Volume II
Draft Environmental Impact Report
Technical Appendices

Church of the Woods

PCR

April 2010

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Draft Environmental Impact Report
Technical Appendices

Church of the Woods

Prepared For

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LSA Associates, Inc.

Air Quality Analysis Church of the Woods

August 2009

AIR QUALITY ANALYSIS

CHURCH OF THE WOODS

Submitted to:

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LSA Project No. CTW430

LSA

August 2009

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INTRODUCTION

This air quality impact analysis has been prepared to evaluate potential air quality impacts and mitigation measures associated with the proposed Church of the Woods project located in an unincorporated portion of San Bernardino County, California. The air quality study provides a discussion of the proposed project, the physical setting of the project area, and the regulatory framework for air quality. The analysis provides data on existing air quality, evaluates potential air quality impacts associated with the proposed project, and identifies mitigation measures recommended for potentially significant impacts. Modeled air quality levels are based upon vehicle data and project trip generation included in a traffic study prepared for the proposed project (LSA Associates, Inc. [LSA] June 2008).

The evaluation was prepared in conformance with appropriate standards, utilizing procedures and methodologies in the South Coast Air Quality Management District (SCAQMD) *CEQA* [California Environmental Quality Act] *Air Quality Handbook* (SCAQMD, April 1993).

PROJECT DESCRIPTION

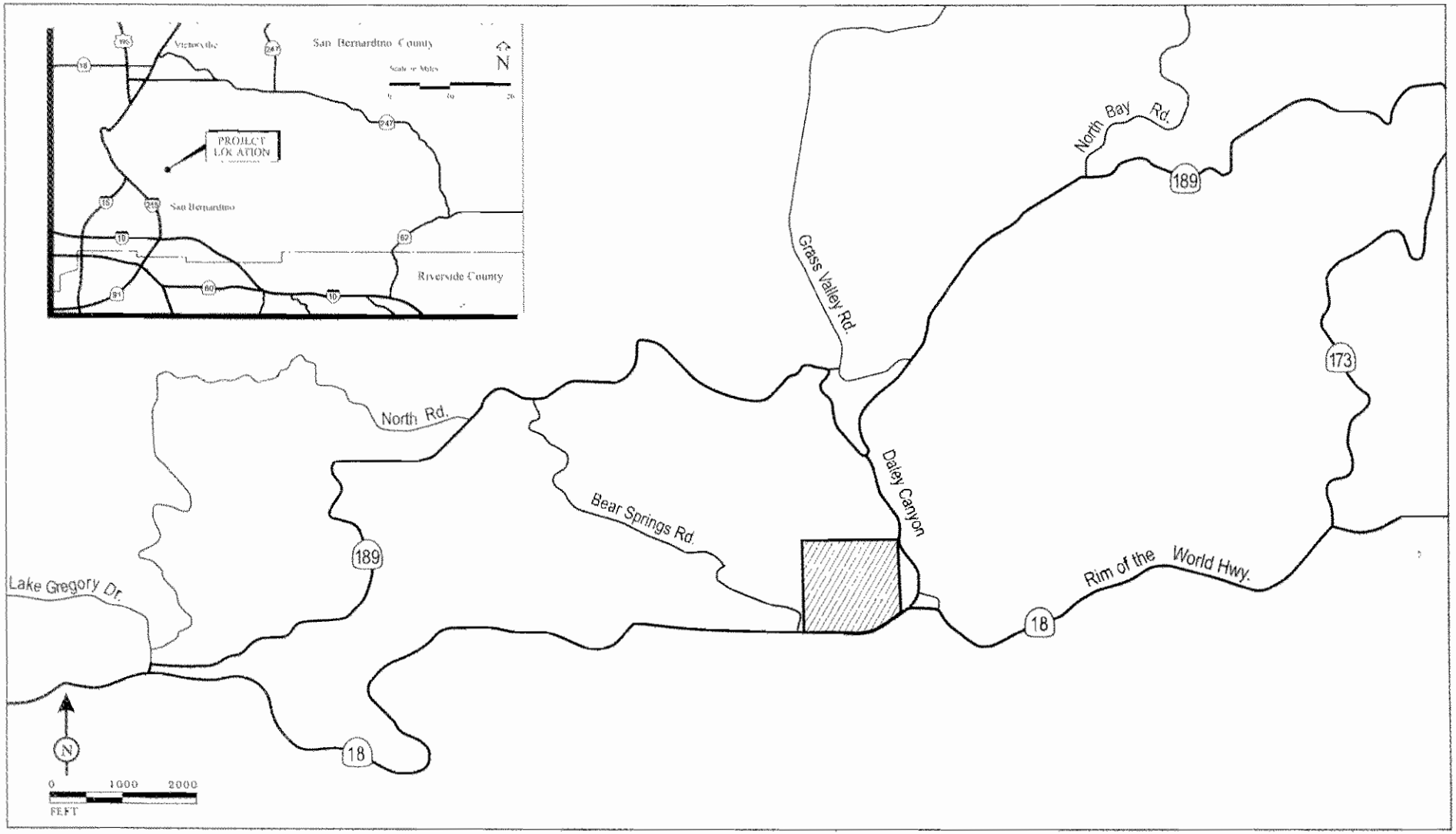
The proposed site of the Church of the Woods is located in Rimforest in unincorporated San Bernardino County. The site is approximately 37 acres (ac) and is located on the north side of State Route 18 (SR-18, Rim of the World Highway) between Bear Springs Road and Daley Canyon Road. There are currently no active land uses on site. Figure 1 shows the project location. Figure 2 presents a conceptual site plan for the project.

PHASE I DEVELOPMENT

Phase I of the project would consist of development of approximately 5.2 ac of the project site with construction of a 27,364-square-foot (sf), two-story assembly building; recreational facilities; a soccer field and a small baseball field; a temporary outdoor amphitheater; and associated parking (approximately 390 spaces). The assembly building would be used for Sunday morning and Wednesday evening services and various meetings and activities during the week. This building would also be made available for scheduled use by the community for local groups such as the Arrowhead Arts, Rotary Club, Boy Scouts, and Girl Scouts. The recreational facilities would be located adjacent to the youth center and would include volleyball and basketball courts, as well as a skateboard park. Volleyball and basketball games would be held during the evenings on Monday and Wednesday and during the day and evening on Saturday, with an average of 30 participants. The skateboard park would be open Wednesday and Friday evenings and during the day on Saturday, with approximately 30–50 participants per occurrence. The sports fields, including a small snack bar and restrooms just east of the baseball diamond, would be located on the southwestern portion of the project site. Soccer and baseball games would take place Monday through Friday afternoons and all day on Saturday. No evening uses, lighting, or amplified sound is proposed for the sports fields. In addition, concrete paths/walkways are proposed to follow the contours of the landscaped manufactured slopes on the western portion of the project site. The temporary outdoor amphitheater, which would be replaced with a worship center in Phase III, would be located north of the youth center. The amphitheater has a seating capacity of 600 and would be used primarily for Sunday morning services from 9:00 a.m. to 11:00 a.m. and on Wednesday evenings from 6:30 p.m. to 8:00 p.m., weather permitting. The amphitheater would also be used for up to three concerts per year. These concerts would be held on a Friday or Saturday evening from approximately 5:00 p.m. to 9:00 p.m., with an estimated attendance of between 200–500 people per concert. The amphitheater use would include lighting and amplified sound.

PHASE II DEVELOPMENT

Phase II of the project would involve development of an additional 13.2 ac of the project site and include a 41,037 sf, two-story auditorium/assembly area and children's ministry; a 2,500 sf, two-story maintenance/caretaker unit; and additional parking (approximately 130 spaces, for a total of 520 spaces on site). The auditorium and children's ministry buildings would be located immediately east



LSA

FIGURE 1

PROJECT LOCATION

Church of the Woods

Project Location

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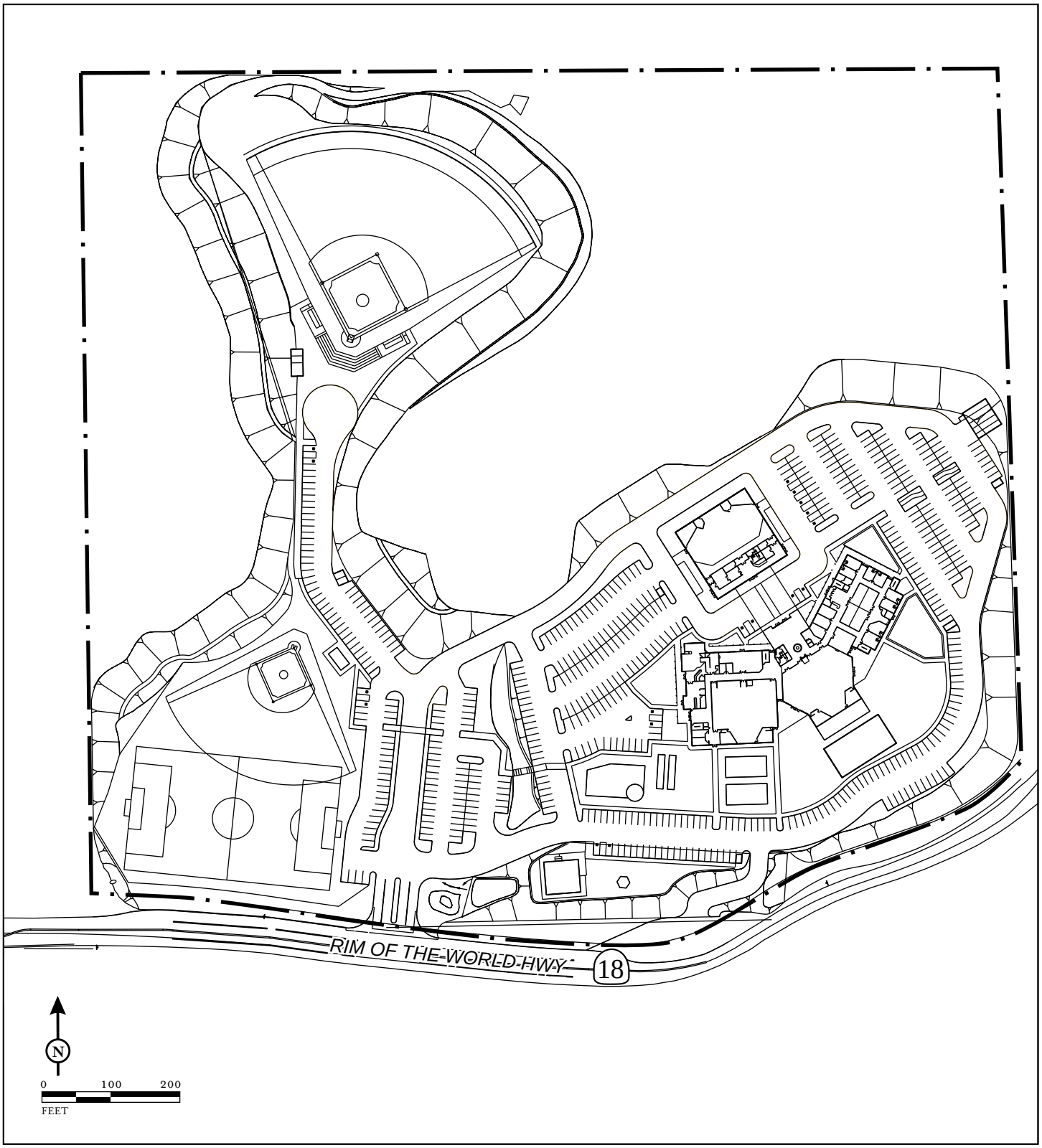

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FIGURE 2

PROJECT BOUNDARY

Church of the Woods

Conceptual Site Plan

SOURCE: Church of the Woods, 2005.

