressed, and it should be approved. It has taken considerable time to coordinate the proposed offsite sewer system associated with the Project and has impacted the overall development schedule. Therefore, your sections expedited review of this fourth submittal would be greatly appreciated. If you or your staff have any questions during the course or your review, please feel free to contact me at 858-514-1027.

Sincerely yours,

Todd D. Engstrand
Senior Project Manager

TDE:jrb

c: Ann Sasaki, Deputy Director – MWWD
Craig Whittemore, MWWD
Kevin Curtin, DR Horton
John Ponder, Sheppard Mullin
John Klein, Hunsaker & Associates
Jeramey Harding, T&B Planning
Jennifer Bileck, PBS&J
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PBSJ
An employee-owned company

April 13, 2006

Barbara Salvini
City of San Diego
MWWD - Development Services Section
600 B St. MS922
San Diego, CA 92101-4502

SUBJECT: CANDLELIGHT VILLAS EAST SEWER STUDY – Third Submittal

Dear Ms. Salvini:

On behalf of our Client, DR Horton, PBS&J submits the third revision to the Candlelight East Villas (Project) Sewer Study (*Study*). The Study has been updated to address comments received at recent meetings with MWWD – Development Services Staff on December 15, 2005 and then again on March 17, 2006.

The following summarizes the revisions to this *Study*:

1. Private Sewer System and Future Public Pump Station. A **permanent** private sewer system is now proposed, and the previous future gravity sewer connection to the public pump station south of the Project has been eliminated. Since the Project will not utilize the public pump station, discussions of its future use have been removed from the *Study*. Therefore, the comment requiring construction of the southern public pump station is no longer applicable.

2. Southview Apartments Gravity Sewer. PBS&J has received and reviewed a copy of the Southview Sewer Study – Revision No. 1. The Southview Sewer Study indicates that the proposed development will not have a gravity sewer to the south through the Candlelight Villas East Project. Therefore, the gravity sewer connection and main for the Southview Development has been eliminated from the proposed sewer system, Figure 3, and removed from discussions in the *Study*.

   In the future, if the Southview Development requires a gravity sewer connection for their project, the owner can contact me or my Client to discuss and coordinate acquiring the necessary easements and aligning the gravity main across the DR Horton property.

3. Airway Road Trunk Sewer. Construction of the proposed 18-inch trunk sewer in Airway Road is currently proposed as part of the Caltrans SR-905 widening improvements.

   In the event that construction of the Airway Road Trunk Sewer was delayed, PBS&J performed a detailed hydraulic analysis of the Otay Valley Trunk Sewer (OVTS) and existing sewer mains in Ocean View Hills Parkway to confirm available interim capacity for the Project. PBS&J worked closely with MWWD Staff for several months to prepare the hydraulic analysis presented in Appendix A of *Study*.

   The hydraulic analysis concluded that 1,450 EDU's of capacity is available in the OVTS and existing sewer mains in Ocean Views Hills Parkway until January 2009 when diverted flows from the City of Chula Vista are anticipated. However, is flow redirection from the City of Chula Vista does not

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November 10, 2005

Ms. Barbara Salvini
City of San Diego – Land Development Review Section
Metropolitan Wastewater Department
600 B Street, Suite 2210
San Diego, CA 92101

SUBJECT: CANDLELIGHT SEWER STUDY – Response to Comments

Dear Ms. Salvini:

We have received and reviewed the City of San Diego (City) comments dated July 17, 2005 on the *Candlelight Sewer Study*, July 2005. The following is our response to your comments:

1. PBS&J spoke with the City's Development Services Mechanical Review section. Based on our conversation, the private system can be designed to meet either the Uniform Plumbing Code or the City's Design Guide standards. The system analyzed in this study meets the City's Design Guide standards.

2. All wet utilities are shown on the sewer exhibit. The location of such facilities is only schematic. Separation is as noted in the text and as shown on the Tentative Map and cross-sections.

3. The location of the sewer laterals is not known at this level of Project processing. The Tentative Map does not require showing each individual unit sewer lateral and it is not necessary to know this information to analyze the sewer system. The locations of building sewer laterals will be shown on the final improvement plans submitted for Candlelight after the discretionary approvals.

4. The parallel sewer is required for future expansion of this area to drain to the proposed future regional pump station to the south.

5. A minimum 10-foot edge-to-edge separation will be maintained between the public sewer main and public water main. The cross-sections provided have been revised to illustrate this requirement. Additionally, the requirement has been stated in the General Criteria and Environmental Constraints Section, Page 5.

6. It is proposed that all on-site sewer facilities will remain private. The public gravity sewer main will be extended from the southeast boundary of the development out of MH #23 as shown in on Figure 3.

   A 15-foot wide private sewer easement will be extended through the development to benefit the "Southview" Apartment Tentative Map (Sudik Property to the North). The "Southview" Apartment development will connect their private gravity sewer at MH #20 at the northern boundary of the Candlelight development. Sewer facilities have been sized to accommodate the gravity flows from the "Southview" Apartment development.

7. The Metropolitan Wastewater Department has confirmed that the Public Sewer Lift Station as referenced in the comment is planned and included as part of the Phase 2C Otay Mesa Trunk Sewer (OMTS) Master Plan. The costs for this facility and funding for the OMTS improvements will be included in the "OMTS supplemental capacity fee" which has already been determined and is currently $1,816.00 per equivalent dwelling unit (EDU). These fees will be paid at the time of building permit issuance.

   The northern "Southview" Apartment development (Sudik Property) currently proposes to construct a separate private sewer lift station and force main to serve their approximate 200 EDU's that cannot sewer by direct gravity to the City's system. Once the public pump station is completed, the pumped flows from the "Southview" Apartment development can be redirected and flow by gravity through the private sewer system planned in the Candlelight development.

8. Plan check requirement noted.

9. Plan check requirement noted.

We feel the attached November 2005 sewer study, along with these responses and clarifications, adequately address issues for the proposed Candlelight development and we request that the City approve the revised sewer study. Please feel free to contact me at 858-874-1810 with any questions or comments you may have.

Cordially,

Todd D. Engstrand, P.E.
Project Manager

TDE:jrb

c: Kurt Bausbek, DR Horton
Kevin Curtin, DR Horton
Jeramey Harding, T&B Planning
John Klein, Hunsaker & Associates
Jennifer Bileck, PBS&J
File

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THE CITY OF SAN DIEGO

July 17, 2005

RECEIVED
AUG 05 2005

Mr. Todd Engstrand, PE
PBS&J Engineers
9275 Skypark Court, Suite 200
San Diego, CA 92123

Dear Mr. Engstrand:

Subject: Sewer Study, Candlelight Development (WO 422966)

We have reviewed the subject sewer study dated July 13, 2005 which was received July 13, 2005 by our offices. Our comments are as follows:

1. According to the Plumbing Code a minimum design slope for the sewer system is 1%. Please redesign the proposed private reaches that do not comply with the above criteria.
2. Please modify the sewer exhibit to show all wet utilities, with dimensions and directions of flow.
3. On the sewer exhibit, please show the location of the proposed sewer laterals.
4. Please eliminate the parallel sewer and provide a separate lateral from each lot to the proposed main.
5. Maintain 10' edge to edge separation between the sewer main and other wet utilities. The State of California Health Department has informed us that they will not give waivers for new construction.
6. The future 200 EDU'S from Sudik Property will be discharged to the proposed MH#20. According to the Sewer Design Guide criteria the proposed sewer main between MH#20 and MH# 16, and also between MH# 16 all the way to the Private Pump Station should be public. Please redesign the street to provide a minimum 28' width.
7. Please provide a proposal to identify and pay for your fare share of the future public Pump Station. Additionally, you will need to enter into a private agreement with the Sudik Development if their flows will discharge to the private pump station until such time as the public pump station is built.

<u>At time of plan check:</u>

8. Provide an Encroachment Maintenance and Removal Agreement for and prior to proposed improvements of any kind, including landscaping , enriched paving, retaining

hardscape (curbs, sidewalks, medians, retaining walls, etc.) and electrical conduits to be installed in or over easements.

9. No trees or shrubs exceeding 3' in height at maturity will be installed within 10' of any public sewer facilities.

Please address and incorporate the above items and revise the sewer study. Resubmit <u>three</u> bound copies, **signed and stamped** by a California Licensed Civil Engineer, for our subsequent review.

If you have any questions or require any additional information please call me at 619-533-5106 or Assistant Engineer Irina Itkin at 619-533-4248.

Sincerely,

Barbara A.B. Sal

BARBARA A.B. SALVINI
Senior Civil Engineer

IXI

cc: Chris Toth, Deputy Director, Metropolitan Wastewater Department
Ann Sasaki, Deputy Director, Metropolitan Wastewater Department
Isam Hireish, Senior Civil Engineer, Metropolitan Wastewater Department
Hushmand Yazdani, Associate Engineer-Civil, Metropolitan Wastewater Department
Ken Wiate, Acting Associate Engineer-Civil, Metropolitan Wastewater Department
Janet Buttmann, Assistant Engineer-Civil, Metropolitan Wastewater Department

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Appendix D
Calculations

THE CITY OF SAN DIEGO

August 2, 2006

Mr. Todd D. Engstrand
PBS&J
9275 Sky Court, Suite 200
San Diego, CA 921123

AUG 0 8 2006

Dear Mr. Engstrand:

Subject: Calculations for the Proposed Private Candlelight Pump Station, and for the Phase 2C Public Sewer Pump Station (Bachmann Property).

The provided calcucations are accepted by the Development Section of the Metropolitan Wastewater Department with the following conditions:

Please include as part of the Candlelight project construction of 2 sets of force mains in Caliente Road:
First set - 6" force mains, Bachmann Property pump station.
Second set - 12" force mains Mesa South East pump station.

Your detailed documentation was very complete and professionally prepared, and that is very appreciated with the condensed schedule we are all working under.

We look forward to working with you all in partnership to see this plan to completion. If you have any questions or require any additional information please call me at 619-533-5106.

Sincerely,

Barbara A. B. Sal

BARBARA A.B. SALVINI
Senior Civil Engineer

BES/ixi

cc: Chris Toth, Deputy Director, Metropolitan Wastewater Department
Robert Ferrier, Assistant Director, Metropolitan Wastewater Department
Ann Sasaki, Deputy Director, Metropolitan Wastewater Department
Isam Hireish, Senior Civil Engineer, Metropolitan Wastewater Department
Hushmand Yazdani, Associate Engineer-Civil, Metropolitan Wastewater Department
Mehdi Rastakhiz, Associate Engineer-Civil, Metropolitan Wastewater Department
Janet Buttmann, Assistant Engineer-Civil, Metropolitan Wastewater Department
Todd Engstrand, PBS&J, 9275 Sky Park Court, Suite 200, San Diego, CA 92123
James Strayer, PBS&J
Mark Elliott, PBSJ
D.R. Horton, 1010 S, Coast Hwy, 101 Suite 101, Encinitas, CA 92024

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Client Name: DR Horton – San Diego Division
Agency Name: City of San Diego - MWWD
Project Name: Candlelight Sewer Pump Station
Calculation Title: Maximum Retention Time within Force Main
PBS&J Project/ File Number: 491096.03

Prepared By:

PBSJ

9275 Sky Park Court, Suite 200
San Diego, CA 92123
Ph. 858.514.1000

REGISTERED PROFESSIONAL ENGINEER
TODD D. ENGSTRAND
C 62867
EXP. 6·30·08
CIVIL
STATE OF CALIFORNIA

Calculated By: Michael Hindle, E.I.T. Date: 07/24/06
Checked By: Todd Engstrand, P.E. Date: 07/24/06
Project Manager: Todd Engstrand, P.E.

Signature:

PBSJ

Calculated by: Michael Hindle
Checked by: Todd Engstrand
Date: 7/24/2006

Proposed Candlelight Private Sewer Pump Station
Maximum Retention Time within Force Main
(WITHOUT sewer flow contribution from Southview Development)

PURPOSE

Determine the maximum retention time within the 4-inch force main for the proposed private Candlelight Sewer Pump Station.