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of the youth center and would serve as an extension of the Phase I building to create one interconnected facility. The children's ministry area and youth center gymnatorium would accommodate Sunday School and various youth activities, while the auditorium/assembly area would replace the youth center gymnatorium as the assembly area for Sunday and Wednesday services and other programs. Overall seating capacity of the auditorium and children's ministry would accommodate 600 people. The maintenance/caretaker unit would be near the eastern boundary of the project site at the edge of the parking lot north of the children's ministry building. In addition, picnic areas and child play areas are proposed immediately to the south and east of the new youth center/ auditorium/children's ministry facility, respectively.

PHASE III DEVELOPMENT

Phase III of the project would involve development of an additional 6.8 ac, including a 23,510 sf, 1,200-seat worship center; a 3,073 sf chapel/retreat; a large baseball field; and additional parking (approximately 20 spaces, for a total of 540 spaces on site). Sunday and Wednesday services would take place at the worship center instead of the assembly area. To accommodate the worship center, the temporary outdoor amphitheater would be removed, and the worship center would be constructed on the same location. In addition to the worship center, a small chapel/retreat building would be constructed just east of the site entrance. This building would be surrounded by an open space area, landscaped manufactured slopes, and a garden. The baseball field with bleachers would be located on the northwestern portion of the project site and would accommodate an additional 25 players and coaches during practice games on weekdays and 60 players, coaches, and spectators during games on Saturday. As with the baseball field proposed for Phase I, no field lighting or amplified sound is proposed for the large baseball field. A second snack bar and restroom building would be provided behind the bleachers to the west.

The worship center would have two Sunday services (from 8:30 a.m. to 10:00 a.m. and from 11:00 a.m. to 12:30 p.m.) and a Wednesday evening service from 6:30 p.m. to 8:30 p.m., with the office open Monday through Friday, 8:00 a.m. to 5:00 p.m. The site would also be available for special events associated with operation of the church, as well as for community sports clubs to utilize the play fields on Saturdays. The size of the congregation is anticipated to be 450 persons per service in Phases I and II, and 1,000 persons per service in Phase III. The church would conduct two services on Sundays and one service on Wednesdays, for all phases, and would ultimately employ a staff of approximately 15. Upon completion of all phases, on-site occupancy would range from approximately 40 on weekday mornings to 1,000 during the Sunday services and special events, as described below.

Typically, two to three special events would be scheduled per year, generally taking place during the day between 9:00 a.m. and 9:00 p.m. on a Saturday or Sunday. Attendance at these special events could be up to 1,000 people. An example of a special event is the "Freedom Celebration," which occurs on the Sunday closest to the Fourth of July. This includes a church service, picnic, games, and music. Other anticipated special events include a Christmas Celebration and softball game/picnic.

In addition to special events, a variety of programs would be scheduled on a weekly basis over a set period of time. These programs would usually be held from 6:30 p.m. to 8:30 p.m. during the week. There are 2–3 programs anticipated to be scheduled during the year. Estimated attendance of these programs would be approximately 300 people. An example of a special program is "True Love

Waits," which would occur on a weekday evening from 6:30 p.m. to 8:30 p.m. for 12 weeks. Other programs may be scheduled from 4 to 6 weeks' duration.

As described for Phase I, the assembly area and other church facilities would be available for local community group events. Approximately five to six community group events are expected throughout the year, with attendance ranging between 25 and 300 people per event. The events would normally be held during the week between 6:00 p.m. to 9:00 p.m. or during the day on Saturday.

SETTING

METHODOLOGY RELATED TO AIR QUALITY IMPACT ASSESSMENT

Evaluation of air quality impacts associated with a proposed church/recreational facility typically includes the following:

- Determine the short-term construction air quality impacts
- Determine the long-term air quality impacts, including vehicular traffic, on on-site and off-site air quality-sensitive uses
- Determine mitigation measures required to reduce short-term and long-term, on-site air quality impacts from all sources

EXISTING ENVIRONMENTAL SETTING

The project site is located within the County of San Bernardino, which is part of the South Coast Air Basin (Basin) and is under the jurisdiction of SCAQMD. The air quality assessment for the proposed project includes estimating emissions associated with both short-term construction and long-term operation of the proposed project.

A number of air quality modeling tools are available to assess air quality impacts of projects. Moreover, certain air districts, such as the SCAQMD, have created guidelines and requirements for air quality analyses. The SCAQMD's current guidelines, included in its CEQA Air Quality Handbook (April 1993), were adhered to in the assessment of air quality impacts for the proposed project.

Regional Air Quality

Both the State of California and the federal government have established health-based ambient air quality standards (AAQS). As shown in Table A, these pollutants include ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter with a diameter of 10 microns or less (PM_{10}), and lead. In July 1997, the U.S. Environmental Protection Agency (EPA) adopted new standards for eight-hour ozone and for fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). In addition, the State has set standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles. These standards are designed to protect the health and welfare of the populace with a reasonable margin of safety.

In addition to setting out primary and secondary AAQS, the State of California has established a set of episode criteria for O_3, CO, NO_2, SO_2, and PM_{10}. These criteria refer to episode levels representing periods of short-term exposure to air pollutants that actually threaten public health. Health effects are progressively more severe as pollutant levels increase from Stage One to Stage Three. Table B lists the health effects of these criteria pollutants and their potential sources. Because the concentration standards were set at a level that protects public health with an adequate margin of safety (EPA),

Table A: Ambient Air Quality Standards (AAQS)

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	—	Same as Primary Standard	Ultraviolet Photometry
	8-Hour	0.07 ppm (137 μg/m^3)		0.075 ppm (147 μg/m^3)		
Respirable Particulate Matter (PM_{10})	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		—		
Fine Particulate Matter ($PM_{2.5}$)	24-Hour	No Separate State Standard		35 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 (10 mg/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	0.030 ppm (56 μg/m^3)	Gas Phase Chemiluminescence	0.053 ppm (100 μg/m^3)	Same as Primary Standard	Gas Phase Chemiluminescence
	1-Hour	0.18 ppm (338 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[8]	30 Day Average	1.5 μg/m^3	Atomic Absorption	—	—	High-Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 μg/m^3	Same as Primary Standard	
	Rolling 3-Month Average[9]	—		0.15 μg/m^3		
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[8]	24-Hour	0.01 ppm (26 μg/m^3)	Gas Chromatography			

Source: ARB (November 17, 2008).

Footnotes:

[1] California standards for ozone; carbon monoxide (except Lake Tahoe); sulfur dioxide (1- and 24-hour); nitrogen dioxide; suspended particulate matter - PM_{10}, $PM_{2.5}$, and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[2] National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth-highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact EPA for further clarification and current federal policies.

[3] Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25˚C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25˚C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] Any equivalent procedure that can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

[5] National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

[6] National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

[7] Reference method as described by the EPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the EPA.

[8] The ARB has identified lead and vinyl chloride as ‘toxic air contaminants’ with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

[9] National lead standard, rolling 3-month average: final rule signed October 15, 2008.

Table B: Summary of Health Effects of the Major Criteria Air Pollutants

Pollutants	Sources	Primary Effects
Ozone (O_3)	Atmospheric reaction of organic gases with nitrogen oxides in the presence of sunlight.	Aggravation of respiratory and cardiovascular diseases. Irritation of eyes. Impairment of cardiopulmonary function. Plant leaf injury.
Nitrogen Dioxide (NO_2)	Motor vehicle exhaust. High temperature stationary combustion. Atmospheric reactions.	Aggravation of respiratory illness. Reduced visibility. Reduced plant growth. Formation of acid rain.
Carbon Monoxide (CO)	By-products from incomplete combustion of fuels and other carbon containing substances, such as motor exhaust. Natural events, such as decomposition of organic matter.	Reduced tolerance for exercise. Impairment of mental function. Impairment of fetal development. Death at high levels of exposure. Aggravation of some heart diseases (angina).
Suspended Particulate Matter ($PM_{2.5}$ and PM_{10})	Stationary combustion of solid fuels. Construction activities. Industrial processes. Atmospheric chemical reactions.	Reduced lung function. Aggravation of the effects of gaseous pollutants. Aggravation of respiratory and cardiorespiratory diseases. Increased cough and chest discomfort. Soiling. Reduced visibility.
Sulfur Dioxide (SO_2)	Combustion of sulfur-containing fossil fuels. Smelting of sulfur-bearing metal ores. Industrial processes.	Aggravation of respiratory diseases (asthma, emphysema). Reduced lung function. Irritation of eyes. Reduced visibility. Plant injury. Deterioration of metals, textiles, leather, finishes, coatings, etc.
Lead (Pb)	Contaminated soil (e.g., from leaded fuels and lead-based paints).	Impairment of blood function and nerve construction. Behavioral and hearing problems in children.

Source: ARB 2001.

these health effects will not occur unless the standards are exceeded by a large margin or for a prolonged period of time. State AAQS are more stringent than federal AAQS. Among the pollutants, ozone (O_3) and particulate matter ($PM_{2.5}$ and PM_{10}) are considered regional pollutants, while the others have more localized effects.

The California Clean Air Act (CCAA) provides the SCAQMD with the authority to manage transportation activities at indirect sources. Indirect sources of pollution are generated when minor sources collectively emit a substantial amount of pollution. Examples of this are the motor vehicles at an intersection, a mall, and on highways. The SCAQMD also regulates stationary sources of pollution throughout its jurisdictional area. Direct emissions from motor vehicles are regulated by the California Air Resources Board (ARB).

Climate/Meteorology. Air quality in the planning area is not only affected by various emission sources (mobile, industry, etc.) but also by atmospheric conditions like wind speed, wind direction, temperature, and rainfall. The combination of topography, low mixing height, abundant sunshine, and emissions from the second largest urban area in the United States gives the Basin the worst air pollution problem in the nation.

Climate in the Basin is determined by its terrain and geographical location. The Basin is a coastal plain with connecting broad valleys and low hills. The Pacific Ocean forms the southwestern border, and high mountains surround the rest of the Basin. The Basin lies in the semi-permanent high-pressure zone of the eastern Pacific; the resulting climate is mild and tempered by cool ocean breezes. This climatological pattern is rarely interrupted. However, periods of extremely hot weather, winter storms and Santa Ana wind conditions do occur.

The annual average temperature varies little throughout the Basin, ranging from the low to middle 60s, measured in degrees Fahrenheit. With a more pronounced oceanic influence, coastal areas show less variability in annual minimum and maximum temperatures than inland areas. The climatological station closest to the site is the Lake Arrowhead Station.[1] The monthly average maximum temperature recorded at this station from July 1948 to December 2007 ranged from 45.7 degrees Fahrenheit (˚F) in January to 81.9˚F in July, with an annual average maximum of 63.1 ˚F. The monthly average minimum temperature recorded at this station ranged from 28.9˚F in January to 56.5˚F in July, with an annual average minimum of 40.4˚F. January is typically the coldest month, and July is typically the warmest month in this area of the Basin.

Most rainfall in the Basin occurs between November and April. Summer rainfall is minimal and is generally limited to scattered thundershowers in coastal regions and slightly heavier showers in the eastern portion of the Basin and along the coastal side of the mountains. The Lake Arrowhead climatological station monitored precipitation from July 1948 to December 2007. Average monthly rainfall during that period varied from 8.67 inches in January to 1.67 inch or less between May and October, with an annual total of 40.37 inches. Patterns in monthly and yearly rainfall totals are unpredictable due to fluctuations in the weather.

[1] Western Regional Climate Center, www.wrcc.dri.edu.

The Basin experiences a persistent temperature inversion (increasing temperature with increasing altitude) as a result of the Pacific high. This inversion limits the vertical dispersion of air contaminants, holding them relatively near the ground. As the sun warms the ground and the lower air layer, the temperature of the lower air layer approaches the temperature of the base of the inversion (upper) layer until the inversion layer finally breaks, allowing vertical mixing with the lower layer. This phenomenon is observed in mid-afternoon to late afternoon on hot summer days, when the smog appears to clear up suddenly. Winter inversions frequently break by mid-morning.