ABBREVIATIONS

FP WWOV - first pump call wet well operating volume
gpd - gallons per day
gpm - gallons per minute
min - minute
MRT - maximum retention time
mgd - million gallons per day
P - cycle period
PRT - minimum pump run time
Q_{min} - minimum flow
V_F - force main volume

CRITERIA

Design Pump Rate (Q_D) =	229 gpm	See Design Pump Rate Calculation dated 7/24/2006
Average Daily Flow (ADF) =	104,400 gpd	Candlelight East Villas Sewer Study Table 1 - Attached
Minimum Pump Run Time (PRT) =	5 min	San Diego Sewer Design Guide 2004 Section 7.2.8.2 - Attached
Minimum Flow Factor (MFF) =	0.2	San Diego Sewer Design Guide 2004 Table 7.2-2 - Attached
Length of Force main (L) =	1,700.0 feet	Candlelight East Villas Sewer Study Figure 3 - Attached
Diameter of Force main (D) =	4.22 inches	See Attached Manufacturer's Data Sheet
Maximum Force Main Retention Time (MRT) =	4.00 hours	Per City Senior Civil Engineer

PROCEDURE

1. Calculate the Force main Volume (V_F) for the 4-inch Diameter Pipe - see Equation 1
2. Calculate the Minimum Flow (Q_{Min}) - see Equation 2
3. Calculate the First Pump Call Wet Well Operating Volume (FPWWOV) - see Equation 3
4. Calculate the number of cycles (N) - see Equation 4
5. Calculate the Wet Well Filling Time (FT) - see Equation 5
6. Calculate the Cycle Period (P) - see Equation 6
7. Calculate the Maximum retention Time (MRT) - see Equation 7

EQUATIONS

1. $V_F = L \times (\pi/4) \times D_F{}^{\wedge 2}$ - see Calculation 1
2. Q_{Min} = ADF x MFF - see Calculation 2
3. FPWWOV = (Q_d - $Q_{min\ in}$) x 5 - See Calculation 3
4. N = V_F / (Q_D x PRT) - see Calculation 4
5. FT = FPWWOV / Q_{Min} - see Calculation 5
6. P = FT + PRT - see Calculation 6
7. MRT = N x P - see Calculation 7

CALCULATIONS

1. V_F = 1,700 ft x (π/4) x (4.22"/12"/ft)$^{\wedge 2}$ x (7.48 gallons/cuft) = 1,235 gallons
2. Q_{Min} = 104,400 gpd x 0.2 / 1440 min/day = 14.5 gpm
3. FPWWOV = (229 gpm - 14.5 gpm) x 5 = 1,073 gallons
4. N = 1,235 gal / (229 gpm x 5 min) = 1.08
5. FT = 1,073 gal / 14.5 gpm = 74.0 minutes
6. P = 74 min + 5 min = 79.0 minutes
7. MRT = 1.08 x 79 min / 60min/hour = 1.42 hours < 4 hrs - Okay

PBSJ

Calculated by: Michael Hindle
Checked by: Todd Engstrand
Date: 7/24/2006

Proposed Candlelight Private Sewer Pump Station
Maximum Retention Time within Force Main
(WITH sewer flow contribution from Southview Development)

PURPOSE

Determine the maximum retention time within the 4-inch force main for the proposed private Candlelight Sewer Pump Station.

ABBREVIATIONS

FP WWOV - first pump call wet well operating volume
gpd - gallons per day
gpm - gallons per minute
min - minute
MRT - maximum retention time

mgd - million gallons per day
P - cycle period
PRT - minimum pump run time
Q_{min} - minimum flow
V_F - force main volume

CRITERIA

Design Pump Rate (Q_D) =	334	gpm	See Design Pump Rate Calculation dated 7/24/2006
Average Daily Flow (ADF) =	152,400	gpd	See Design Pump Rate Calculation dated 7/24/2006
Minimum Pump Run Time (PRT) =	5	min	San Diego Sewer Design Guide 2004 Section 7.2.8.2 - Attached
Minimum Flow Factor (MFF) =	0.2		San Diego Sewer Design Guide 2004 Table 7.2-2 - Attached
Length of Force main (L) =	1,700.0	feet	Candlelight East Villas Sewer Study Figure 3 - Attached
Diameter of Force main (D) =	4.22	inches	See Attached Manufacturer's Data Sheet
Maximum Force Main Retention Time (MRT) =	4.00	hours	Per City Senior Civil Engineer

PROCEDURE

1. Calculate the Force main Volume (V_F) for the 4-inch Diameter Pipe - see Equation 1
2. Calculate the Minimum Flow (Q_{Min}) - see Equation 2
3. Calculate the First Pump Call Wet Well Operating Volume (FPWWOV) - see Equation 3
4. Calculate the number of cycles (N) - see Equation 4
5. Calculate the Wet Well Filling Time (FT) - see Equation 5
6. Calculate the Cycle Period (P) - see Equation 6
7. Calculate the Maximum retention Time (MRT) - see Equation 7

EQUATIONS

1. $V_F = L \times (\pi/4) \times D_F{}^{\wedge 2}$ - see Calculation 1
2. Q_{Min} = ADF x MFF - see Calculation 2
3. FPWWOV = (Q_d - $Q_{min\ in}$) x 5 - See Calculation 3
4. N = V_F / (Q_D x PRT) - see Calculation 4
5. FT = FPWWOV / Q_{Min} - see Calculation 5
6. P = FT + PRT - see Calculation 6
7. MRT = N x P - see Calculation 7

CALCULATIONS

1. V_F = 1,700 ft x (π/4) x (4.22"/12"/ft)^2 x (7.48 gallons/cuft) =	1,235 gallons	
2. Q_{Min} = 152,400 gpd x 0.2 / 1440 min/day =	21.2 gpm	
3. FPWWOV = (334 gpm - 21.2 gpm) x 5 =	1,564 gallons	
4. N = 1,235 gal / (334 gpm x 5 min) =	0.74	
5. FT = 1,073 gal / 21.2 gpm =	73.8 minutes	
6. P = 73.8 min + 5 min =	78.8 minutes	
7. MRT = 1.08 x 78.8 min / 60min/hour =	0.97 hours	< 4 hrs - Okay

conditions through peak wet weather inflow conditions. The total wet well operating volume is the volume between the first pump on start level in the wet well to the all pumps on start level. For periods of very low inflow, the volume to be pumped by the first pump call shall be as small as possible to allow regular pumping down of the wet well volume to prevent septic action from taking place. However, the wet well must be large enough to provide at least 5 minutes pump running time at minimum flow to prevent overheating of the electric motor and controls (refer to minimum operating volume calculation in Section 7.2.6.5).

Where variable speed pumps are installed (i.e. to provide the required variation in pumping rate for minimum inflow through peak wet weather inflow conditions), the pump(s) start/stop call levels in the wet well shall be configured to satisfy the above requirements over the entire range of design pumping rates and pump sequencing.

7.2.6.4 **Minimum Inflow Calculation:** In the sizing of a pump station wet well, determination of minimum flow is also important to control cycling of constant speed pumps. Wet well should be large enough to provide at least 5 minutes of pump running time to prevent overheating of the motor, but not too large in order to prevent septic conditions in the wet well. Table 7.-2 shall be used to determine minimum flow (note: typically 20 to 30% of the average daily flow dependent on population and flow (Source: WPCF Manual of Practice No. 9). No reference to Table 7.2-2

TABLE 7.2-2

RATIO OF MINIMUM TO AVERAGE FLOW

Average Flow, mgd	Min. Flow Factor
Less than 1	0.2
2	0.24
3	0.26
4	0.27
5	0.28
7	0.30
10	0.32

7.2.6.5.1 **First Pump Call Level in the Wet Well Operating Volume:** The minimum wet well operating volume (i.e. first pump call operating volume based on start and stop levels) shall be equal to the following (refer Section 1.3.2.2):

First Pump Call Wet Well Operating Volume = [(Pump Station Design Capacity) – ($Q_{\text{Minimum Inflow}}$)] x 5 Minutes

Where:

$Q_{\text{Minimum Inflow}}$ = (Average Dry Weather Flow) x (Minimum Flow Factor, Table 1.7-1)

7.2.6.6 **Wet Well Operating and Alarm Levels:** The wet well low and high operating water levels and alarm levels shall be indicated on the design drawings. The pump automatic shut-off level shall be located above the pump volute level to ensure sufficient net positive suction head per Section 7.2.3.6. Minimum submergence of the pump suction bells (this defines the low flow level) shall be not less than that determined in accordance with Section 9.8.7 of the *Hydraulic Institute Pump Intake Design Standard*. The automatic low level shut-off feature shall be inoperable during cleaning cycles of self-cleaning trench type wet wells.

7.2.6.7 **Emergency Storage Volume:** Separate from the wet well operating volume, the DESIGN ENGINEER shall provide an emergency storage volume sufficient to accommodate a storage of two-hour pumping volume at peak wet weather flow. The total pump station sewage storage volume (i.e., volume of the wet well above the pump "off" level to the lowest sewage spill point) can be accomplished by the following measures singly or in combination, and listed in order of preference: additional storage in the wet well above the operating volume, separate overflow tank and storage in the inlet line to the spill level.

This "emergency repair holding time" will allow operating personnel at least two (2) hours to respond to a station failure alarm and/or to shut off all pumps to perform emergency repairs to correct a failure condition. In addition, this storage is also available to be utilized for flow equalization during large storm events should peak wet weather inflow exceed the pump station design capacity.

7.2.6.8 **Influent Line Storage:** The wet well influent sewer shall not be designed to accommodate storage except as required for "emergency repair holding time" as described in Section 7.2.6.7 (note: this causes grease buildup problems in the inlet line). This storage shall be utilized where it is not practical to provide two-hour emergency storage in the wet well and/or separate overflow storage tank.

7.2.6.9 **Spill Location Indication:** Influent sewer and pump station spill locations shall be indicated on the design drawings (lowest upstream elevation or wet well cover elevation where backup spill will occur). Mean sea level (MSL) elevation shall be included for information for spill location.

7.2.7 A SIX-HOUR EMERGENCY STORAGE (SPECIAL STATION REQUIREMENT)

7.2.7.1 **Closed Tanks:** In areas where maximum protection from spillage must be provided, such as areas where a station sewage spill would flow into a water supply reservoir or other sensitive areas as determined by the Senior Civil Engineer, a six-hour emergency overflow storage (at peak wet weather inflow rate) shall be provided. This storage requirement is in addition to the wet well operational storage. The emergency storage can be an underground structure or a separate tank that is normally empty but can drain by gravity back into the wet well.

Similar to section 7.2.6.7 above, this storage is also available to be utilized for flow equalization during large storm events should peak wet weather inflows exceed the pump station design capacity.

7.2.7.2 **Ponds:** In isolated areas, an open-air basin or a pond may be provided as an emergency storage in lieu of underground concrete structure; however, the basin shall be lined with an impermeable flexible barrier protected by a layer of concrete. Provision shall be made for draining the emergency storage basin back into the wet well.

7.2.8 FORCE MAIN

7.2.8.1 **Capacity of Discharge Sewer:** During pump station design, the DESIGN ENGINEER shall verify that there is sufficient capacity to handle the increased sewer flow in the gravity sewer into which the force main discharges. This calculation shall route the design discharge of the facility through the discharge sewers to the point at which the pump station component is reduced to 10% of the total flow (refer to Chapter 1, Subsection 1.7.2 for additional information)

7.2.8.2 **Force Main Retention Time:** The following calculations shall be used to determine maximum retention time within the force main. This information shall be utilized with other hydraulic factors (i.e. maximum wet well detention time, downstream gravity sewer discharge conditions) to determine if chemical addition for odor control is required.

Force Main Volume = Length x Area

Minimum Pump Run Time (PRT) = 5 Minutes = (First Pump Call Wet Well Operating Volume)/[(Pump Station Design Capacity) – ($Q_{\text{minimum inflow}}$)]

Number of Cycles = Force Main Volume/[(Pump Station Design Capacity) x PRT]

Maximum Wet Well Filling Time = (First Pump Call Wet Well Volume)/($Q_{\text{minimum inflow}}$)

1 Cycle Period = Maximum Wet Well Filling Time + PRT

Maximum Retention Time = (Number of Cycles) x (1 Cycle Period)

D·R·HORTON
America's Builder
WESTERN PACIFIC SERIES

Client Name: DR Horton – San Diego Division

Agency Name: City of San Diego - MWWD

Project Name: Phase 2C Public Sewer Pump Station (Bachmann Property)

Calculation Title: Maximum Retention Time within Force Main

PBS&J Project/ File Number: 491096.03

Prepared By:

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EXP. 6-30-08
CIVIL

Calculated By: Michael Hindle, E.I.T. Date: 07/24/06

Checked By: Todd Engstrand, P.E. Date: 07/24/06

Project Manager: Todd Engstrand, P.E.

Signature:

PBSJ

Calculated by: mh
Checked by: te
Date: 7/24/2006

Proposed OMTS Phase 2C Public Sewer Pump Station (Bachmann Property)
Maximum Retention Time within Force main Calculation

PURPOSE

Determine the maximum retention time within the proposed 6-inch dual force mains for the Proposed OMTS Phase 2C Public Sewer Pump Station.

ABBREVIATIONS

gpd - gallons per day
mgd - million gallons per day
gpm - gallons per minute
min - minute

CRITERIA

Design Pump Rate (Q_D) =	482.00 gpm	Taken from Design Pump Rate Calculation
Average Daily Flow (ADF) =	156,480 gpd	Taken from Design Pump Rate Calculation
Peak Dry Weather Inflow (PDWF) =	356,148 gpd	Taken from Design Pump Rate Calculation
Minimum Pump Run Time (PRT) =	5 min	San Diego Sewer Design Guide 2004 Section 7.2.8.2 - Attached
Minimum Flow Factor (MFF) =	0.2	San Diego Sewer Design Guide 2004 Section 7.2.8.2 - Attached
Length of Force main (L) =	3,000.0 feet	Taken from schematic layout
Diameter of Force main (D) =	6 inches	Taken from Force Main Sizing Calculation
Maximum Retention Time within Force Main (MRT) =	4 hours	Per City Senior Civil Engineer

PROCEDURE

1. Calculate the Force main Volume (V_F) for the 6-inch Diameter Pipe - see Equation 1
2. Calculate the Minimum Flow (Q_{Min}) - see Equation 2
3. Calculate the First Pump Call Wet Well Operating Volume (FPWWOV) - see Equation 3
4. Calculate the number of cycles (N) - see Equation 4
5. Calculate the Wet Well Filling Time (FT) - see Equation 5
6. Calculate the Cycle Period (P) - see Equation 6
7. Calculate the Maximum retention Time (MRT) - see Equation 7

EQUATIONS

1. $V_F = L \text{ x } (\pi/4) \text{ x } D_F{}^{\wedge 2}$ - see Calculation 1
2. Q_{Min} = ADF x MFF - see Calculation 2
3. FPWWOV = (Q_d - $Q_{min\ m}$) x 5 - See Calculation 3
4. N = V_F / (Q_D x PRT) - see Calculation 4
5. FT = FPWWOV / Q_{Min} - see Calculation 5
6. P = FT + PRT - see Calculation 6
7. MRT = N x P - see Calculation 7

CALCULATIONS

1. V_F = 3,000 ft x (π/4) x (6"/12"/ft)$^{\wedge 2}$ x (7.48 gallons/cuft) =	4,406 gallons	
2. Q_{Min} = 156,480 gpd x 0.2 / 1440 min/day =	21.7 gpm	
3. FPWWOV = (482 gpm - 21.7 gpm) x 5 =	2,302 gallons	
4. N = 4,406 gal / (482 gpm x 5 min) =	1.83	
5. FT = 2,302 gal / 21.7 gpm =	106.1 minutes	
6. P = 106.1 min + 5 min =	111.1 minutes	
7. MRT = 1.83 x111.1 min / 60min/hour =	3.38 hours	< 4 hrs - Okay

conditions through peak wet weather inflow conditions. The total wet well operating volume is the volume between the first pump on start level in the wet well to the all pumps on start level. For periods of very low inflow, the volume to be pumped by the first pump call shall be as small as possible to allow regular pumping down of the wet well volume to prevent septic action from taking place. However, the wet well must be large enough to provide at least 5 minutes pump running time at minimum flow to prevent overheating of the electric motor and controls (refer to minimum operating volume calculation in Section 7.2.6.5).

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RATIO OF MINIMUM TO AVERAGE FLOW

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Less than 1	0.2
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5	0.28
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10	0.32

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First Pump Call Wet Well Operating Volume = [(Pump Station Design Capacity) – ($Q_{Minimum\ Inflow}$)] x 5 Minutes

Where:

$Q_{Minimum\ Inflow}$ = (Average Dry Weather Flow) x (Minimum Flow Factor, Table 1.7-1)

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7.2.7 A SIX-HOUR EMERGENCY STORAGE (SPECIAL STATION REQUIREMENT)

7.2.7.1 **Closed Tanks:** In areas where maximum protection from spillage must be provided, such as areas where a station sewage spill would flow into a water supply reservoir or other sensitive areas as determined by the Senior Civil Engineer, a six-hour emergency overflow storage (at peak wet weather inflow rate) shall be provided. This storage requirement is in addition to the wet well operational storage. The emergency storage can be an underground structure or a separate tank that is normally empty but can drain by gravity back into the wet well.

Similar to section 7.2.6.7 above, this storage is also available to be utilized for flow equalization during large storm events should peak wet weather inflows exceed the pump station design capacity.

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7.2.8.1 **Capacity of Discharge Sewer:** During pump station design, the DESIGN ENGINEER shall verify that there is sufficient capacity to handle the increased sewer flow in the gravity sewer into which the force main discharges. This calculation shall route the design discharge of the facility through the discharge sewers to the point at which the pump station component is reduced to 10% of the total flow (refer to Chapter 1, Subsection 1.7.2 for additional information)

7.2.8.2 **Force Main Retention Time:** The following calculations shall be used to determine maximum retention time within the force main. This information shall be utilized with other hydraulic factors (i.e. maximum wet well detention time, downstream gravity sewer discharge conditions) to determine if chemical addition for odor control is required.

Force Main Volume = Length x Area

Minimum Pump Run Time (PRT) = 5 Minutes = (First Pump Call Wet Well Operating Volume)/[(Pump Station Design Capacity) – ($Q_{\text{minimum inflow}}$)]

Number of Cycles = Force Main Volume/[(Pump Station Design Capacity) x PRT]

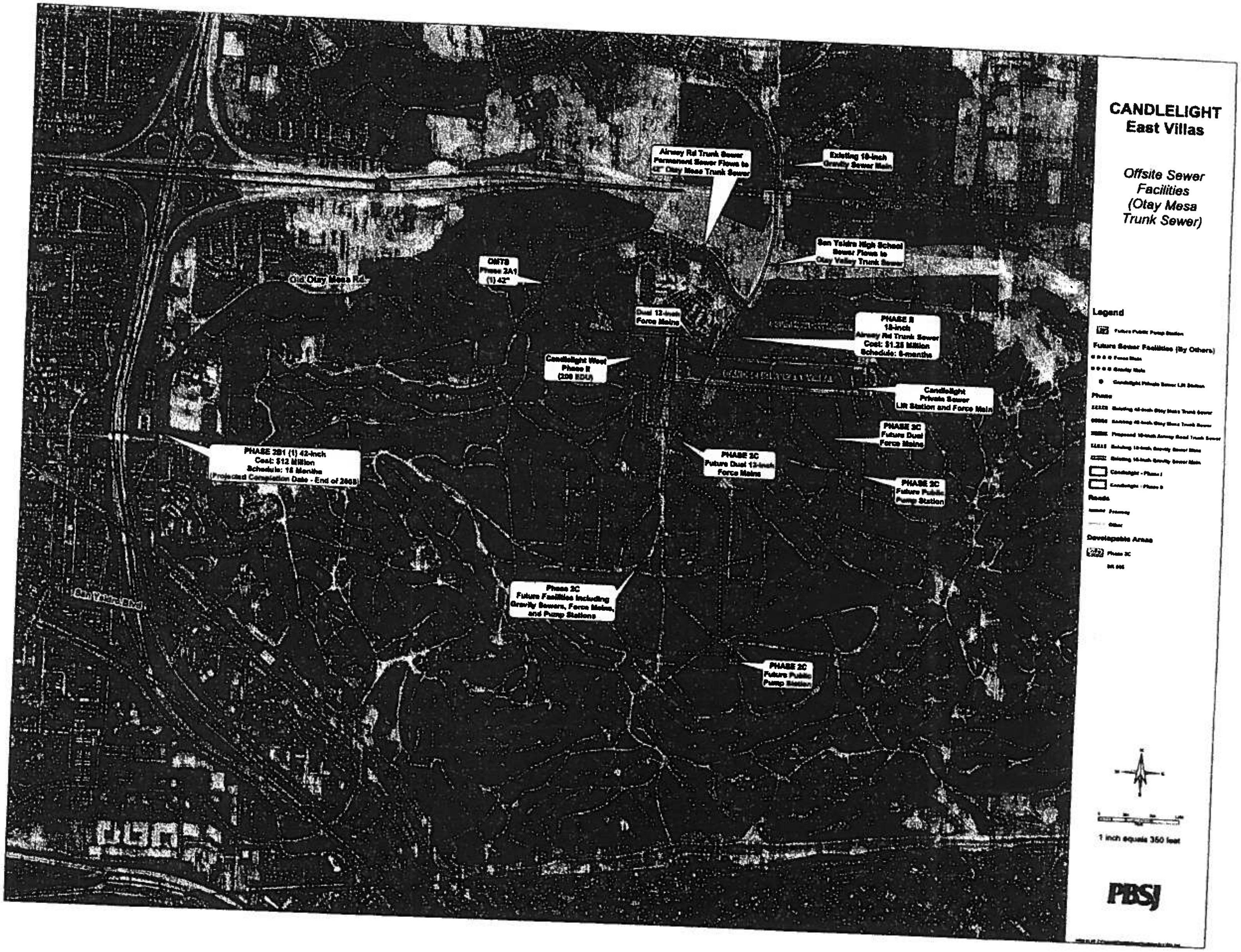
Maximum Wet Well Filling Time = (First Pump Call Wet Well Volume)/($Q_{\text{minimum inflow}}$)

1 Cycle Period = Maximum Wet Well Filling Time + PRT

Maximum Retention Time = (Number of Cycles) x (1 Cycle Period)

CANDLELIGHT
East Villas

Offsite Sewer Facilities (Otay Mesa Trunk Sewer)



Appendix K

Acoustical Report

HELIX Environmental Planning, November 2012

Candlelight Properties, LLC

Acoustical Report

November 15, 2012

Prepared for:
Mr. Walter Schwerin
Schwerin & Associates
814 Morena Blvd., Suite 101
San Diego, CA 92110

Prepared by:
HELIX Environmental Planning, Inc.
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La Mesa, CA 91942

ACOUSTICAL REPORT

Candlelight Properties, LLC

Prepared For

Mr. Walter Schwerin
Schwerin & Associates
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San Diego, CA 92110

Prepared By

HELIX Environmental Planning, Inc.
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(619) 462-1515

Job No. WTS-05

November 15, 2012

Candlelight Properties, LLC
Acoustical Report

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GLOSSARY OF TERMS AND ACRONYMS

A-Weighted Sound Levels	Decibels (referenced to 20 micro-Pascals) as measured with an A-weighting network of standard sound level meter, abbreviated dB(A)
ANSI	American National Standards Institute
CADNA	Computer Aided Noise Abatement
City	City of San Diego
CNEL	Community Noise Equivalent Level: A 24-hour average, where sound levels during the evening hours of 7:00 p.m. to 10:00 p.m. have an added 5 dB weighting, and sound levels during the nighttime hours of 10:00 p.m. to 7 a.m. have an added 10 dB weighting
dB	Decibel
dBA	A-weighted sound pressure level
Daytime	The period from 7:00 a.m. to 10:00 p.m.
Evening	The period from 7:00 p.m. to 10:00 p.m.
HVAC	Heating, ventilating, and air conditioning
L_{EQ}	The equivalent sound level, or the continuous sound level, that represents the same sound energy as the varying sound levels, over a specified monitoring period
M1	Noise measurement location adjacent to Ingraham Street
mph	Miles per hour
Nighttime	Periods other than daytime (as defined above), including legal holidays
Noise	Any audible sound that has the potential to annoy or disturb humans, or to cause an adverse psychological or physiological effect in humans

GLOSSARY OF TERMS AND ACRONYMS (cont.)