Winds in the Basin are predominantly with relatively low velocities. Wind speeds in the Basin average about 4 miles per hour (mph). Summer wind speeds average slightly higher than winter wind speeds. Low average wind speeds, together with a persistent temperature inversion, limit the vertical dispersion of air pollutants throughout the Basin. Strong, dry, north, or northeasterly winds, known as Santa Ana winds, occur during the fall and winter months, dispersing air contaminants. The Santa Ana conditions tend to last for several days at a time.

The combination of stagnant wind conditions and low inversions produces the greatest pollutant concentrations. On days of no inversion or high wind speeds, ambient air pollutant concentrations are the lowest. During periods of low inversions and low wind speeds, air pollutants generated in urbanized areas are transported predominantly onshore into Riverside and San Bernardino Counties. In the winter, the greatest pollution problems are carbon monoxide and oxides of nitrogen, because of extremely low inversions and air stagnation during the night and early morning hours. In the summer, the longer daylight hours and the brighter sunshine combine to cause a reaction between hydrocarbons and oxides of nitrogen to form photochemical smog.

Air Pollution Constituents and Attainment Status. The following describes the six criteria air pollutants and their attainment status in the Basin based on ARB's Area Designations (Activities and Maps) (http://www.arb.ca.gov/desig/desig.htm). Table C summarizes the attainment status in the Basin for the major criteria pollutants.

Table C: Attainment Status of Criteria Pollutants in the South Coast Air Basin

Pollutant	State	Federal
O_3 1-hour	Nonattainment	Revoked June 2005
O_3 8-hour	Not Established	Severe 17 Nonattainment
PM_{10}	Nonattainment	Serious Nonattainment[1]
$PM_{2.5}$	Nonattainment	Nonattainment[2]
CO	Attainment	Attainment/Maintenance[3]
NO_2	Attainment	Attainment/Maintenance
All others	Attainment/Unclassified	Attainment/Unclassified

Source: California Air Resources Board (ARB), 2007 (http://www.arb.ca.gov/desig/desig.htm).

[1] In October 2006, the EPA, in its final rule revision, eliminated the annual PM_{10} standard.

[2] The $PM_{2.5}$ nonattainment designation is based on the 1997 standard. In 2006, the EPA revised the 24-hour standard. The 2006 $PM_{2.5}$ new standard of 35 $\mu g/m^3$ applies 1 year after the effective date of the new designation (April 2010).

[3] Effective June 11, 2007, the South Coast Air Basin was redesignated as attainment/maintenance for the federal CO standard.

$\mu g/m^3$ = micrograms per cubic meter
CO = carbon monoxide
EPA = United States Environmental Protection Agency
NO_2 = nitrogen dioxide
O_3 = ozone (smog)
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size

Ozone. O_3 (smog) is formed by photochemical reactions between nitrogen oxides (NO_X) and reactive organic gases (ROGs) rather than being directly emitted. O_3 is a pungent, colorless gas typical of Southern California smog. Elevated O_3 concentrations result in reduced lung function, particularly during vigorous physical activity. This health problem is particularly acute in sensitive receptors such as the sick, the elderly, and young children. O_3 levels peak during summer and early fall. Effective

June 15, 2005, the EPA revoked in full the federal 1-hour ozone ambient air quality standard, including associated designations and classifications, in all areas except 14 early action compacts all outside California. The entire Basin is designated as a nonattainment area for the State 1-hour ozone standard. The EPA has designated the status in the Basin for the 8-hour ozone standard as "Severe 17," which means the Basin has until 2021 to attain the federal 8-hour ozone standard. SCAQMD has requested that the Basin's federal designation be changed from severe to extreme nonattainment. This change would extend the attainment deadline to 2023.

Carbon Monoxide. CO is formed by the incomplete combustion of fossil fuels, almost entirely from automobiles. It is a colorless, odorless gas that can cause dizziness, fatigue, and impairments to central nervous system functions. The entire Basin is designated as attainment/maintenance for the federal standard and maintenance for the State CO standard.

Nitrogen Oxides. NO_2, a reddish brown gas, and nitric oxide (NO), a colorless, odorless gas, are formed from fuel combustion under high temperature or pressure. These compounds are referred to as nitrogen oxides, or NO_X. NO_X is a primary component of the photochemical smog reaction. It also contributes to other pollution problems, including a high concentration of fine particulate matter, poor visibility, and acid deposition (i.e., acid rain). NO_2 decreases lung function and may reduce resistance to infection. The entire Basin has not exceeded both federal and State standards for NO_2 in the past five years with published monitoring data. It is designated a maintenance area under federal standards and an attainment area under State standards.

Sulfur Dioxide. SO_2 is a colorless, irritating gas formed primarily from incomplete combustion of fuels containing sulfur. Industrial facilities also contribute to gaseous SO_2 levels. SO_2 irritates the respiratory tract, can injure lung tissue when combined with fine particulate matter, and reduces visibility and the level of sunlight. The entire Basin is in attainment with both federal and State SO_2 standards.

Lead. Lead is found in old paints and coatings, plumbing, and a variety of other materials. Once in the bloodstream, lead can cause damage to the brain, nervous system, and other body systems. Children are highly susceptible to the effects of lead. The entire Basin is in attainment for federal and State lead standards.

Particulate Matter. Particulate matter is the term used for a mixture of solid particles and liquid droplets found in the air. Coarse particles, PM_{10}, derive from a variety of sources, including windblown dust and grinding operations. Fuel combustion and resultant exhaust from power plants and diesel buses and trucks are primarily responsible for fine particle, $PM_{2.5}$, levels. Fine particles can also be formed in the atmosphere through chemical reactions. PM_{10} can accumulate in the respiratory system and aggravate health problems such as asthma. The EPA's scientific review concluded that $PM_{2.5}$, which penetrates deeply into the lungs, is more likely than PM_{10} to contribute to the health effects listed in a number of recently published community epidemiological studies at concentrations that extend well below those allowed by current PM_{10} standards. These health effects include premature death and increased hospital admissions and emergency room visits (primarily the elderly and individuals with cardiopulmonary disease); increased respiratory symptoms and disease (children and individuals with cardiopulmonary disease such as asthma); decreased lung functions (particularly in children and individuals with asthma); and alterations in lung tissue and structure and in respiratory tract defense mechanisms. The entire Basin is a nonattainment area for federal and State PM_{10} and federal $PM_{2.5}$ standards. The $PM_{2.5}$ nonattainment designation is effective from April 5, 2005, and the conformity determination requirements are effective from April 5, 2006. In the 2007 AQMP, SCAQMD anticipated that the Basin will be in attainment for the $PM_{2.5}$ annual average federal air quality standard by the April 5, 2015, deadline.

Reactive Organic Compounds. Reactive organic compounds (ROCs) are formed from the combustion of fuels and evaporation of organic solvents. ROCs are not defined criteria pollutants but are a prime component of the photochemical smog reaction. Consequently, ROCs accumulate in the atmosphere more quickly during the winter, when sunlight is limited and photochemical reactions are slower. ROCs are also referred to as volatile organic compounds (VOCs).

Local Air Quality

The SCAQMD, together with the ARB, maintains ambient air quality monitoring stations in the Basin. The air quality monitoring station closest to the site is the San Bernardino station (located approximately 10 miles south of the project site), and its air quality trends are representative of the ambient air quality in the project area. As the San Bernardino Station does not monitor SO_2 concentrations, the data from the Fontana Station (located approximately 15 miles southwest of the project site) was used for this analysis. The pollutants monitored are CO, O_3, PM_{10}, $PM_{2.5}$, NO_2, and SO_2.[1]

The ambient air quality data in Table D show that NO_2, SO_2, and CO levels are below relevant State and federal standards. The State standard was exceeded between 48 and 57 times per year in the past three years. The federal 8-hour O_3 standard was exceeded between 29 and 51 times per year in the past 3 years. The State 24-hour PM_{10} standard was exceeded from 20 to 26 days in each of the past 3 years and exceeded the federal 24-hour standard once in 2007. The federal 24-hour $PM_{2.5}$ standard was exceeded from 0 to 3 days per year for the past 3 years. Both State and federal annual average $PM_{2.5}$ standards have been exceeded every year for the past 3 years.

[1] Air quality data, 2005–2007; EPA and ARB websites.

Table D: Ambient Air Quality at the San Bernardino Air Monitoring Station

Pollutant	Standard	2007	2006	2005
Carbon Monoxide (CO)				
Maximum 1-hr concentration (ppm)		3.7	2.8	3.8
Number of days exceeded:	State: > 20 ppm	0	0	0
	Federal: > 35 ppm	0	0	0
Maximum 8-hr concentration (ppm)		2.3	2.2	2.5
Number of days exceeded:	State: ≥ 9.0 ppm	0	0	0
	Federal: ≥ 9 ppm	0	0	0
Ozone (O_3)				
Maximum 1-hr concentration (ppm)		0.153	0.154	0.163
Number of days exceeded:	State: > 0.09 ppm	48	57	54
Maximum 8-hr concentration (ppm)		0.121	0.126	0.129
	Federal: > 0.08 ppm	51	29	31
Coarse Particulates (PM_{10})				
Maximum 24-hr concentration ($\mu g/m^3$)		219	92	72
Number of days exceeded:	State: > 50 $\mu g/m^3$	26	22	20
	Federal: > 150 $\mu g/m^3$	1	0	0
Annual arithmetic average concentration ($\mu g/m^3$)		54.2	46.0	42.3
Exceeded for the year:	State: > 20 $\mu g/m^3$	Y	Y	Y
	Federal: > 50 $\mu g/m^3$	Y	N	N
Fine Particulates ($PM_{2.5}$)[1]				
Maximum 24-hr concentration ($\mu g/m^3$)		72.1	55.0	106.2
	Federal: > 65 $\mu g/m^3$	3	0	1
Annual arithmetic average concentration ($\mu g/m^3$)		17.8	17.8	17.3
Exceeded for the year:	State: > 12 $\mu g/m^3$	Y	Y	Y
	Federal: > 15 $\mu g/m^3$	Y	Y	Y
Nitrogen Dioxide (NO_2)				
Maximum 1-hr concentration (ppm)		0.083	0.088	0.098
Number of days exceeded:	State: > 0.25 ppm	0	0	0
Annual arithmetic average concentration (ppm)		0.024	0.025	0.026
	Federal: > 0.053 ppm	N	N	N
Sulfur Dioxide (SO_2)[2]				
Maximum 1-hr concentration (ppm)		0.010	0.009	0.009
	State: > 0.25 ppm	0	0	0
Maximum 3-hr concentration (ppm)		0.004	0.004	0.006
	Federal: > 0.5 ppm	0	0	0
Maximum 24-hr concentration (ppm)		0.005	0.004	0.004
Number of days exceeded:	State: > 0.04 ppm	0	0	0
	Federal: > 0.14 ppm	0	0	0
Annual arithmetic average concentration (ppm)		0.002	0.002	0.002
Exceeded for the year:	Federal: > 0.030 ppm	N	N	N

Source: EPA and ARB, 2008.

[1] The exceedances of the federal 24-hour $PM_{2.5}$ standard are based on the old 65 $\mu g/m^3$ standard. In 2006 the EPA revised the standard to 35 $\mu g/m^3$.

[2] Data measured at the Fontana Station.

ARB = California Air Resources Board
EPA = United States Environmental Protection Agency
hr = hour
ppm = parts per million
$\mu g/m^3$ = microgram of pollutant per cubic meter of air

REGULATORY SETTINGS

Federal Regulations/Standards

Pursuant to the federal Clean Air Act (CAA) of 1970, the EPA established national ambient air quality standards (NAAQS) for six major pollutants, termed "criteria" pollutants. Criteria pollutants are defined as those pollutants for which the federal and State governments have established AAQS, or criteria, for outdoor concentrations in order to protect public health.

Data collected at permanent monitoring stations are used by the EPA to classify regions as "attainment" or "nonattainment," depending on whether the regions met the requirements stated in the primary NAAQS. Nonattainment areas have additional restrictions as required by the EPA.