Noise Level Measurements	Unless otherwise indicated, the use of A-weighted and "slow" response of instrument complying with at least Type 2 requirements of latest revision of American National Standard Institute (ANSI) S1.4. Specification for Sound Level Meters
Noise-sensitive Location	A location where particular sensitivities to noise exist, such as residential areas, institutions, hospitals, parks, or other environmentally sensitive areas
SANDAG	San Diego Regional Association of Governments
Sound Pressure Level (SPL)	The observable effect of acoustic energy radiation, quantifying sound level as perceivable by the receiver. When Sound Pressure is used to describe a noise source, the distance between source and receiver must be known in order to yield useful information about the power rating of the source.
Sound power level	A specialized analytical metric used to fully quantify the acoustic energy emitted by a source and is complete without accompanying information on the position of measurement relative to the source. It may be used to calculate the sound pressure level at any desired distance.
STC	Sound transmission control

EXECUTIVE SUMMARY

The Proposed Project, named "Candlelight Properties, LLC," entails the construction of a multi-family residential development with approximately 475 multi-family dwelling units. The proposed Project includes three club houses, as well as small private decks for the residences. The Project site consists of multiple undeveloped parcels located in the Otay Community of San Diego, beyond the southern extension of Caliente Avenue south of Otay Mesa Road. The site is zoned for multi-family residential (RM-2-5).

The only adjacent off-site sensitive receptor is San Ysidro High School located to the north of the site. The Princess Park in California Terraces residential development area is located approximately ¼ mile to the northwest, yet this is sufficiently far away to not be affected by potential noise associated with the project. Open space surrounds the site to the east, south and west; there is very little development in the area, and all land uses are at sufficiently large distances so as not to be disturbed by potential on-site noise sources. All proposed on-site housing units would be considered sensitive noise receptors as well.

The nearest airport to the Proposed Project site is Brown Field Municipal Airport, approximately 1.5 miles east of the Project site. Rodriguez Field (Tijuana) is located approximately 1.5 miles southeast of the site. State Route 905 is currently under construction north of the site. Neither this roadway nor Otay Mesa Road, to its north, is a significant source of noise at the project site. Specific project information used in this report was obtained from the Candlelight Villas East EIR (2006) which states: Caliente Avenue is proposed to be constructed as a Five-Lane Major roadway. The northbound portion of the road would be constructed to a Six-Lane Primary Arterial standard, while the southbound portion of the road would be constructed to a Four-Lane Major standard. The project proposes to design both roadway segments to a design speed of 45 mph, in lieu of the 55 mph design speed normally adhered to. These future roadways will provide access through the area to the manufacturing, warehousing, and San Ysidro border access areas. The future traffic volumes used in this planning assume a high level of truck trips on the roadways.

The worst construction noise impacts to off-site uses would occur during site grading. The site is semi-level and would not require extensive material excavation or fill. The loudest noise would occur when the site is excavated, backfilled, and compacted. This noise level would be below the City's construction noise ordinance limits for residentially zoned property of 75 dBA for a 12-hour average time period. Therefore, excavator or other equipment operation at an average distance of 50 or more feet for an 8-hour period would be in compliance with the City's property-line construction noise limits. It should be noted that the area of San Ysidro High School adjacent the Project site is a parking lot. The closest classrooms or offices are nearly 200 feet from the Project site and would have significantly lower impacts.

The HVAC systems would be mounted on the building rooftop surrounded with visual and acoustic screening walls. As specific planning data for the future HVAC systems is not available, professional judgment was used to identify potential impacts. Given the relatively low amount of noise produced by such units, the distances involved, and the acoustic screening walls, the noise impacts at the upper levels of the adjacent buildings are predicted to be below the 42.5 dBA property-line noise level impact threshold for nighttime noise.

No exterior usable space areas for the High School are located adjacent to the roadways. All exterior usable spaces are at distances greater than 250 feet from the roadways and in most cases the existing buildings are situated between the outdoor spaces and the roadways. There are no significant impacts to San Ysidro High School.

Roadway noise impacts to the project in the area along Caliente Avenue would exceed the allowed 65 CNEL maximum if any of this area is included in the future exterior use area planning.

If future design plans contain any of the following conditions, then the design would need to incorporate noise control to comply with the 65 CNEL requirements for any designated outdoor use space in the areas facing the roadways.

The future design plans may contain one of the following three conditions. Noise control planning can be included in the design plans as follows:

1. If the ground level grassy space between the buildings is required as part of the Project designated exterior use area, the noise can be controlled to less than 65 CNEL with a noise control fence along the outer edge of the area facing the roadway. This noise control fence would need to be a minimum of six feet above the level of the outdoor use area adjacent the fence. The fence would need returns along the north and south end or walkways entering from the street 10-feet in length.

2. If the ground level grassy space area does not require noise control but there are ground level decks adjacent the buildings facing the roadways, these ground level decks would require five and a half foot high noise control barriers around the deck space to control roadway noise impacts to less than 65 CNEL. This noise control would only be required if the grassy area does not include noise control.

3. If there are second level decks planed as part of the required outdoor usable space they would require noise control in the form of a four and one half foot high noise control barrier around the deck to control noise to less than 65 CNEL.

A Title 24 exterior-to-interior noise study will be required as part of the final building plan submittal. The Title 24 exterior to interior study is expected to be able to show compliance with the 45 CNEL interior usable space requirements with normal construction techniques.

1.0 INTRODUCTION

The Proposed Project, named "Candlelight Properties, LLC," entails the construction of a multi-family residential development with approximately 475 multi-family dwelling units (hereafter referred to as the "Project" or "Proposed Project") in the Otay area of the City of San Diego (City).

1.1 NOISE AND SOUND LEVEL DESCRIPTORS

All noise level or sound level values presented herein are expressed in terms of decibels (dB), with A-weighting (dBA) to approximate the hearing sensitivity of humans. Time-averaged noise levels are expressed by the symbol L_{EQ}, with a specified duration. The Community Noise Equivalent Level (CNEL) is a 24-hour average, where noise levels during the evening hours of 7:00 p.m. to 10:00 p.m. have an added 5 dB weighting, and sound levels during the nighttime hours of 10:00 p.m. to 7:00 a.m. have an added 10 dB weighting. This is similar to the Day-Night sound level (L_{DN}) which is a 24-hour average with an added 10 dB weighting on the same nighttime hours but no added weighting on the evening hours. Sound levels expressed in CNEL are always based on dBA. These metrics are used to express noise levels for both measurement and municipal regulations, for land use guidelines, and for enforcement of noise ordinances.

1.2 PROJECT LOCATION

The Project site consists of multiple parcels in the Otay community of San Diego, located beyond the southern extension of Caliente Avenue south of Otay Mesa Road. Please see Figures 1 and 2 for the regional location and an aerial photograph of the Project site, respectively.

The nearest airport to the Proposed Project site is Brown Field Municipal Airport, approximately 1.5 miles east of the Project site. Rodriguez Field (Tijuana) is located approximately 1.5 miles southeast of the site.

The site is zoned for multifamily development (RM-2-5).

1.3 PROJECT DESCRIPTION

The Proposed Project entails the Project site mass grading, installation of utilities, completion of access and onsite roads, and the phased construction of approximately 475 multi-family residential dwelling units. Conceptual architectural plans are attached as Appendix A.

1.4 SENSITIVE RECEPTORS

The only adjacent off-site sensitive receptor is San Ysidro High School north of the site. All proposed on-site housing units would be considered sensitive noise receptors as well.

1.5 APPLICABLE NOISE REGULATIONS AND STANDARDS

Applicable noise standards for the Proposed Project are codified in the following:

City of San Diego Municipal Code, Chapter 5, Article 9.5, Division 4, §59.5.0404 Construction Noise

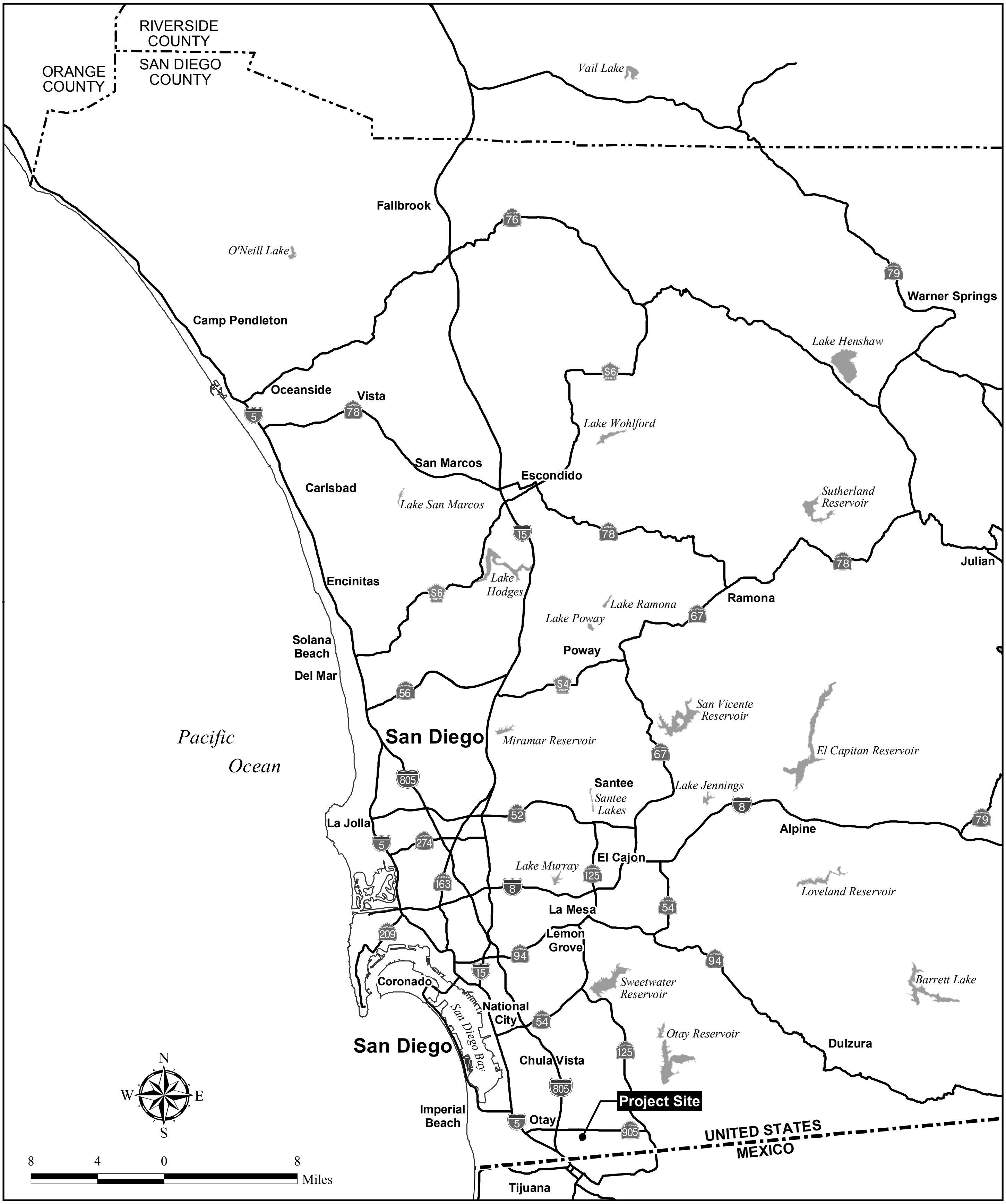
(a) It shall be unlawful for any person, between the hours of 7:00 p.m. of any day and 7:00 a.m. of the following day, or on legal holidays as specified in Section 21.04 of the San Diego Municipal Code, with exception of Columbus Day and Washington’s Birthday, or on Sundays, to erect, construct, demolish, excavate for, alter or repair any building or structure in such a manner as to create disturbing, excessive or offensive noise unless a permit has been applied for and granted beforehand by the Noise Abatement and Control Administrator. In granting such permit, the Administrator shall consider whether the construction noise in the vicinity of the proposed work site would be less objectionable at night than during the daytime because of different population densities or different neighboring activities; whether obstruction and interference with traffic particularly on streets of major importance, would be less objectionable at night than during the daytime; whether the type of work to be performed emits noises at such a low level as to not cause significant disturbances in the vicinity of the work site; the character and nature of the neighborhood of the proposed work site; whether great economic hardship would occur if the work were spread over a longer time; whether proposed night work is in the general public interest; and he shall prescribe such conditions, working times, types of construction equipment to be used, and permissible noise levels as he deems to be required in the public interest.

(b) Except as provided in subsection C. hereof, it shall be unlawful for any person, including the City of San Diego, to conduct any construction activity so as to cause, at or beyond the property lines of any property zoned residential, an average sound level greater than 75 decibels during the 12-hour period from 7:00 a.m. to 7:00 p.m.

(c) The provisions of subsection B. of this section shall not apply to construction equipment used in connection with emergency work, provided the Administrator is notified within 48 hours after commencement of work.

City of San Diego Municipal Code, Chapter 5, Article 9.5, Division 4, § 59.5.0401, Sound Level Limits

(a) It shall be unlawful for any person to cause noise by any means to the extent that the one-hour average sound level exceeds the applicable limit given in the following table (Table 1), at any location in the City of San Diego on or beyond the boundaries of the property on which the noise is produced. The noise subject to these limits is that part of the total noise at the specified location that is due solely to the action of said person.



I:\ArcGIS\W\WPH-15 Candlelight\Map\Noise\Fig1_Regional.mxd -RK

Regional Location Map

CANDLELIGHT

HELIX Environmental Planning

Figure 1

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Project Location Map

CANDLELIGHT

HELIX
Environmental Planning

Figure 2

Table 1
APPLICABLE NOISE LIMITS

Land Use Zone	Time of Day	One-hour Average Sound Level (dB)
Single Family Residential	7:00 a.m. to 7:00 p.m.	50
	7:00 p.m. to 10:00 p.m.	45
	10:00 p.m. to 7:00 a.m.	40
Multi-Family Residential (Up to a maximum density of 1/2000)	7:00 a.m. to 7:00 p.m.	55
	7:00 p.m. to 10:00 p.m.	50
	10:00 p.m. to 7:00 a.m.	45
All other Residential	7:00 a.m. to 7:00 p.m.	60
	7:00 p.m. to 10:00 p.m.	55
	10:00 p.m. to 7:00 a.m.	50
Commercial	7:00 a.m. to 7:00 p.m.	65
	7:00 p.m. to 10:00 p.m.	60
	10:00 p.m. to 7:00 a.m.	60
Industrial or Agricultural	anytime	75

Source: City of San Diego Municipal Code, Chapter 5, Article 9.5, Division 4, § 59.5.0401, Sound Level Limits

(b) The sound level limit at a location on a boundary between two zoning districts is the arithmetic mean of the respective limits for the two districts. Permissible construction noise level limits shall be governed by Section 59.5.0404 of this article.

(c) Fixed-location public utility distribution or transmission facilities located on or adjacent to a property line shall be subject to the noise level limits of Part (a) of this section, measured at or beyond six feet from the boundary of the easement upon which the equipment is located.

Development Services Department Significance Determination Thresholds (January 2011 Revision)

1. Interior and Exterior Noise Impacts from Traffic Generated Noise provides the general thresholds of significance for uses affected by traffic noise.

Table 2
CITY OF SAN DIEGO TRAFFIC NOISE SIGNIFICANCE THRESHOLDS (CNEL)

Structure or Proposed Use that would be Impacted by Traffic Noise	Interior Space	Exterior Useable Space	General Indication of Potential Significance
Single-family detached	45 dB	65 dB	Structure or outdoor useable area is < 50 feet from the center of the closest (outside) lane on a street with existing or future ADTs > 7500
Multi-family, schools, libraries, hospitals, day care, hotels, motels, parks, convalescent homes.	Development Services Department (DSD) ensures 45 dB pursuant to Title 24	65 dB	
Offices, Churches, Business, Professional Uses	n/a	70 dB	Structure or outdoor usable area is < 50 feet from the center of the closest lane on a street with existing or future ADTs > 20,000
Commercial, Retail, Industrial, Outdoor Spectator Sports Uses	n/a	75 dB	Structure or outdoor usable area is < 50 feet from the center of the closest lane on a street with existing or future ADTs > 40,000

Source: Significance Determination Thresholds, Development Services Department, January 2011 Revision

2.0 ENVIRONMENTAL SETTING

2.1 SURROUNDING LAND USES

The Proposed Project site is currently undeveloped. San Ysidro High School is located immediately north of the site, and the Princess Park in California Terraces residential development area is located approximately ¼ mile to the northwest.

2.2 SURROUNDING ROADWAY DESCRIPTIONS

State Route 905 is currently under construction north of the site. Neither this roadway nor Otay Mesa Road, to its north, is a significant source of noise at the project site. Specific project information used in this report include was obtained from the *Candlelight Villas East EIR* (2006) which states: Caliente Avenue is proposed to be constructed as a Five-Lane Major roadway. The northbound portion of the road would be constructed to a Six-Lane Primary Arterial standard, while the southbound portion of the road would be constructed to a Four-Lane Major standard. The project proposes to design both roadway segments to a design speed of 45 mph, in lieu of the 55 mph design speed normally adhered to.

2.3 AIRPORT NOISE

The Proposed Project site is located outside all airport noise impact forecast zones; noise impacts from airports are not further considered in this report.

2.4 EXISTING NOISE ENVIRONMENT

The dominant noise sources in the vicinity of the Project site are associated with vehicle traffic on Caliente Avenue with some contribution from the nearby SR-905. Nearly all traffic on the section of Caliente Avenue that leads to the Proposed Project site is currently for San Ysidro High School, as this is the only existing use on this street.

2.5 FUTURE NOISE ENVIRONMENT

The surrounding area is predominately undeveloped. It is reasonable to assume that the area will experience significant increases in future noise levels due to planned future roadways and increased traffic volumes; this has been accounted for by using the planned roadway alignments through the Project and reasonably foreseeable locations near the Project with the future traffic volumes in the Project planning.

These future roadways will provide access through the area to the manufacturing, warehousing, and San Ysidro border access areas. The future traffic volumes used in this planning assume a high level of truck trips on the roadways.

3.0 STUDY METHODS, EQUIPMENT, AND PROCEDURES

This section discusses the methods and procedures followed for the noise study, including the selection of noise measurement and receiver locations, noise measurement procedures, and noise impact evaluation.

3.1 METHODOLOGY

A “one-hour” equivalent sound level measurement (L_{EQ}, A-Weighted) was recorded for one location near the Project site. During the on-site noise measurement, start and end times were recorded, vehicle counts were made for cars, medium trucks (double-tires/two axles), and heavy trucks (three or more axles) for the corresponding road segment(s).

The measurement time was long enough for a representative traffic volume to occur and the noise level (L_{EQ}) to stabilize; 15 minutes is usually sufficient for this purpose. The vehicle counts were then converted to one-hour equivalent volumes by applying an appropriate factor. Other field data gathered includes measuring or estimating distances.

3.2 EQUIPMENT

The following equipment was used to measure existing noise levels at the Project site:

- Larson Davis System LxT Integrating Sound Level Meter
- Larson Davis Model CA250 Calibrator
- Windscreen and tripod for the sound level meter
- Digital camera

The sound level meter was field-calibrated immediately prior to the noise measurements to ensure accuracy. All sound level measurements conducted and presented in this report were made with a sound level meter that conforms to the American National Standards Institute specifications for sound level meters (ANSI SI.4-1983 R2001). All instruments were maintained with National Bureau of Standards traceable calibration per the manufacturers' standards.

3.3 NOISE MODELING SOFTWARE

Modeling of the outdoor noise environment for this report was accomplished using two computer noise models: Computer Aided Noise Abatement version 3.6 (CADNA) and Traffic Noise Model (TNM) version 2.5. CADNA is a model-based computer program developed by *DataKustik* for predicting noise impacts in a wide variety of conditions. CADNA assists in the calculation, presentation, assessment, and mitigation of noise exposure. It allows for the input of project-related information, such as noise source data, barriers, structures, and topography to create a detailed CADNA model, and uses the most up-to-date calculation standards to predict outdoor noise impacts. CADNA traffic noise prediction is based on the data and methodology used in TNM. The TNM was released in February 2004 by the U.S. Department of Transportation. TNM calculates the daytime average Hourly Noise Level (HNL) from three-dimensional model inputs and traffic data. The TNM used in this analysis was developed from Computer Aided Design (CAD) plans provided by the Project applicant. Input variables included road alignment, elevation, lane configuration, area topography, existing and planned noise control features, projected traffic volumes, estimated truck composition percentages, and vehicle speeds.

The model-calculated one-hour L_{EQ} noise output, with the use of 8 to 10 percent of the average daily traffic occurring during a peak hour, is the equivalent of the CNEL (Caltrans Technical Noise Supplement Nov, 2009). Six to eight percent of the traffic may be converted to CNEL by adding two to the one-hour L_{EQ}.

3.4 SUMMARY OF SITE-SPECIFIC FEATURES INCLUDED IN CADNA MODEL

The CADNA and TNM computer noise models include the existing site topography, existing nearby buildings, and proposed on-site structures. The models take into consideration the fact that some of the structures provide noise shielding to other areas of the Project site[1]. Please refer to Appendix A for locations of on-site structures.

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[1] With the exception of the buildout traffic noise contour model.

4.0 EXISTING NOISE ENVIRONMENT

As described in Section 2.4, the dominant noise sources at the Project site are traffic on the adjacent Caliente Avenue. All traffic on the section of Caliente Avenue that leads to the Proposed Project site is currently for San Ysidro High School, as this is the only existing use on this street. An on-site inspection and "one-hour" equivalent traffic noise measurements was taken adjacent Caliente Ave north of the site on Monday, October 15, 2012 (location M1 on Figure 2). The microphone was placed at approximately five feet above the existing Project site grade.

4.1 SITE NOISE MEASUREMENTS AND COMPARISON CALCULATIONS

Traffic volumes for Caliente Avenue, near San Ysidro High School, were recorded for automobiles, medium-size trucks, and heavy trucks during the measurement period. After a continuous 15-minute sound level measurement, minimal changes in the L_{EQ} were detectable and results were recorded. The measured noise level and related weather conditions are shown in Table 3. The traffic counts for the 15-minute measurements and the one-hour equivalent volumes are shown in Table 4.