The EPA has designated the Southern California Association of Governments (SCAG) as the Metropolitan Planning Organization (MPO) responsible for ensuring the Basin's compliance with the CAA.

The EPA established new national air quality standards for ground-level O_3 and $PM_{2.5}$ matter in 1997. On May 14, 1999, the Court of Appeals for the District of Columbia Circuit issued a decision ruling that the CAA, as applied in setting the new public health standards for O_3 and particulate matter, was unconstitutional as an improper delegation of legislative authority to the EPA. On February 27, 2001, the U.S. Supreme Court upheld the way the government sets air quality standards under the CAA. The court unanimously rejected industry arguments that the EPA must consider financial cost as well as health benefits in writing standards. The justices also rejected arguments that the EPA took lawmaking power from Congress when it set tougher standards for O_3 and particulate matter in 1997. Nevertheless, the court threw out the EPA's policy for implementing new O_3 rules, saying that the agency ignored a section of the law that restricts its authority to enforce such rules.

In April 2003, the EPA was cleared by the White House Office of Management and Budget (OMB) to implement the 8-hour ground-level O_3 standard. The EPA issued the proposed rule implementing the 8-hour O_3 standard in April 2003. The EPA completed final 8-hour nonattainment status on April 15, 2004. The EPA revoked the one-hour O_3 standard on June 15, 2005.

The EPA issued the final $PM_{2.5}$ implementation rule in fall 2004. The EPA issued final designations on December 14, 2004. The EPA lowered the 24-hour $PM_{2.5}$ standard from 65 to 35 micrograms per cubic meter ($\mu g/m^3$) and revoked the annual average PM_{10} standard in December 2006.

State Regulations/Standards

The State of California began to set California ambient air quality standards (CAAQS) in 1969 under the mandate of the Mulford-Carrell Act. The CAAQS are generally more stringent than the NAAQS. In addition to the six criteria pollutants covered by the NAAQS, there are CAAQS for sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles. These standards are also listed in Table A. In January 2007 the CAAQS for 1-hour NO_2 was reduced from 0.25 ppm to 0.18 ppm.

Originally, there were no attainment deadlines for CAAQS. However, the CCAA of 1988 provided a time frame and a planning structure to promote their attainment. The CCAA required nonattainment areas in the State to prepare attainment plans and proposed to classify each such area on the basis of the submitted plan, as follows: moderate, if CAAQS attainment could not occur before December 31, 1994; serious, if CAAQS attainment could not occur before December 31, 1997; and severe, if CAAQS attainment could not be conclusively demonstrated at all.

The attainment plans are required to achieve a minimum 5 percent annual reduction in the emissions of nonattainment pollutants unless all feasible measures have been implemented. The Basin is currently classified a nonattainment area for four criteria pollutants.

REGIONAL AIR QUALITY PLANNING FRAMEWORK

The 1976 Lewis Air Quality Management Act established the SCAQMD and other air districts throughout the State. The federal CAA Amendments of 1977 required that each state adopt an implementation plan outlining pollution control measures to attain the federal standards in nonattainment areas of the state.

The ARB coordinates and oversees both State and federal air pollution control programs in California. It oversees activities of local air quality management agencies and is responsible for incorporating air quality management plans for local air basins into a State Implementation Plan (SIP) for EPA approval. The ARB maintains air quality monitoring stations throughout the State in conjunction with local air districts. Data collected at these stations are used by the ARB to classify air basins as “attainment” or “nonattainment” with respect to each pollutant and to monitor progress in attaining air quality standards. The ARB has divided the State into 15 air basins. Significant authority for air quality control within them has been given to local air districts that regulate stationary source emissions and develop local nonattainment plans.

Regional Air Quality Management Plan (AQMP)

The SCAQMD and the SCAG are responsible for formulating and implementing the AQMP for the SCAB. Every 3 years the SCAQMD prepares a new AQMP, updating the previous plan and having a 20-year horizon. The SCAQMD adopted the 2003 AQMP in August 2003 and forwarded it to ARB for review and approval. The ARB approved a modified version of the 2003 AQMP and forwarded it to the EPA in October 2003 for review and approval.

The 2003 AQMP updates the attainment demonstration for the federal standards for O_3 and PM_{10}; replaces the 1997 attainment demonstration for the federal CO standard and provides a basis for a maintenance plan for CO for the future; and updates the maintenance plan for the federal NO_2 standard that the SCAB has met since 1992. The 2003 AQMP proposes policies and measures to achieve federal and State standards for healthful air quality in the SCAB.

This revision to the AQMP also addresses several State and federal planning requirements and incorporates significant new scientific data, primarily in the form of updated emissions inventories, ambient measurements, new meteorological episodes, and new air quality modeling tools. This AQMP is consistent with and builds upon the approaches taken in the 1997 AQMP and the 1999

Amendments to the ozone SIP for the SCAB for the attainment of the federal ozone air quality standard. However, this revision points to the urgent need for additional emission reductions (beyond those incorporated in the 1997/1999 Plan) to offset increased emission estimates from mobile sources and meet all federal criteria pollutant standards within the timeframes allowed under the federal Clean Air Act.

The SCAQMD adopted the 2007 AQMP on June 1, 2007, which it describes as a regional and multiagency effort (i.e., the SCAQMD Governing Board, ARB, SCAG, and EPA). State and federal planning requirements will include developing control strategies, attainment demonstration, reasonable further progress, and maintenance plans. The 2007 AQMP also incorporates significant new scientific data, primarily in the form of updated emissions inventories, ambient measurements, new meteorological episodes, and new air quality modeling tools. The ARB approved the 2007 AQMP on September 27, 2007, and adopted it as part of the 2007 SIP. SCAQMD has forwarded the 2007 AQMP to the EPA for its review and approval.

THRESHOLDS OF SIGNIFICANCE

A project would normally be considered to have a significant effect on air quality if it would violate any AAQS, contribute substantially to an existing air quality violation, expose sensitive receptors to substantial pollutants concentrations, or conflict with adopted environmental plans and goals of the community in which it is located.

In addition to the federal and State AAQS, there are daily and quarterly emissions thresholds for construction and operation of a proposed project in the Basin. The Basin is administered by the SCAQMD, and guidelines and emissions thresholds established by the SCAQMD in its CEQA Air Quality Handbook (SCAQMD, April 1993) are used in this analysis. It should be noted that the emission thresholds were established based on the attainment status of the air basin in regard to air quality standards for specific criteria pollutants. Because the concentration standards were set at a level that protects public health with an adequate margin of safety (EPA), these emission thresholds are regarded as conservative and would overstate an individual project's contribution to health risks.

Thresholds for Construction Emissions

The following CEQA significance thresholds for construction emissions have been established for the Basin:

- 75 pounds per day (lbs/day) of reactive organic compounds (ROCs)
- 100 lbs/day of NO_X
- 550 lbs/day of CO
- 150 lbs/day of PM_{10}
- 55 lbs/day of $PM_{2.5}$
- 150 lbs/day of sulfur oxides (SO_X)

Projects in the Basin with construction-related emissions that exceed any of the emission thresholds should be considered to be significant under CEQA.

Thresholds for Operational Emissions

The daily operational emissions "significance" thresholds for the Basin are as follows.

Emission Thresholds for Pollutants with Regional Effects. Projects with operations-related emissions that exceed any of the emission thresholds listed below are considered significant under the SCAQMD guidelines.

- 55 lbs/day of ROCs
- 55 lbs/day of NO_X
- 550 lbs/day of CO
- 150 lbs/day of PM_{10}
- 55 lbs/day of $PM_{2.5}$
- 150 lbs/day of SO_X

Local Microscale Concentration Standards. The significance of localized project impacts under CEQA depends on whether ambient CO levels in the vicinity of the project are above or below State and federal CO standards. If ambient levels are below the standards, a project is considered to have a significant impact if project emissions result in an exceedance of one or more of these standards. If ambient levels already exceed a State or federal standard, project emissions are considered significant if they increase 1-hour CO concentrations by 1.0 part per million (ppm) or more or 8-hour CO concentrations by 0.45 ppm or more. The following are applicable local emission concentration standards for CO:

- California State 1-hour CO standard of 20.0 ppm
- California State 8-hour CO standard of 9.0 ppm

Thresholds for Localized Significance

The SCAQMD published their *Final Localized Significance Threshold Methodology* in June 2003, recommending that all air quality analyses include an assessment of both construction and operational impacts on the air quality of nearby sensitive receptors. LSTs represent the maximum emissions from a project site that are not expected to result in an exceedance of the national or state AAQS shown in Table A. LSTs are based on the ambient concentrations of that pollutant within the project source receptor area (SRA) and the distance to the nearest sensitive receptor. For this project, the appropriate Source Receptor Area (SRA) for the LST is the West San Bernardino Valley area (Area 37). The project site is larger than 5 ac; therefore, air dispersion modeling was performed to determine potential impacts. The nearest sensitive receptors are to the west of the project site boundary approximately 90 feet (27 meters) from the property line.

Operational thresholds for a 5 ac site at 25 meters:

- 270 lbs/day of NO_X
- 1,720 lbs/day of CO
- 4 lbs/day of PM_{10}
- 2 lb/day of $PM_{2.5}$

IMPACTS AND MITIGATION

Air pollutant emissions associated with the project would occur over the short term from construction activities, such as fugitive dust from site preparation and grading and emissions from equipment exhaust. There would be long-term regional emissions associated with project-related vehicular trips and stationary source emissions due to energy consumption, such as natural gas and electricity usage by the proposed project. Long-term local CO emissions at intersections in the project vicinity are not expected to be significantly affected by project-related traffic.

CONSTRUCTION IMPACTS

Construction activities produce combustion emissions from various sources such as utility engines, on-site heavy-duty construction vehicles, equipment hauling materials to and from the site, asphalt paving, and motor vehicles transporting the construction crew. Exhaust emissions from construction activities envisioned on site would vary daily as construction activity levels change. The use of construction equipment on site would result in localized exhaust emissions.

Construction activities associated with new development occurring on site would temporarily increase localized PM_{10}, $PM_{2.5}$, ROC, NO_X, and CO concentrations in the project vicinity. The primary sources of construction-related ROC and NO_X emissions are gasoline- and diesel-powered, heavy-duty mobile construction equipment such as scrapers and motor graders. Primary sources of PM_{10} and $PM_{2.5}$ emissions would be clearing activities, excavation and grading operations, construction vehicle traffic on unpaved ground, and wind blowing over exposed earth surfaces.

Emissions generated from construction activities are anticipated to cause temporary increases in pollutant concentrations that could contribute to the continuing violations of the federal and State maximum concentration standards. The frequency and concentrations of such violations would depend on several factors, including the soil composition on site, the amount of soil disturbed, wind speed, the number and type of machinery used, the construction schedule, and the proximity of other construction and demolition projects.

Based on the construction operation estimates provided by W.J. McKeever, Inc., the site would require approximately 295,000 cubic yards of cut and fill. The grading is anticipated to be balanced on site. Table E lists the construction emissions estimates. The construction emission calculations are included in Appendix A. It is assumed that grading will not start until site preparation is finished and, similarly, that building construction will not start until grading is finished. Table E shows that construction equipment/vehicle emissions during grading periods would exceed the SCAQMD NO_X threshold during the grading phase.

Table E: Peak-Day Construction Emissions (lbs/day) by Phase[1]

Construction Phase	CO	ROCs	NO_X	SO_X	PM_{10}[2]	$PM_{2.5}$	CO_2
Site Preparation	37.2	7.9	88.2	12.7	8.8	4.7	11,213
Grading	89.1	19.1	238.7	40.1	10.3	6.9	26,043
Building	38.1	8.2	66.7	5.0	4.0	3.7	17,574
Paving	55.2	10.0	86.1	7.7	4.3	4.0	19,460
SCAQMD Emission Threshold	**550**	**75**	**100**	**150**	**150**	**55**	**—**
Exceed Significance?	**NO**	**NO**	**YES**	**NO**	**NO**	**NO**	**NA**

Source: LSA Associates, Inc., July 2008.
[1] It is assumed that there is no overlap of these construction phases.
[2] Total PM_{10} daily emission rate with fugitive dust mitigation measures implemented.