Table 3
ON-SITE NOISE MEASUREMENT CONDITIONS AND RESULTS

Date	October 15, 2012
Time	11:15 p.m. – 11:30 p.m.
Conditions	Clear skies, no measurable wind, temperature in the high 80s with normal humidity
Measured Noise Level	
Caliente Avenue - Near School	58.9 dBA L_{EQ}
Caliente Avenue - Near SR-905	61.6 dBA L_{EQ}
Caliente Avenue - Near Proposed project	45.5 dBA L_{EQ}

Table 4
TRAFFIC COUNTS

Roadway	Traffic	Autos	MT[1]	HT[2]
Caliente Avenue - Near School	15-minute Count	55	2	1
	One-hour Equivalent	220	8	4

[1] Medium Trucks (double-tires/two axles)
[2] Heavy Trucks (three or more axles)

4.2 CALCULATED NOISE LEVEL

Estimated and measured noise levels along Caliente Avenue are shown in Table 5. The difference between the two levels is also illustrated in Table 5. A difference of less than two dBA is considered sufficiently accurate without an adjustment to the CADNA model. No correction is applied for this model.

Table 5
CALCULATED VERSUS MEASURED TRAFFIC NOISE DATA

Receiver Position	Calculated	Measured	Difference	Correction Factor
Caliente Avenue	60.2 dBA L_{EQ}	58.9 dBA L_{EQ}	1.3 dBA L_{EQ}	none needed

5.0 IMPACTS

5.1 SIGNIFICANCE THRESHOLDS

The City of San Diego Zoning Code includes property-line noise limits and the General Plan includes noise standards for proposed land uses. The following applicable standards are used to establish significance thresholds for this analysis.

Construction Noise Impact Significance Thresholds

Construction noise impacts would be significant, if the Project would:

- Result in temporary construction noise that exceeds noise levels identified in the City's Municipal Code 59.0404, including result in temporary construction noise level that exceeds an average sound level greater than 75 dBA L_{EQ} at a sensitive receptor during the 12-hour period from 7:00 a.m. to 7:00 p.m. No impacts are assessed during the 12-hour period from 7:00 p.m. to 7:00 a.m. because non-emergency construction is not allowed during this time period.

Operational Noise Impact Significance Thresholds

Stationary Sources

Operational noise impacts are typically associated with two aspects of a proposed project. First, noise generated by activities associated with a proposed project could adversely impact surrounding land uses. In this scenario, the project would function as a "noise generator." Second, noise from surrounding land uses could adversely affect occupants of a proposed project. The most common example is traffic noise from surrounding roadways. In this scenario, the project would function as a "noise receptor." Noise generated by a proposed project would be significant, if the project would generate noise that would result in noise levels at a common property line with a single-family residential use that would exceed the following levels: 52.5/47.5/42.5 dBA (7:00 a.m. to 7:00 p.m./7:00 p.m. to 10:00 p.m./10:00 p.m. to 7:00 a.m.).

Transportation Noise

The City's Significance Determination Thresholds (2011) contain specific traffic noise significance thresholds that are based on the City of San Diego Progress Guide and General Plan, which has been superseded by the currently adopted 2008 General Plan. Specifically, the Land Use Compatibility Chart (Table K-4) has been updated in the Noise Element of the 2008 General Plan, and the Transportation Element of the 2008 General Plan does not include the traffic noise thresholds contained in Table K-2 of the City's Significance Determination Thresholds (2011). Traffic noise significance thresholds used in this report are based on a combination of Table K-2 (from the City's Significance Determination Thresholds) and the Land Use – Noise Compatibility Guidelines in the Noise Element of the 2008 General Plan. Where differences occur between Table K-2 and the Land Use – Noise Compatibility Guidelines, the more restrictive guideline is applied.

Traffic noise impacts may be significant if the Project would:

- Expose single-family or multi-family housing, schools, and parks to exterior traffic noise levels that exceed 65 dBA CNEL at exterior usable areas and interior traffic noise levels that exceed 45 dBA CNEL at habitable areas; and/or

- Increase noise levels by at least 3 dBA where noise levels currently exceed the traffic noise thresholds.

5.2 CONSTRUCTION NOISE IMPACTS

Construction Noise Analysis Assumptions

Project construction would entail the use of equipment throughout the site for the full term of construction. Construction activities would be roughly divided into eight phases, which could contain some overlap depending on location and timing. The phases would include the following:

1. Grading
2. Foundation excavation
2. Foundation pour
4. Utilities excavation
5. Building construction

Potential Noise Impact

The worst noise impacts to off-site uses would occur during site grading. The site is semi-level and would not require extensive material excavation or fill. The loudest noise would occur when the site is excavated, backfilled, and compacted.

The Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) Version 1.0 (February 2, 2006) lists the maximum noise level of an excavator as 85 dBA at 50 feet. With a normal 40 percent hourly operating time, this would equate to a 76.7 dBA L_{EQ}

noise level at a distance of 50 feet, resulting in noise level of 74.9 dBA 12-hour average using a normal 8-hour work day. This noise level would be below the City's construction noise ordinance limits for residentially zoned property of 75 dBA for a 12-hour average time period. Therefore, excavator or other equipment operation at an average distance of 50 or more feet for an 8-hour period would be in compliance with the City's property-line construction noise limits.

It should be noted that the area of San Ysidro High School adjacent the Project site is a parking lot. The closest classrooms or offices are nearly 200 feet from the Project site and would have significantly lower impacts.

5.3 OPERATIONAL NOISE IMPACTS

Stationary Noise Source Impacts

Off-Site Impacts

The HVAC systems would be mounted on the building rooftop surrounded with visual and acoustic screening walls. As specific planning data for the future HVAC systems is not available, professional judgment was used to identify potential impacts. Given the relatively low amount of noise produced by such units, the distances involved, and the acoustic screening walls, the noise impacts at the upper levels of the adjacent buildings are predicted to be below the 42.5 dBA property-line noise level impact threshold for nighttime noise.

On-Site Impacts

These are single parcels with multi-family residential only and therefore not subject to on-site impact analysis.

Transportation Noise Impacts

As indicated in Section 2.4, the only audible transportation noise in the vicinity of the Project site is vehicle traffic. Anticipated future traffic noise levels are based on traffic volumes provided by Kimley-Horn Associates prior to the final project Traffic Impact Report.

Traffic composition during the site visit was observed to be 97.4 percent automobiles, 3.5 percent medium trucks, and one percent heavy trucks. A slightly higher (more conservative) traffic composition of three percent medium trucks and two percent heavy trucks is used for Caliente and Airway Rd. The assumed traffic data used to calculate future traffic noise are summarized in Table 6.

Table 6
SUMMARY OF ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS

Roadway Segment	Roadway Classification	Existing	Existing Plus Project	Near Term (2014) Baseline	Near Term (2014) Plus Project	Year 2035 Baseline	Year 2035 Plus Project
Otay Mesa Road							
I-805 to Caliente Ave	6 Lane Prime Arterial	0	0	3,937	3,937	22,174	22,317
Caliente Ave to Heritage Rd	6 Lane Prime Arterial	13,967	14,708	17,141	17,882	50,543	51,341
Caliente Avenue							
Otay Mesa Rd to SR-905	6 Lane Prime Arterial	17,562	18,474	20,179	21,091	26,608	27,919
SR-905 to Airway Rd	6 Lane Prime Arterial	6,403	8,883	9,268	11,748	21,362	23,357
Airway Rd to Public Street A	6 Lane Major Arterial	4,652	7,502	4,652	7,502	18,155	20,948
Airway Road							
Old Otay Mesa Rd to Caliente Ave	3 Lane Collector	4,989	5,360	5,804	6,175	19,627	19,770
Ocean View Hills Parkway							
Otay Mesa Rd to Hidden Trails Rd	6 Lane Major Arterial	8,500	8,671	12,711	12,882	23,263	23,634

Table 7
TRAFFIC NOISE PLANNING INFORMATION

Road	2030 ADT	Cars			MT			HT		
		Percent	/	Peak Hour	Percent	/	Peak Hour	Percent	/	Peak Hour
Otay Mesa Rd (Caliente to Heritage)	51,341	95.0	/	222	3.0	/	7	2.0	/	5
Airway Rd	19,770	95.0	/	199	3.0	/	6	2.0	/	4
Street A	1,500	97.5	/	15	2.0	/	0	0.5	/	0

Off-Site

The only off-site sensitive receptor is San Ysidro High School.

There are no exterior usable space areas for the High School adjacent the roadways. All exterior usable spaces are at distances greater than 250 feet from the roadways and in most cases the existing buildings are situated between the outdoor spaces and the roadways. There are no significant impacts to San Ysidro High School.

On-Site

Figure 3 shows the predicted on-site traffic noise contours without buildings. Table 8 provides the expected roadway noise levels along Caliente Avenue with the buildings with the expected roadway setback. A row of receivers is analyzed adjacent the roadway and on the back side of the buildings away from the roadways.

Table 8
2030 SITE ROADWAY NOISE

#	Location	CNEL	#	Location	CNEL
W R 01	West of Road	70.9	E R 01	East of Road	70.5
W R 02	West of Road	71.0	E R 02	East of Road	70.3
W R 03	West of Road	70.6	E R 03	East of Road	70.4
W R 04	West of Road	70.8	E R 04	East of Road	70.3
W R 05	West of Road	70.6	E R 05	East of Road	70.2
W R 06	West of Road	70.0	E R 06	East of Road	70.1
W B 01	West of Buildings	62.8	E B 01	East of Buildings	60.0
W B 02	West of Buildings	48.4	E B 02	East of Buildings	53.5
W B 03	West of Buildings	47.9	E B 03	East of Buildings	56.1
W B 04	West of Buildings	49.0	E B 04	East of Buildings	52.4
W B 05	West of Buildings	48.6	E B 05	East of Buildings	53.1
W B 06	West of Buildings	52.7	E B 06	East of Buildings	59.5

Exterior Noise

As can be seen in Figure 3 and Table 8, roadway noise impacts in the area along Caliente Avenue would exceed the allowed 65 CNEL maximum if any of this area is included in the future exterior use area planning.

Interior Noise

Because building façade noise levels are expected to exceed 60 CNEL (see Table 8), traditional architectural materials would not be expected to attenuate noise to a level of 45 CNEL. Traditional architectural materials are normally able to reduce exterior to interior noise by up to 15 dBA. Therefore, in accordance with standard City requirements, additional noise analysis per Title 24 would be conducted where exterior noise levels are expected to exceed 60 CNEL.

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Noise Contours

CANDLELIGHT

Figure 3

HELIX
Environmental Planning

5.4 IMPACT SUMMARY

The following is a summary of Project noise impacts:

- The area adjacent Caliente Avenue and the building façade facing Caliente Avenue would exceed the City standard of 65 CNEL for exterior use areas. If the area, including potential second floor decks, is designated as planned outdoor use areas they will require noise control to provide compliance with the 65 CNEL standard.

- The noise at the building façade would exceeds 60 CNEL and would require a Title 24 exterior-to-interior analysis proving interior noise levels below 45 CNEL to be submitted with the final building plan submittal for the buildings along Caliente Avenue.

6.0 PROJECT DESIGN FEATURES

If future design plans contain any of the following conditions then the design would need to incorporate noise control to comply with the 65 CNEL requirements for any designated outdoor use space in the areas facing the roadways.

6.1 OUTDOOR RECREATIONAL AREAS

The future design plans may contain one of the following three conditions. Noise control planning can be included in the design plans as follows:

1. If the ground level grassy space between the buildings is required as part of the Project designated exterior use area, the noise can be controlled to less than 65 CNEL with a noise control fence along the outer edge of the area facing the roadway. This noise control fence would need to be a minimum of six feet above the level of the outdoor use area adjacent the fence. The fence would need returns along the north and south end or walkways entering from the street 10-feet in length.

2. If the ground level grassy space area does not require noise control but there are ground level decks adjacent the buildings facing the roadways, these ground level decks would require five and a half foot high noise control barriers around the deck space to control roadway noise impacts to less than 65 CNEL. This noise control would only be required if the grassy area does not include noise control.

3. If there are second level decks planed as part of the required outdoor usable space they would require noise control in the form of a four and one half foot high noise control barrier around the deck to control noise to less than 65 CNEL.

Noise attenuation barriers would be solid and constructed of masonry, wood, plastic, fiberglass, steel, or a combination of those materials, with no cracks or gaps through or below the wall. Glass or clear plastic may be used on the upper portions of the barriers if it is desirable to preserve a view. Any seams or cracks must be filled or caulked. If wood is used, it can be tongue and groove and must be at least one-inch thick or have a surface density of at least 3.5 pounds per square foot.

6.2 INTERIOR HABITABLE AREAS

In accordance with standard City requirements, additional noise analysis per Title 24 would be conducted where exterior noise levels are expected to exceed 60 CNEL. The information in the Title 24 analysis shall include wall heights and lengths, room volumes, window and door tables typical for a building plan, as well as information on any other openings in the building shell. With this specific building plan information, the analysis shall determine the predicted interior noise levels at the planned on-site buildings. If predicted noise levels are found to be in excess of 45 CNEL, the report shall identify architectural materials or techniques which could be included to reduce noise levels to 45 CNEL in habitable rooms. Glazing with Sound Transmission Control (STC) ratings from a STC 22 to STC 60 should be considered. In addition, walls with appropriate STC ratings (34 to 60) should also be considered.

Appropriate means of air circulation and provision of fresh air would be provided to allow windows to remain closed for extended intervals of time so that acceptable levels of noise can be maintained on the interior. The mechanical ventilation system would meet the criteria of the International Building Code (Chapter 12, Section 1203.3 of the 2001 California Building Code).

7.0 CONCLUSIONS

Through the incorporation of the previously specified exterior noise control features as required by future design plans the 65 CNEL standards may be met in areas facing Caliente Avenue if these areas are used as part of the required exterior use areas for the Project planning.

A Title 24 exterior-to-interior noise study will be required as part of the final building plan submittal. The Title 24 exterior to interior study is expected to be able to show compliance with the 45 CNEL interior usable space requirements with normal construction techniques.

8.0 CERTIFICATION

The findings and recommendations of this acoustical analysis report are based on the available information, and are a true and factual analysis of the potential acoustical issues associated with "The Candlelight" project located in the community of Otay Community in the City of San Diego, California. This report was prepared by Charles Terry.

____ November 15, 2012

Charles Terry, Acoustics and Noise Group Manager Date

9.0 REFERENCES

2001 California Building Code, Based on the 1997 Uniform Building Code, Appendix Chapter 12, Division II - Sound Transmission Control, Section 1208 - *Sound Transmission Control*.

2001 California Building Code, Based on the 1997 Uniform Building Code, Chapter 12, Section 1203.3 - Ventilation.

2001 California Noise Insulation Standards, effective 11/01/02, Based on 1997 Uniform Building Code, California Code of Regulations, Title 24.

California Department of Transportation, Traffic Noise Model.

Candlelight Villas East EIR (2006)

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City of San Diego California Environmental Quality Act Significance Determination Thresholds, 2011.

Harris, Cyril M., Handbook of Acoustical Measurements and Noise Control, 3rd Edition, Acoustical Society of America, 1998.

Heeden, Robert A., Compendium of Materials for Noise Control, U.S. Department of Health, Education and Welfare, National Institute for Occupational Safety and Health, November 1978.

Irvine, Leland K., Richards, Roy L., Acoustics and Noise Control Handbook for Architects and Builders, Kreiger Publishing Company, 1998.

NBS Building Sciences Series 77, Acoustical and Thermal Performance on Exterior Residential Walls, U.S. Department of Commerce/National Bureau of Standards, November 1976.

Western Electro-Acoustic Laboratory, Inc., 1711 Sixteenth Street, Santa Monica, California 90404, 213-80-9268, Sound Transmission Loss Vs. Glazing Type, Window Size and Air Filtration , January 1985. The research described in this report was prepared for the California Association of Window Manufacturers, 823 North Harbor Boulevard, Suite E, Fullerton, California 92632, 714-525-7088.

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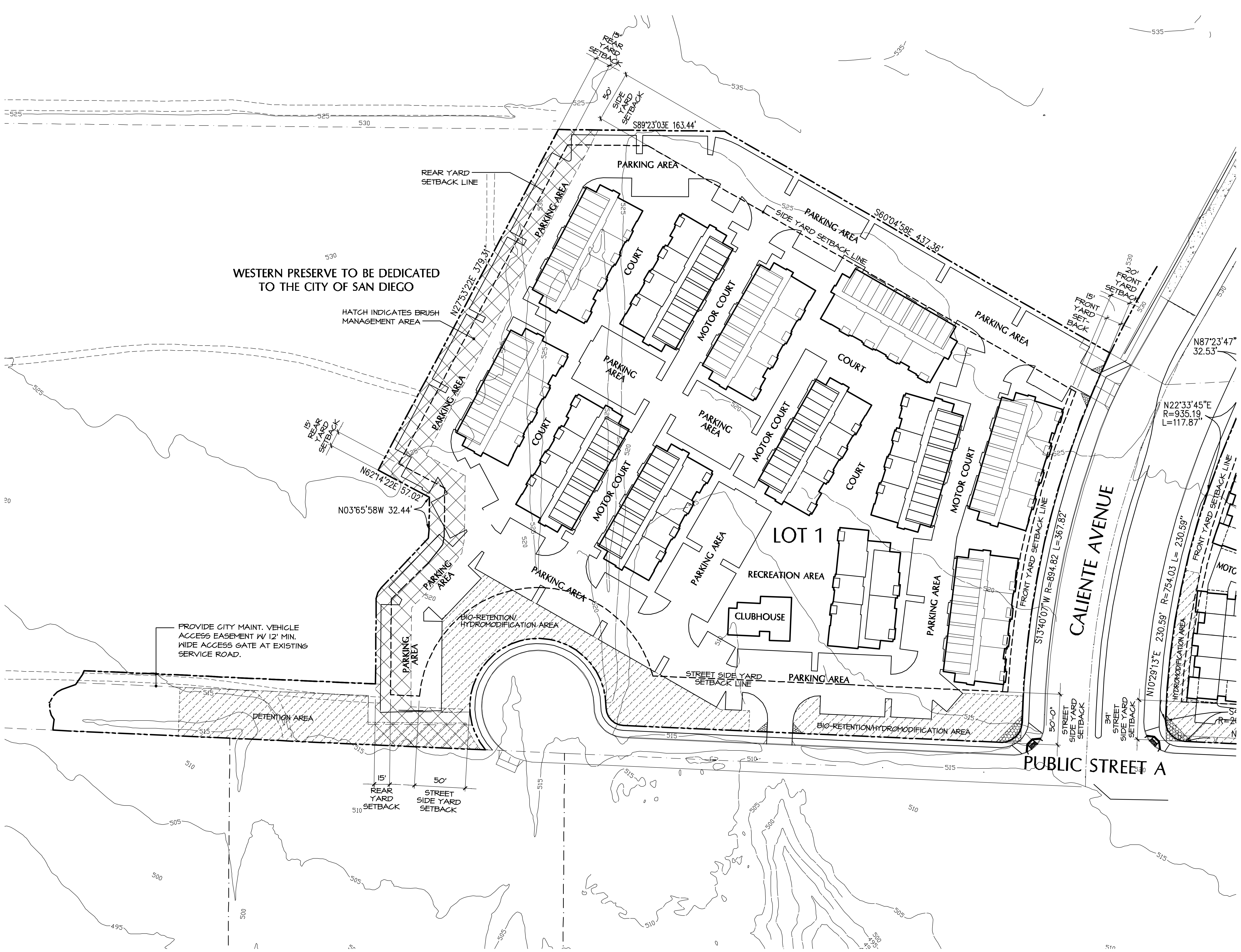
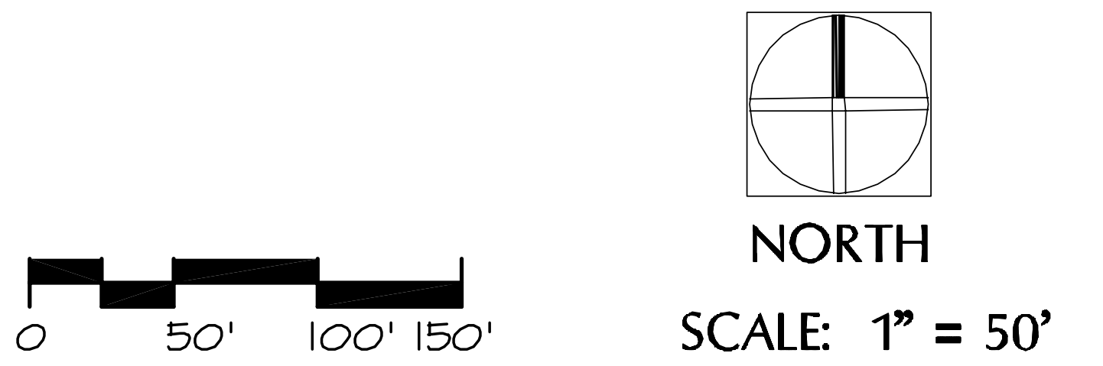
Appendix A

SITE PLANS



CONCEPTUAL ARCHITECTURAL SITE PLAN - LOT 1



SCALE: 1" = 50'

LOT 1 - DEVELOPMENT SUMMARY

SITE AREA : 7.81 AC. / 340,203 S.F. (NET)

ZONING: RM-2-5

UNIT MIX:

1 BDRM. UNITS	=	69
2 BDRM. UNITS	=	110
3 BDRM. UNITS	=	28
4 BDRM. UNITS	=	6
TOTAL UNITS	=	213

APPROX. UNIT S.F.:

1 BDRM. UNITS -	650-700 S.F.
2 BDRM. UNITS -	800-900 S.F.
3-4 BDRM. UNITS -	1,100-1,250 S.F.

DENSITY:

PER ZONE	=	29 DU/ACRE
UNITS	=	182
GEN. PLAN	=	29 DU/ACRE
UNITS	=	182
PROPOSED	=	27.3 DU/ACRE
UNITS	=	213

BLDG. MIX:

18-PLEX BLDG.	=	11
15-PLEX BLDG.	=	1
CLUB HOUSE	=	1
TOTAL BLDG.S	=	13

MAX. HT.: ALLOWABLE = 30/40 FT. *

FOOTNOTES:
* 30' AT SIDE SETBACK UP TO 40' AT 60' DEGREE ANGLE FROM SETBACK.
** 10% OF LOT WIDTH

SETBACKS:

FRONT - MIN.	=	15 - 20 FT.
INT. SIDE	=	50 FT. **
STREET SIDE	=	50 FT. **
REAR	=	15 FT.

COMMON OPEN SPACE REQUIRED: 213 X 25 S.F. = 5,325 S.F.

LOT COVERAGE: NOT APPLICABLE

PARKING SPACES REQUIRED:

1 BDRM. - 69 X 1.5	= 103.5
2 BDRM. - 110 X 2.0	= 220.0
3-4 BDRM. - 34 X 2.25	= 76.5
SUB-TOTAL	= 400.0
VISITOR - 20% OF SUB-TOTAL	= 80.0
TOTAL REQUIRED	= 480.0

LOADING SPACES REQUIRED: 2 SPACES

MOTORCYCLE SPACES REQUIRED: 213 UNITS X 0.1 = 22.0

BICYCLE SPACES REQUIRED:

1 BDRM. - 69 X 0.4	= 27.6
2 BDRM. - 110 X 0.5	= 55.0
3-4 BDRM. - 34 X 0.6	= 20.4
TOTAL REQUIRED	= 103.0

NOTES:

1. PROVIDE BUILDING ADDRESS NUMBERS VISIBLE AND LEGIBLE FROM THE STREET OR ROAD FRONTING THE PROPERTY PER FHPS POLICY P-00-6.
2. POST INDICATOR VALVES, FIRE DEPT. CONNECTIONS, AND ALARM BELL ARE TO BE LOCATED ON THE ADDRESS/ ACCESS SIDE OF THE STRUCTURE.
3. EMERGENCY ACCESS DRIVEWAYS SHALL HAVE CONTROLLED ACCESS AND A MODIFIED ROLLED CURB IN LIEU OF A STANDARD DRIVEWAY, SATISFACTORY TO THE FIRE DEPARTMENT AND THE CITY ENGINEER.