CO = carbon monoxide
CO_2 = carbon dioxide
lbs/day = pounds per day
NA = not applicable
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
ROCs = reactive organic compounds
SCAQMD = South Coast Air Quality Management District
SO_X = sulfur oxides

Fugitive Dust

Fugitive dust emissions are generally associated with land clearing, exposure, and cut-and-fill operations. Dust generated daily during construction would vary substantially, depending on the level of activity, the specific operations, and weather conditions. Nearby sensitive receptors and on-site workers may be exposed to blowing dust, depending upon prevailing wind conditions. Fugitive dust also would be generated as construction equipment or trucks travel on unpaved areas of the construction site.

$PM_{2.5}$ and PM_{10} emissions from grading operations during a peak construction day are based on the LST analysis techniques published by SCAQMD (see Appendix A).

Architectural Coatings

Architectural coatings contain VOCs that are similar to ROCs and are part of the O_3 precursors. At this stage of project planning, no detailed architectural coatings information is available. Compliance with SCAQMD Rule 1113 on the use of architectural coatings should be considered sufficient. A very rough approximation of exterior wall area, based on planned floor space and ignoring the reduction for doors and windows, gives an approximate 80,000 sf area to cover. Using the SCAQMD CEQA VOC emission factor for architectural coatings of 2.08 pounds per gallon and assuming a 1-mil-thick coat translates to 18.5 pounds of VOC per 1,000 sf of coating. This predicts total project emissions of 1,480 pounds of VOC. Assuming a 1-month period of coating application and 22 workdays per month, the result is a total of 67 pounds of VOC emitted per day from the application of architectural coatings. Architectural coatings would potentially occur while grading is being conducted within a different portion of the project site. When combined with the 19 pounds of ROC generated per day by the construction equipment, the total organic compounds released per day would be 86 pounds, exceeding the SCAQMD's 75 lbs/day construction threshold.

Localized Significance Analysis

Table F lists the construction-related LSTs for the West San Bernardino Valley area as calculated using ISCST3 air dispersion modeling, the ambient pollutant concentrations as shown in Table D and following the SCAQMD LST methodology. The LST dispersion analysis calculations are included in Appendix C.

Table F: Construction LST Modeling Results

Category	Maximum Increase in Ambient Concentrations for Off-Site Sensitive Receptors During Project Construction
PM_{10} (24-hour Average)	
Maximum Concentration Increase (µg/m^3)	50.1
Threshold (µg/m^3)	10.4
Over/(Under)	39.7
Adverse Concentration	Yes
$PM_{2.5}$ (24-hour Average)	
Maximum Concentration Increase (µg/m^3)	11.6
Threshold (µg/m^3)	10.4
Over/(Under)	1.2
Adverse Concentration	Yes
NO_2 (1-hour Average)	
Maximum Concentration Increase (µg/m^3)	180
Threshold (µg/m^3) (AAQS – ambient)	155
Over/(Under)	25
Adverse Concentration	Yes
CO (1-Hour Average)	
Maximum Concentration Increase (µg/m^3)	2,200
Threshold (µg/m^3) (AAQS – ambient)	18,657
Over/(Under)	(16,457)
Adverse Concentration	No
CO (8-Hour Average)	
Maximum Concentration Increase (µg/m^3)	310
Threshold (µg/m^3) (AAQS – ambient)	7,143
Over/(Under)	(6,833)
Adverse Concentration	

Source : LSA Associates, Inc. May 2009.
AAQS = ambient air quality standards
CO = carbon monoxide
µg/m^3 = microgram of pollutant per cubic meter of air
NO_2 = nitrogen dioxide
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
PM_{10} = particulate matter less than 10 microns in size

Summary of Construction Emissions

Based on the above information, with implementation of feasible measures during construction of the proposed project, emissions from construction equipment exhaust and soil disturbance would be

minimized. Construction emissions from the project would exceed the SCAQMD daily emissions thresholds for NO_X and ROC and resulting concentrations of NO_2, PM_{10}, and $PM_{2.5}$ would exceed their LST thresholds.

The emissions generated during the peak grading period (Table E) are anticipated to be much higher than the emissions generated during the construction of the on-site structures. Therefore, any emissions generated during periods of overlap between project operations and final construction would be lower than those shown in Table E.

LONG-TERM REGIONAL AIR QUALITY IMPACTS

Long-term air emission impacts are those associated with stationary sources and mobile sources related to any change related to the proposed project. The proposed development would consist of church facilities and recreational facilities. The stationary source emissions from this land use would come from its consumption of natural gas and electricity. Based on the traffic study prepared for this project (LSA, June 2008), the proposed project would generate 58 daily trips on Saturdays and 334 daily trips on Sundays in 2009 (opening year). In 2013 (project build-out) the proposed project would generate 58 daily trips on Saturdays and 800 daily trips on Sundays. Using the default emission factors included in URBEMIS2007 (Version 9.2.4), emissions associated with project-related vehicular trips were calculated and are included in Table G. As the URBEMIS2007 model does not calculate emissions from electrical consumption, the emission rates listed in Table A9-11-B of the SCAQMD CEQA Handbook were used to calculate the emissions from the estimated electrical usage of 490 megawatt hours (mWh)/year (1.34 mWh/day). The proposed project's electrical consumption emissions are included with the Sunday emissions listed in Table G.

Table G: Operational Emissions

Source	Pollutants, lbs/day					
	CO	**ROGs**	**NO_X**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
2009 Opening Year						
Saturday: Soccer Complex	7.2	0.6	0.8	0.0	0.9	0.2
Sunday: Church	35.0	3.2	6.4	0.2	5.3	1.1
2009 Maximum Emissions	**35.0**	**3.2**	**6.4**	**0.2**	**5.3**	**1.1**
2013 Project Build-out						
Saturday: Soccer Complex	5.7	0.4	0.6	0.0	0.9	0.2
Sunday: Church	60.6	5.8	10.4	0.3	12.6	2.5
2013 Maximum Emissions	**60.6**	**5.8**	**10.4**	**0.3**	**12.6**	**2.5**
SCAQMD Threshold	**550**	**55**	**55**	**150**	**150**	**55**
Exceed SCAQMD Threshold?[1]	**No/No**	**No/No**	**No/No**	**No/No**	**No/No**	**No/No**

Source: LSA Associates, Inc., July 2009.
[1] Reporting status for 2009/2013 scenarios.
CO = carbon monoxide
lbs/day = pounds per day
NA = not applicable
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
ROGs = reactive organic gases
SCAQMD = South Coast Air Quality Management District
SO_2 = sulfur dioxide

Implementation of the proposed greenhouse gas/climate change mitigation measures would reduce the proposed project's natural gas and electrical consumption by 10 percent. Table H lists the proposed project's operational emissions after mitigation. As shown in Tables G and H, the project's emissions would not exceed the SCAQMD daily emissions thresholds. Therefore, the proposed project's impact is less than significant, and no mitigation measures are required. The URBEMIS2007 model runs are included in Appendix B.

Table H: Mitigated Operational Emissions

Source	Pollutants, lbs/day					
	CO	ROGs	NO_X	SO_2	PM_{10}	$PM_{2.5}$
2009 Opening Year						
Saturday: Soccer Complex	7.2	0.6	0.8	0.0	0.9	0.2
Sunday: Church	34.9	3.2	6.3	0.1	5.2	1.0
2009 Maximum Emissions	**34.9**	**3.2**	**6.3**	**0.1**	**5.2**	**1.0**
2013 Project Build-out						
Saturday: Soccer Complex	5.7	0.4	0.6	0.0	0.9	0.2
Sunday: Church	60.4	5.8	10.2	0.2	12.1	2.4
2013 Maximum Emissions	**60.4**	**5.8**	**10.2**	**0.2**	**12.1**	**2.4**
SCAQMD Threshold	**550**	**55**	**55**	**150**	**150**	**55**
Exceed SCAQMD Threshold?[1]	**No/No**	**No/No**	**No/No**	**No/No**	**No/No**	**No/No**

Source: LSA Associates, Inc., July 2009.

LONG-TERM MICROSCALE (CO HOT SPOT) ANALYSIS

Vehicular trips associated with the proposed project would contribute to the congestion at intersections and along roadway segments in the project vicinity. Localized air quality effects would occur when emissions from vehicular traffic increase in local areas as a result of the proposed project. The primary mobile source pollutant of local concern is CO, which is a direct function of vehicle idling time and, thus, traffic flow conditions. CO transport is extremely limited; it disperses rapidly with distance from the source under normal meteorological conditions. However, under certain extreme meteorological conditions, CO concentrations proximate to a congested roadway or intersection may reach unhealthful levels affecting local sensitive receptors (residents, school children, the elderly, hospital patients, etc). Typically, high CO concentrations are associated with roadways or intersections operating at unacceptable levels of service or with extremely high traffic volumes. In areas with high ambient background CO concentration, modeling is recommended to determine a project's effect on local CO levels.

The intersection vehicle turn volumes were used in the California Department of Transportation (Caltrans) CALINE4 model to evaluate local CO concentrations at intersections most affected by project traffic. Per EPA guidelines, the highest of the second-highest CO concentrations measured within the past 3 years were used as the background levels. At the San Bernardino Monitoring Station, the background concentrations are 3.3 ppm for the 1-hour period and 2.2 ppm for the 8-hour period.

The traffic analysis prepared by LSA Associates, Inc. (2008) evaluated the existing, opening year (2009), project build-out year (2013), and future (2030) traffic conditions in the project vicinity. To determine the proposed project's impact on the local air quality, the CO levels were modeled at six

intersections in the project area. These six intersections represent the intersections with the highest traffic volumes in the project area. Tables I, J, K, and L list the CO concentrations that would result at the six intersections for the existing, opening year (2009), build-out year (2013), and future (2030) conditions, respectively. The CALINE4 model printouts are included in Appendix D.

Table I: Existing CO Concentrations[1]

Intersection	Receptor to Road Centerline Distance (Meters)	Existing 1-Hour CO Concentration (ppm)	Existing 8-Hour CO Concentration (ppm)	Exceeds State Standards	
				1-Hr	8-Hr
Daley Canyon Road and SR-189	8	4.2	2.8	No	No
	8	4.2	2.8	No	No
	8	4.2	2.8	No	No
	8	4.1	2.8	No	No
Bear Springs Road and SR-18	12	4.2	2.8	No	No
	12	4.2	2.8	No	No
	12	4.2	2.8	No	No
	12	4.2	2.8	No	No
Project Access and SR-18	12	4.2	2.8	No	No
	12	4.2	2.8	No	No
	10	4.2	2.8	No	No
	10	4.1	2.8	No	No
Daley Canyon Road and SR-18	12	4.4	3.0	No	No
	12	4.2	2.8	No	No
	12	4.2	2.8	No	No
	8	4.1	2.8	No	No
Daley Canyon Road and Daley Canyon Access	8	4.2	2.8	No	No
	8	4.1	2.8	No	No
	8	4.1	2.8	No	No
	8	4.1	2.8	No	No
Daley Canyon Access and SR-18	10	4.1	2.8	No	No
	10	4.0	2.7	No	No
	10	4.0	2.7	No	No
	8	4.0	2.7	No	No

Source: LSA Associates, Inc., July 2008.

[1] Includes ambient 1-hour concentration of 3.3 ppm and ambient 8-hour concentration of 2.2 ppm. Measured at the San Bernardino Monitoring Station.