LEGEND:

INDICATES BIO-RETENTION OR HYDROMODIFICATION AREA AS REQUIRED BY CIVIL ENGINEER	▨
INDICATES BRUSH MANAGEMENT AREA	▩
INDICATES TRAIL ACCESS EASEMENT	░

RODRIGUEZ ASSOCIATES
ARCHITECTS & PLANNERS, INC.
2445 FIFTH AVE. SUITE 220, SAN DIEGO, CA 92101 (619) 544-8951 (619) 544-8941 FAX

CLEM ABRAMS
8015 LA JOLLA SCENIC DRIVE
LA JOLLA, CALIFORNIA 92037

PROJECT ADDRESS:
LOT 1 WEST OF CALIENTE AVE. AND LOTS 2 & 3
EAST OF CALIENTE AVE., AT THE CORNER WITH
PUBLIC STREET A — SAN DIEGO, CALIFORNIA

CANDLELIGHT SITE DENSITY STUDY
SAN DIEGO - CALIFORNIA

SHEET TITLE:
CONCEPTUAL ARCH. SITE PLAN
FILE NAME:

REVISIONS	
NO.	DESCRIPTION
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ORIGINAL DATE:
OCT. 23, 2012

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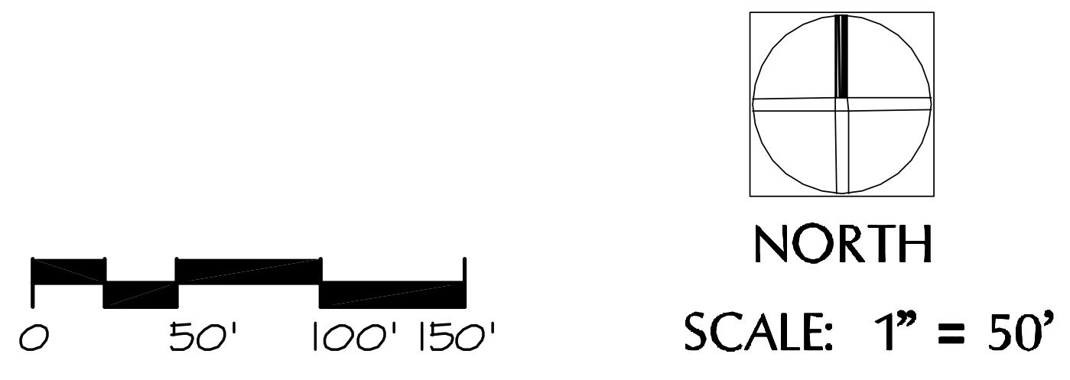
CONCEPTUAL ARCHITECTURAL SITE PLAN - LOT 2



SCALE: 1" = 50'

LOT 2 - DEVELOPMENT SUMMARY

SITE AREA: 7.15 AC. / 311,454 S.F. (NET)

ZONING: RM-2-5

UNIT MIX:
2 BDRM. UNITS = 38
3-4 BDRM. UNITS = 92
TOTAL UNITS = 130

APPROX. UNIT S.F.:
2 BDRM. UNITS - 1,100-1,300 S.F.
3-4 BDRM. UNITS - 1,400-1,500 S.F.

DENSITY:
PER ZONE = 29 DU/ACRE
UNITS = 207.06
GEN. PLAN = 29 DU/ACRE
UNITS = 207.06
PROPOSED = 18.2 DU/ACRE
UNITS = 130

BLDG. MIX:
6-PLEX BLDG. = 10
7-PLEX BLDG. = 2
8-PLEX BLDG. = 7
CLUB HOUSE = 1
TOTAL BLDG.S = 20

MAX. HT.: ALLOWABLE = 30/40 FT. *

FOOTNOTES: * 30' AT SIDE SETBACK UP TO 40' AT 60' DEGREE ANGLE FROM SETBACK.
** 10% OF LOT WIDTH

SETBACKS:
FRONT - MIN. = 15 - 20 FT.
INT. SIDE = 39 FT. **
STREET SIDE = 39 FT. **
REAR = 15 FT.

COMMON OPEN SPACE REQUIRED: 130 X 25 S.F. = 3,250 S.F.

LOT COVERAGE: NOT APPLICABLE

PARKING SPACES REQUIRED:
2 BDRM. - 38 X 2.0 = 76.0
3-4 BDRM. - 92 X 2.25 = 207.0
SUB-TOTAL = 283.0
VISITOR - 20% OF SUB-TOTAL = 56.6
TOTAL REQUIRED = 340.0

LOADING SPACES REQUIRED: 2 SPACES

MOTORCYCLE SPACES REQUIRED: 130 UNITS X 0.1 = 13.0

BICYCLE SPACES REQUIRED:
2 BDRM. - 38 X 0.5 = 19.0
3-4 BDRM. - 92 X 0.6 = 55.2
TOTAL REQUIRED = 75.0

NOTES:

1. PROVIDE BUILDING ADDRESS NUMBERS VISIBLE AND LEGIBLE FROM THE STREET OR ROAD FRONTING THE PROPERTY PER FHPS POLICY P-00-6.
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3. EMERGENCY ACCESS DRIVEWAYS SHALL HAVE CONTROLLED ACCESS AND A MODIFIED ROLLED CURB IN LIEU OF A STANDARD DRIVEWAY, SATISFACTORY TO THE FIRE DEPARTMENT AND THE CITY ENGINEER.

LEGEND:

INDICATES BIO-RETENTION OR HYDROMODIFICATION AREA AS REQUIRED BY CIVIL ENGINEER	▨
INDICATES BRUSH MANAGEMENT AREA	▩
INDICATES TRAIL ACCESS EASEMENT	░

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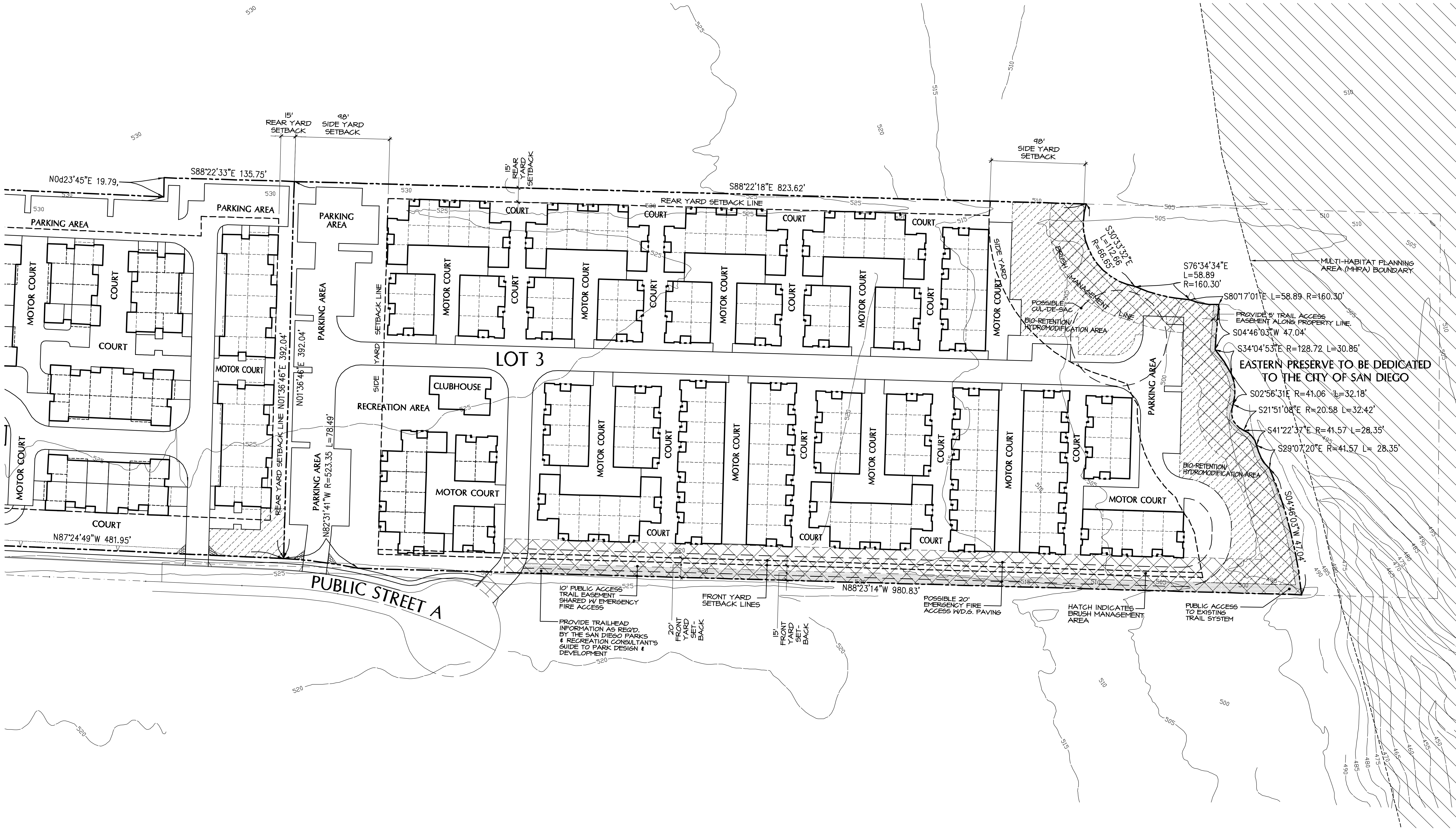

CONCEPTUAL ARCHITECTURAL SITE PLAN - LOT 3

NORTH

0 50' 100' 150'

SCALE: 1" = 50'

LOT 3 - DEVELOPMENT SUMMARY

SITE AREA: 8.87 AC. / 386,377.2 S.F. (NET)

ZONING: RM-2-5

UNIT MIX:
2 BDRM. UNITS = 27
3-4 BDRM. UNITS = 106
TOTAL UNITS = 133

APPROX. UNIT S.F.:
2 BDRM. UNITS - 1,200-1,400 S.F.
3-4 BDRM. UNITS - 1,400-1,600 S.F.

DENSITY:
PER ZONE = 29 DU/ACRE
UNITS = 257.2
GEN. PLAN = 29 DU/ACRE
UNITS = 257.2
PROPOSED = 15 DU/ACRE
UNITS = 133

BLDG. MIX:
4-PLEX BLDG. = 1
5-PLEX BLDG. = 1
6-PLEX BLDG. = 1
8-PLEX BLDG. = 4
10-PLEX BLDG. = 1
12-PLEX BLDG. = 4
14-PLEX BLDG. = 2
CLUB HOUSE = 1
TOTAL BLDG.S = 15

FOOTNOTES: * 30' AT SIDE SETBACK UP TO 40' AT 60' DEGREE ANGLE FROM SETBACK.
** 10% OF LOT WIDTH

MAX. HT.: ALLOWABLE = 30/40 FT. *

SETBACKS:
FRONT - MIN. = 15 - 20 FT.
INT. SIDE = 98 FT. **
STREET SIDE = N/A
REAR = 15 FT.

COMMON OPEN SPACE REQUIRED: 133 X 25 S.F. = 3,325 S.F.

LOT COVERAGE: NOT APPLICABLE

PARKING SPACES REQUIRED:
2 BDRM. - 27 X 2.0 = 54.0
3-4 BDRM. - 106 X 2.25 = 238.5
SUB-TOTAL = 292.5
VISITOR - 20% OF SUB-TOTAL = 58.5
TOTAL REQUIRED = 351.0

LOADING SPACES REQUIRED: 2 SPACES

MOTORCYCLE SPACES REQUIRED: 133 UNITS X 0.1 = 13.3

BICYCLE SPACES REQUIRED:
2 BDRM. - 27 X 0.5 = 13.5
3-4 BDRM. - 106 X 0.6 = 63.6
TOTAL REQUIRED = 78.0

NOTES:

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INDICATES BRUSH MANAGEMENT AREA	▩
INDICATES TRAIL ACCESS EASEMENT	░

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