CO = carbon monoxide
ppm = parts per million
SR-18 = State Route 18
SR-189 = State Route 189

Table J: 2009 CO Concentrations[1]

Intersection	Receptor to Road Centerline Distance (Meters)	Project Related Increase 1-Hour/8-Hour (ppm)	Without/With Project 1-Hour CO Concentration (ppm)	Without/With Project 8-Hour CO Concentration (ppm)	Exceeds State Standards	
					1-Hr	8-Hr
Daley Canyon Road and SR-189	8 / 8	0.2 / 0.1	4.3 / 4.5	2.9 / 3.0	No	No
	8 / 8	0.2 / 0.1	4.3 / 4.5	2.9 / 3.0	No	No
	8 / 8	0.1 / 0.1	4.3 / 4.4	2.9 / 3.0	No	No
	8 / 8	0.1 / 0.1	4.2 / 4.3	2.8 / 2.9	No	No
Bear Springs Road and SR-18	12 / 12	0.2 / 0.1	4.3 / 4.5	2.9 / 3.0	No	No
	12 / 12	0.1 / 0.1	4.3 / 4.4	2.9 / 3.0	No	No
	12 / 12	0.2 / 0.2	4.2 / 4.4	2.8 / 3.0	No	No
	12 / 12	0.2 / 0.2	4.2 / 4.4	2.8 / 3.0	No	No
Project Access and SR-18	12 / 12	0.2 / 0.1	4.3 / 4.5	2.9 / 3.0	No	No
	12 / 12	0.3 / 0.2	4.2 / 4.5	2.8 / 3.0	No	No
	10 / 10	0.3 / 0.2	4.2 / 4.5	2.8 / 3.0	No	No
	10 / 10	0.2 / 0.1	4.1 / 4.3	2.8 / 2.9	No	No
Daley Canyon Road and SR-18	12 / 12	0.2 / 0.2	4.5 / 4.7	3.0 / 3.2	No	No
	12 / 12	0.2 / 0.1	4.3 / 4.5	2.9 / 3.0	No	No
	8 / 8	0.2 / 0.2	4.2 / 4.4	2.8 / 3.0	No	No
	8 / 8	0.2 / 0.2	4.2 / 4.4	2.8 / 3.0	No	No
Daley Canyon Road and Daley Canyon Access	8 / 8	0.1 / 0.1	4.2 / 4.3	2.8 / 2.9	No	No
	8 / 8	0.1 / 0.1	4.2 / 4.3	2.8 / 2.9	No	No
	8 / 8	0.1 / 0.0	4.1 / 4.2	2.8 / 2.8	No	No
	8 / 8	0.1 / 0.0	4.1 / 4.2	2.8 / 2.8	No	No
Daley Canyon Access and SR-18	10 / 10	0.1 / 0.0	4.1 / 4.2	2.8 / 2.8	No	No
	10 / 10	0.1 / 0.1	4.0 / 4.1	2.7 / 2.8	No	No
	10 / 10	0.1 / 0.1	4.0 / 4.1	2.7 / 2.8	No	No
	8 / 8	0.0 / 0.0	4.0 / 4.0	2.7 / 2.7	No	No

Source: LSA Associates, Inc., July 2008.

[1] Includes ambient 1-hour concentration of 3.3 ppm and ambient 8-hour concentration of 2.2 ppm. Measured at the San Bernardino Monitoring Station.

CO = carbon monoxide
ppm = parts per million
SR-18 = State Route 18
SR-189 = State Route 189

Table K: 2013 CO Concentrations[1]

Intersection	Receptor to Road Centerline Distance (Meters)	Project Related Increase 1-Hour/8-Hour (ppm)	Without/With Project 1-Hour CO Concentration (ppm)	Without/With Project 8-Hour CO Concentration (ppm)	Exceeds State Standards	
					1-Hr	8-Hr
Daley Canyon Road and SR-189	8 / 8	0.2 / 0.1	4.1 / 4.3	2.8 / 2.9	No	No
	8 / 8	0.2 / 0.1	4.1 / 4.3	2.8 / 2.9	No	No
	8 / 8	0.2 / 0.1	4.0 / 4.2	2.7 / 2.8	No	No
	8 / 8	0.2 / 0.2	3.9 / 4.1	2.6 / 2.8	No	No
Bear Springs Road and SR-18	12 / 12	0.3 / 0.2	4.0 / 4.3	2.7 / 2.9	No	No
	12 / 12	0.2 / 0.1	4.0 / 4.2	2.7 / 2.8	No	No
	12 / 12	0.2 / 0.1	4.0 / 4.2	2.7 / 2.8	No	No
	12 / 12	0.2 / 0.1	4.0 / 4.2	2.7 / 2.8	No	No
Project Access and SR-18	12 / 12	0.5 / 0.3	4.1 / 4.6	2.8 / 3.1	No	No
	12 / 12	0.5 / 0.3	4.0 / 4.5	2.7 / 3.0	No	No
	10 / 10	0.4 / 0.3	4.0 / 4.4	2.7 / 3.0	No	No
	10 / 10	0.4 / 0.3	3.9 / 4.3	2.6 / 2.9	No	No
Daley Canyon Road and SR-18	12 / 12	0.5 / 0.4	4.2 / 4.7	2.8 / 3.2	No	No
	12 / 8	0.3 / 0.2	4.1 / 4.4	2.8 / 3.0	No	No
	8 / 8	0.4 / 0.3	4.0 / 4.4	2.7 / 3.0	No	No
	8 / 8	0.3 / 0.2	4.0 / 4.3	2.7 / 2.9	No	No
Daley Canyon Road and Daley Canyon Access	8 / 8	0.2 / 0.1	4.0 / 4.2	2.7 / 2.8	No	No
	8 / 8	0.2 / 0.1	4.0 / 4.2	2.7 / 2.8	No	No
	8 / 8	0.2 / 0.2	3.9 / 4.1	2.6 / 2.8	No	No
	8 / 8	0.2 / 0.2	3.9 / 4.1	2.6 / 2.8	No	No
Daley Canyon Access and SR-18	10 / 10	0.1 / 0.1	3.9 / 4.0	2.6 / 2.7	No	No
	10 / 10	0.1 / 0.0	3.8 / 3.9	2.6 / 2.6	No	No
	10 / 10	0.1 / 0.0	3.8 / 3.9	2.6 / 2.6	No	No
	8 / 8	0.1 / 0.0	3.8 / 3.9	2.6 / 2.6	No	No

Source: LSA Associates, Inc., July 2008.

[1] Includes ambient 1-hour concentration of 3.3 ppm and ambient 8-hour concentration of 2.2 ppm. Measured at the San Bernardino Monitoring Station.

CO = carbon monoxide
ppm = parts per million
SR-18 = State Route 18
SR-189 = State Route 189

Table L: 2030 CO Concentrations[1]

Intersection	Receptor to Road Centerline Distance (Meters)	Project Related Increase 1-Hour/8-Hour (ppm)	Without/With Project 1-Hour CO Concentration (ppm)	Without/With Project 8-Hour CO Concentration (ppm)	Exceeds State Standards	
					1-Hr	8-Hr
Daley Canyon Road and SR-189	8 / 8	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
	8 / 8	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
	8 / 8	0.0 / 0.0	3.7 / 3.7	2.5 / 2.5	No	No
	8 / 8	0.0 / 0.0	3.7 / 3.7	2.5 / 2.5	No	No
Bear Springs Road and SR-18	12 / 12	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
	12 / 12	0.0 / 0.0	3.7 / 3.7	2.5 / 2.5	No	No
	12 / 12	0.1 / 0.1	3.6 / 3.7	2.4 / 2.5	No	No
	12 / 12	0.1 / 0.1	3.6 / 3.7	2.4 / 2.5	No	No
Project Access and SR-18	12 / 12	0.2 / 0.1	3.7 / 3.9	2.5 / 2.6	No	No
	12 / 12	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
	10 / 10	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
	10 / 10	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
Daley Canyon Road and SR-18	12 / 12	0.2 / 0.1	3.8 / 4.0	2.6 / 2.7	No	No
	8 / 8	0.2 / 0.1	3.7 / 3.9	2.5 / 2.6	No	No
	8 / 8	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
	8 / 8	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
Daley Canyon Road and Daley Canyon Access	8 / 8	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
	8 / 8	0.1 / 0.1	3.7 / 3.8	2.5 / 2.6	No	No
	8 / 8	0.0 / 0.0	3.7 / 3.7	2.5 / 2.5	No	No
	8 / 8	0.0 / 0.0	3.7 / 3.7	2.5 / 2.5	No	No
Daley Canyon Access and SR-18	10 / 10	0.1 / 0.1	3.6 / 3.7	2.4 / 2.5	No	No
	10 / 10	0.0 / 0.0	3.6 / 3.6	2.4 / 2.4	No	No
	10 / 10	0.0 / 0.0	3.6 / 3.6	2.4 / 2.4	No	No
	8 / 8	0.0 / 0.0	3.6 / 3.6	2.4 / 2.4	No	No

Source: LSA Associates, Inc., July 2008.

[1] Includes ambient one-hour concentration of 3.3 ppm and ambient eight-hour concentration of 2.2 ppm. Measured at the San Bernardino Monitoring Station.

CO = carbon monoxide
ppm = parts per million
SR-18 = State Route 18
SR-189 = State Route 189

As shown in Tables I, J, K, and L, none of the six intersections analyzed would have 8-hour CO concentration exceeding federal and State standards of 9 ppm. The 1-hour CO concentration at these intersections would also be below the State standard of 20.0 ppm and below the federal standard of 35 ppm. The proposed project would contribute at most 0.5 ppm to the 1-hour and 0.3 ppm to the 8-hour CO concentrations at these intersections. The proposed project would not have a significant impact on local air quality for CO, and no mitigation measures would be required.

LOCALIZED SIGNIFICANCE

The following analysis was performed per SCAQMD *Final Localized Significance Threshold Methodology* (June 2003). The closest sensitive receptor to the proposed site is located to the west at a distance of approximately 90 feet (27 meters). Thus, LST values for 25 meters were used.

Table M shows the calculated emissions for the proposed operational activities (fully described above) compared to the LSTs for the West San Bernardino Valley area. The localized significance analysis is only supposed to include on-site sources; therefore, the emissions shown include all stationary and 10 percent of the proposed project's mobile sources.

Table M: Summary of Operation Emissions, Localized Significance

	Emission Rates (lbs/day)			
	CO	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Proposed Project	8.0	1.6	1.3	0.3
Localized Significance Threshold	**1,720**	**270**	**4**	**2**
Exceed Significance?	**No**	**No**	**No**	**No**

Source: LSA Associates, Inc., July 2008.
CO = carbon monoxide
lbs/day = pounds per day
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size

Table M shows that all operational emission rates are below the LST thresholds at 25 meters. Therefore, the proposed operational activity will not cause any localized significant air quality impacts.

AIR QUALITY MANAGEMENT PLAN CONSISTENCY

An AQMP describes air pollution control strategies to be taken by a city/county or region classified as a nonattainment area. The main purpose of an AQMP is to bring the area into compliance with the requirements of federal and State air quality standards. CEQA requires that certain proposed projects be analyzed for consistency with the AQMP. For a project to be consistent with the 2007 AQMP, the pollutants emitted from the project should not exceed the SCAQMD daily threshold or cause a significant impact on air quality. However, if feasible mitigation measures are implemented and shown to reduce the impact level from significant to less than significant, the project is deemed consistent with the AQMP. The AQMP uses the assumptions and projections of local planning agencies to determine control strategies for regional compliance status. Since the AQMP is based on local General Plans, projects that are deemed consistent with the General Plan are usually found to be consistent with the AQMP. The proposed project site is currently designated for light industrial uses within the County of San Bernardino's General Plan. The proposed project would generate fewer traffic trips during weekday peak hours and very few on-site emissions when compared to an industrial development. In addition, the proposed project will not exceed the SCAQMD's long-term growth projections and emissions thresholds. Therefore, implementation of the project will not conflict with the 2007 AQMP, and no significant impacts will result.

CUMULATIVE IMPACT

The proposed project area is currently in nonattainment for O_3, PM_{10}, and $PM_{2.5}$. As shown in Table E, construction emissions would exceed the SCAQMD's threshold for NO_X (an O_3 precursor). In addition, the NO_2, $PM_{2.5}$, and PM_{10} concentrations within the project area during grading would exceed their LST thresholds. Construction of the project would contribute cumulatively to the local and regional air pollutants, together with other projects under construction. Therefore, implementation of the proposed project would contribute to significant cumulative air quality impacts.

As shown in Tables G and H, the proposed project's operational emissions would not exceed the SCAQMD's long-term emission thresholds. Therefore, the project would not contribute to a long-term cumulative air quality impact.

MITIGATION MEASURES

Standard Conditions

Construction Impacts. The project is required to comply with regional rules that assist in reducing short-term air pollutant emissions. SCAQMD Rule 403 requires that fugitive dust be controlled with best available control measures so that the presence of such dust does not remain visible in the atmosphere beyond the property line of the emission source. In addition, SCAQMD Rule 402 requires implementation of dust suppression techniques to prevent fugitive dust from creating a nuisance off site. Applicable dust suppression techniques from Rule 403 are summarized below. Implementation of these dust suppression techniques can reduce the fugitive dust generation (and thus the PM_{10} component). Compliance with these rules would reduce impacts on nearby sensitive receptors.

The following are the applicable Rule 403 Measures:

- Apply nontoxic chemical soil stabilizers according to manufacturers' specifications to all inactive construction areas (previously graded areas inactive for 10 days or more).
- Water active sites at least twice daily. (Locations where grading is to occur will be thoroughly watered prior to earthmoving.)
- All trucks hauling dirt, sand, soil, or other loose materials are to be covered or should maintain at least two feet of freeboard in accordance with the requirements of California Vehicle Code (CVC) Section 23114 (freeboard means vertical space between the top of the load and top of the trailer).
- Pave construction access roads at least 100 feet onto the site from main road.
- Traffic speeds on all unpaved roads shall be reduced to 15 mph or less.

Additional Mitigation Measures

Construction Impacts.

A. Additional dust suppression measures in the SCAQMD CEQA Air Quality Handbook are included as part of the project's mitigation.

- Revegetate disturbed areas with native vegetation as soon as possible.
- All excavating and grading operations shall be suspended when wind speeds (as instantaneous gusts) exceed 25 mph.
- When visible soil materials are carried to adjacent streets, those streets shall be swept once per day to the extent necessary to remove the visible soil material (recommend water sweepers with reclaimed water).
- Install wheel washers where vehicles enter and exit unpaved roads onto paved roads, or wash trucks and any equipment leaving the site each trip.
- All on-site roads shall be paved as soon as feasible, watered periodically, or chemically stabilized.
- The area disturbed by clearing, grading, earthmoving, or excavation operations shall be minimized at all times.

B. The Construction Contractor shall select the construction equipment used on site based on low emission factors and high energy efficiency. The Construction Contractor shall ensure that construction grading plans include a statement that all construction equipment will be tuned and maintained in accordance with the manufacturer's specifications.

C. The Construction Contractor shall utilize electric or diesel powered equipment in lieu of gasoline powered engines where feasible.

D. The Construction Contractor shall ensure that construction grading plans include a statement that work crews will shut off equipment when not in use. During smog season (May through October), the overall length of the construction period will be extended, thereby decreasing the size of the area prepared each day, to minimize vehicles and equipment operating at the same time.

E. The Construction Contractor shall time the construction activities so as to not interfere with peak-hour traffic and minimize obstruction of through traffic lanes adjacent to the site; if necessary, a flagperson shall be retained to maintain safety adjacent to existing roadways.

F. The Construction Contractor shall support and encourage ridesharing and transit incentives for the construction crew.

G. For those applications for which suitable products are commercially available, the construction contractors shall use "Super Compliant" architectural coatings. A list of "Super-Compliant" paint manufacturers is available at: http://www.aqmd.gov/prdas/brochures/paintguide.html.

H. Prior to issuance of any grading or building permit, the project plans and specifications shall include a statement that at least 50 percent of nonhazardous construction and demolition debris (including but not limited to soil, vegetation, concrete, lumber, metal, and cardboard) shall be recycled, salvaged, or reused. The statement in the plans and specifications shall be reviewed and approved by the Planning Department

The above mitigation measures will reduce the construction impacts to the extent feasible.

Operational Impacts. Although the proposed project will not result in any long-term air quality impacts, the following measures will be implemented to reduce the potential global warming/climate change impacts:

A. Prior to issuance of a building permit, the applicant shall demonstrate that the design of the proposed buildings or structures exceeds the requirements set forth in Title 24 Part 6 of the California Code of Regulations; Energy Efficiency Standards for Residential and Non Residential Buildings, as amended October 1, 2005, by a minimum of 10 percent, subject to review by the County Building Official. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval prior to issuance of the permit. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

B. Prior to issuance of a building permit, the applicant shall demonstrate that the design of the proposed buildings or structures incorporates basic or enhanced insulation such that heat transfer and thermal bridging is minimized. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

C. Heating and cooling systems will be designed for maximum efficiency by limiting air leakage through the structure. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

D. Prior to issuance of a building permit, the applicant shall demonstrate that the design of the proposed buildings or structures incorporates ENERGY STAR™ rated windows or better. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

E. Prior to issuance of a building permit, the applicant shall demonstrate that the design of the proposed buildings or structures incorporates ENERGY STAR™ rated space heating and cooling equipment or better. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

F. Prior to issuance of a building permit, the applicant shall demonstrate that the design of the proposed buildings or structures incorporates ENERGY STAR™ rated light fixtures or better. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

G. Prior to issuance of a building permit, the applicant shall demonstrate that the design of the proposed buildings or structures includes consideration of/installation/operation of renewable electric generation systems. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

H. Prior to issuance of a building permit, the applicant shall demonstrate that the design of the proposed building or structure designs incorporate energy efficient hot water systems. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

I. Prior to the issuance of a building permit, the applicant shall demonstrate that provisions for future solar panels have been designed into all main buildings. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval.

J. Prior to issuance of a building permit, the applicant shall demonstrate that the proposed building or structure designs incorporate interior and exterior storage areas for recyclables and green waste and adequate recycling containers located in public areas. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

K. Prior to issuance of a building permit, the applicant shall demonstrate that measures have been included to promote ride sharing programs such as, but not necessarily including publishing ride sharing information for all of the participants in church activities, designating a certain percentage of parking spaces for ride sharing vehicles, designating adequate passenger loading/unloading and waiting areas for ride sharing vehicles, and providing a website or message board for coordinating rides. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

L. Prior to issuance of a building permit, the applicant shall demonstrate that measures have been included to provide adequate bicycle parking near building entrances to promote cyclist safety, security, and convenience. Documentation of compliance with this measure shall be provided to the Planning Department and Building Official for review and approval. Installation of the

identified mitigation measures or equipment will be confirmed by the County Building Official prior to certificate of occupancy.

Implementation of these measures would reduce the proposed project's stationary source emissions (natural gas and electrical consumption) by 10 percent.

REFERENCES

California Air Resources Board website: http://www.arb.ca.gov.

Caltrans 1988. Air Quality Technical Analysis Notes.

Caltrans 1997. Transportation Project-Level Carbon Monoxide Protocol.

LSA Associates, Inc., June 2008. Church of the Woods Traffic Analysis.

South Coast Air Quality Management District. CEQA Air Quality Handbook. 1993.

South Coast Air Quality Management District. Air Quality Management Plan. 2003 and 2007.

Western Regional Climate Center website: http://www.wrcc.dri.edu.

APPENDIX A

CONSTRUCTION EMISSIONS CALCULATIONS

Construction Summary By Phase and Equipment

Site Preparation

Vehicle Description	No. of Vehicle	Hours	Trips	Length	CO	VOC	NOx	SOx	PM10	PM2.5
Rubber Tired Dozers	3	8.0			23	4.9	65	11	4.5	2.8
Tractors/Loaders/Backhoes	2	8.0			6.7	2.0	13	1.8	4.1	1.8
Haul Trucks			5	25	7	0.9	9	0.009	0.2	0.1
Water Trucks			3	6.9	1.1	0.15	1.4	0.0016	0.030	0.028
Worker Trips			24	40	15	0.61	2.4	0.013	0.15	0.11
Total Emissions					**37**	**7.9**	**88**	**12.7**	**8.8**	**4.7**
SCAQMD Emissions Threshold					**550**	**75**	**100**	**150**	**150**	**55**
Exceed Significance?					**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Grading

Vehicle Description	No. of Vehicle	Hours	Trips	Length	CO	VOC	NOx	SOx	PM10	PM2.5
Rubber Tired Dozers	4	8.0			30	6.5	87	14.5	3.5	3.2
Scrapers	4	8.0			24	6.1	84	15.9	0.0	0.0
Graders	4	8.0			17.3	3.6	43	8.8	2.2	2.0
Tractors/Loaders/Backhoes	1	8.0			3	1.0	6	0.9	4.3	1.4
Haul Trucks			10	25	13.1	1.8	17	0.019	0.31	0.29
Water Trucks			3	6.4	1.0	0.14	1.3	0.0014	0.020	0.018
Worker Trips			24	40	15	0.61	2.4	0.013	0.15	0.11
Total Emissions					**89**	**19.1**	**239**	**40**	**10.3**	**6.9**
SCAQMD Emissions Threshold					**550**	**75**	**100**	**150**	**150**	**55**
Exceed Significance?					**NO**	**NO**	**YES**	**NO**	**NO**	**NO**

Building of 100,000 Square Foot Structure

Vehicle Description	No. of Vehicle	Hours	Trips	Length	CO	VOC	NOx	SOx	PM10	PM2.5
Cranes	2	8.0			5.6	1.28	15.1	3.1	0.78	0.72
Forklifts	2	8.0			4.1	1.2	7	0.0	0.8	0.7
Tractors/Loaders/Backhoes	2	8.0			6.7	2.0	13	1.8	1.3	1.2
Generator Sets	2	8.0			5.0	1.44	10.2	0.0160	0.75	0.69
Electric Welders	1	8.0			N/A	N/A	N/A	N/A	N/A	N/A
Haul Trucks			10	30	15.7	2.18	20.5	0.0225	0.38	0.35
Water Trucks			3	6.4	1.0	0.14	1.3	0.0014	0.020	0.018
Worker Trips			24	40	15	0.61	2.4	0.013	0.15	0.11
Total Emissions					**38**	**8.2**	**67**	**5.0**	**4.0**	**3.7**
SCAQMD Emissions Threshold					**550**	**75**	**100**	**150**	**150**	**55**
Exceed Significance?					**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Asphalt Paving of Parking Lot

Vehicle Description	No. of Vehicle	Hours	Trips	Length	CO	VOC	NOx	SOx	PM10	PM2.5
Pavers	1	8.0			3.4	0.69	6.0	1.3	0.42	0.39
Rollers	2	8.0			5.8	1.09	10.4	2.2	0.74	0.68
Paving Equipment	2	8.0			6.5	1.7	14	2.3	1.04	0.96
Cement and Mortar Mixers	1	8.0			0.37	0.08	0.58	0.00	0.040	0.037
Tractors/Loaders/Backhoes	2	8.0			6.7	2.0	12.8	1.84	1.33	1.22
Haul Trucks			20	30	31	4.4	41	0.045	0.75	0.69
Water Trucks			3	6.4	1.0	0.14	1.3	0.0014	0.020	0.018
Worker Trips			24	40	15	0.61	2.4	0.013	0.15	0.11
Total Emissions					**55**	**10.0**	**86**	**7.7**	**4.3**	**4.0**
SCAQMD Emissions Threshold					**550**	**75**	**100**	**150**	**150**	**55**
Exceed Significance?					**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Five Acre Site - Site Preparation Phase

Construction Activity			
Five Acre Site	Site Preparation	218,000	Square Feet[a]
Site Preparation Schedule -	**20**	**days[a]**	

Equipment Type[a,b]	No. of Equipment	hr/day	Crew Size
Rubber Tired Dozers	3	8.0	10
Tractors/Loaders/Backhoes	2	8.0	

Construction Equipment Emission Factors

Equipment Type[c]	CO lb/hr	NOx lb/hr	PM10 lb/hr
Rubber Tired Dozers	0.952	2.728	0.108
Tractors/Loaders/Backhoes	0.420	0.799	0.083

Fugitive Dust Clearing Parameters

Silt Content[d]	Moisture Content[d]
6.9	7.9

Fugitive Dust Stockpiling Parameters

Silt Content[d]	Precipitation Days[e]	Mean Wind Speed Percent[f]	TSP Fraction	Area[g] (acres)
6.9	10	100	0.5	0.21

Fugitive Dust Material Handling

Aerodynamic Particle Size Multiplier[h]	Mean Wind Speed[i] mph	Moisture Content[d]	Dirt Handled[a] cy	Debris Handled[a] cy	Dirt Handled[j] lb/day
0.35	10	7.9	10,000	185	1,250,000

Construction Vehicle (Mobile Source) Emission Factors

	CO lb/mile	NOx lb/mile	PM10 lb/mile
Heavy-Duty Truck[k]	0.026167	0.034155	0.000626
	11.869	15.492	0.284

Five Acre Site - Site Preparation Phase

Construction Worker Number of Trips and Trip Length

Vehicle	No. of One-Way Trips/Day	One WayTrip Length (miles)
Haul Truck[l]	5	0.1
Water Truck[m]	3	6.9

Incremental Increase in Onsite Combustion Emissions from Construction Equipment

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day

Equipment Type	CO lb/day	NOx lb/day	PM10 lb/day
Rubber Tired Dozers	22.85	65.47	2.59
Tractors/Loaders/Backhoes	6.72	12.78	1.33
Total	**29.6**	**78.3**	**3.92**

Incremental Increase in Fugitive Dust Emissions from Construction Operations

Equations:

Clearing[n]: PM10 Emissions (lb/day) = 0.75 x (silt content$^{1.5}$)/(moisture content$^{1.4}$) x hours operated (hr/day) x (1 - control efficiency)

Storage Piles[o]: PM10 Emissions (lb/day) = 1.7 x (silt content/1.5) x ((365-precipitation days)/235) x wind speed percent/15 x TSP fraction x Area) x (1 - control efficiency)

Material Handling[p]: PM10 Emissions (lb/day) = (0.0032 x aerodynamic particle size multiplier x (wind speed (mph)/5)$^{1.3}$/(moisture content/2)$^{1.4}$ x dirt handled (lb/day)/2,000 (lb/ton) (1 - control efficiency)

Description	Control Efficiency %	Unmitigated PM10 lb/day	Mitigated PM10[q] lb/day
Clearing	68	6.02	1.93
Storage Piles	68	8.27	2.65
Material Handling	68	0.25	0.08
Total		**14.5**	**4.66**

Five Acre Site - Site Preparation Phase

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicles

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

	CO	NOx	PM10
Vehicle	lb/day	lb/day	lb/day
Haul Truck	0.03	0.03	0.001
Water Truck	1.08	1.41	0.030
Total	**1.11**	**1.44**	**0.03**

Total Incremental Localized Emissions from Construction Activities

	CO	NOx	PM10
Sources	lb/day	lb/day	lb/day
On-site Emissions	**30.7**	**79.7**	**8.6**
Significance Threshold[r]	***1,147***	***439***	***14***
Exceed Significance?	**NO**	**NO**	**NO**

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a) SCAQMD, estimated from survey data, Sept 2004

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically.

c) SCAB values provided by the ARB, Aug 2004. Assumed equipment is diesel fueled.

d) USEPA, AP-42, July 1998, Table 11.9-3 Typical Values for Corection Factors Applicable to the Predictive Emission Factor Equations

e) Table A9-9-E2, SCAQMD CEQA Air Quality Handbook, 1993

f) Mean wind speed percent - percent of time mean wind speed exceeds 12 mph

g) Assumed storage piles are 0.21 acres in size

h) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggretate Handling and Storage Piles, p 13.2.4-3 Aerodynamic particle size multiplier for < 10 µm

i) Mean wind speed - maximum of daily average wind speeds reported in 1981 meteorological data.

j) Assuming 10,000 cubic yards of dirt handled [(10,000 cyd x 2,500 lb/cyd)/20 days = 1,250,000 lb/day]

k) CARB, EMFAC2002 (version 2.2) Burden Model, Winter 2005, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

l) Assumed 30 cubic yd truck capacity 10,000 cyd of dirt and 185 cyd of debris [(10,185 cyd x truck/30 cyd)/20 days = 5 one-way truck trips]. Assumed haul truck travels 0.1 miles through facility

m) Assumed six foot wide water truck traverses over 218,000 square feet of disturbed area

n) USEPA, AP-42, July 1998, Table 11.9-1, Equation for bulldozer, overburden, ≤ 10 µm

o) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggretate Handling and Storage Piles, Equation 1

p) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, Sept 1992, EPA-450/2-92-004, Equation 2-12

q) Includes watering at least three times a day per Rule 403 (68% control efficiency).

r) Thresholds for the West San Bernardino Valley (Area 37) Source Receptor Area (SRA) at 25 meters.

Five Acre Site - Grading Phase

Construction Activity

Five Acre Site		Grading	218,000	Square Feet[a]
Grading Schedule -	**50**	**days[a]**		

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Rubber Tired Dozers	4	8.0	10
Scrapers	4	8.0	
Graders	4	8.0	
Tractors/Loaders/Backhoes	1	8.0	

Construction Equipment Emission Factors

Equipment Type[c]	**CO** lb/hr	**NOx** lb/hr	**PM10** lb/hr
Rubber Tired Dozers	0.952	2.728	0.108
Scrapers	0.748	2.625	0.105
Graders	0.540	1.331	0.069
Tractors/Loaders/Backhoes	0.420	0.799	0.083

Fugitive Dust Grading Parameters

Vehicle Speed (mph)[d]	**Vehicle Miles Traveled[e]**
3	0.08

Fugitive Dust Stockpiling Parameters

Silt Content[f]	**Precipitation Days[g]**	**Mean Wind Speed Percent[h]**	**TSP Fraction**	**Area[i] (acres)**
6.9	10	100	0.5	0.21

Fugitive Dust Material Handling

Aerodynamic Particle Size Multiplier[j]	**Mean Wind Speed[k]** mph	**Moisture Content[f]**	**Dirt Handled[a]** cy	**Dirt Handled[l]** lb/day
0.35	10	7.9	295,000	14,750,000

Construction Vehicle (Mobile Source) Emission Factors

CO lb/mile	**NOx** lb/mile	**PM10** lb/mile

Heavy-Duty Truck[m]	0.026167	0.034155	0.000626	

Five Acre Site - Grading Phase

Construction Worker Number of Trips and Trip Length

Vehicle	No. of One-Way Trips/Day	One WayTrip Length (miles)
Haul Truck[n]	10	0.1
Water Truck[o]	3	6.4

Incremental Increase in Onsite Combustion Emissions from Construction Equipmen

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

Equipment Type	CO lb/day	NOx lb/day	PM10 lb/day
Rubber Tired Dozers	30.46	87.30	3.46
Scrapers	23.94	84.00	3.36
Graders	17.28	42.59	2.21
Tractors/Loaders/Backhoes	3.36	6.39	0.66
Total	**75.0**	**220.3**	**9.69**

Incremental Increase in Fugitive Dust Emissions from Construction Operation

Equations:

Grading[p]: PM10 Emissions (lb/day) = 0.60 x 0.051 x mean vehicle speed$^{2.0}$ x VMT x (1 - control efficiency)

Storage Piles[q]: PM10 Emissions (lb/day) = 1.7 x (silt content/1.5) x ((365-precipitation days)/235) x wind speed percent/15 x TSP fraction x Area) x (1 - control efficiency)

Material Handling[r]: PM10 Emissions (lb/day) = (0.0032 x aerodynamic particle size multiplier x (wind speed (mph)/5)$^{1.3}$/(moisture content/2)$^{1.4}$ x dirt handled (lb/day)/2,000 (lb/ton) (1 - control efficiency)

Description	Control Efficiency %	Unmitigated PM10 lb/day	Mitigated PM10[s] lb/day
Earthmoving	68	0.02	0.01
Storage Piles	68	8.27	2.65
Material Handling	68	2.97	0.95
Total		**11.26**	**3.61**

Five Acre Site - Grading Phase

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicle

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

	CO	NOx	PM10
Vehicle	lb/day	lb/day	lb/day
Haul Truck	0.05	0.07	0.00
Water Truck	1.00	1.31	0.02
Total	**1.05**	**1.38**	**0.02**

Total Incremental Localized Emissions from Construction Activities

	CO	NOx	PM10
Sources	lb/day	lb/day	lb/day
On-site Emissions	**76.1**	**221.7**	**13.3**
Significance Threshold[t]	***1,147***	***439***	***14***
Exceed Significance?	**NO**	**NO**	**NO**

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a) SCAQMD, estimated from survey data, Sept 2004

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Aug 2004. Assumed equipment is diesel fueled.

d) Caterpillar Performance Handbook, Edition 33, October 2003 Operating Speeds, p 2-3.

e) Assuming 295,000 cubic yards of dirt handled [(295,000 cyd x 2,500 lb/cyd)/50 days = 14,750,000 lb/day]

f) USEPA, AP-42, July 1998, Table 11.9-3 Typical Values for Corection Factors Applicable to the Predictive Emission Factor Equations

g) Table A9-9-E2, SCAQMD CEQA Air Quality Handbook, 1993

h) Mean wind speed percent - percent of time mean wind speed exceeds 12 mph. At least one meteorological site recorded wind speeds greater than 12 mph over a 24-hour period in 1981.

i) Assumed storage piles are 0.21 acres in size

j) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggretate Handling and Storage Piles, p 13.2.4-3 Aerodynamic particle size multiplier for < 10 µm

k) Mean wind speed - maximum of daily average wind speeds reported in 1981 meteorological data.

l) Assuming 295,000 cubic yards of dirt handled [(295,000 cyd x 2,500 lb/cyd)/50 days = 14,750,000 lb/day]

m) CARB, EMFAC2002 (version 2.2) Burden Model, Winter 2005, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

n) Assumed 30 cubic yd truck capacity 295,000 cyd of dirt [(295,000 cyd x truck/30 cyd)/50 days = 10 one-way truck trips/day]. Assumed haul truck travels 0.1 miles through facility

o) Assumed six foot wide water truck traverses over 218,000 square feet of disturbed area

p) USEPA, AP-42, July 1998, Table 11.9-1, Equation for Site Grading ≤ 10 µm

q) USEPA, AP-42, Jan 1995, Section 13.2.4 Aggretate Handling and Storage Piles, Equation 1

r) USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, Sept 1992, EPA-450/2-92-004, Equation 2-12

s) Includes watering at least three times a day per Rule 403 (68% control efficiency).

t) Thresholds for the West San Bernardino Valley (Area 37) Source Receptor Area (SRA) at 25 meters.

Five Acre Site - Structure Construction

	Construction Activity		
Five Acre Site	Building	100,000	Square Foot Structure[a]

Construction Schedule

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Cranes	2	8.0	20
Forklifts	2	8.0	
Tractors/Loaders/Backhoes	2	8.0	
Generator Sets	2	8.0	
Electric Welders	1	8.0	

Construction Equipment Combustion Emission Factors

Equipment Type[c]	**CO** lb/hr	**NOx** lb/hr	**PM10** lb/hr
Cranes	0.350	0.941	0.049
Forklifts	0.254	0.432	0.048
Tractors/Loaders/Backhoes	0.420	0.799	0.083
Generator Sets	0.315	0.635	0.047
Electric Welders	N/A	N/A	N/A

Construction Vehicle (Mobile Source) Emission Factors

	CO lb/mile	**NOx** lb/mile	**PM10** lb/mile
Heavy-Duty Truck[d]	0.026167	0.034155	0.000626

Construction Worker Number of Trips and Trip Length

Vehicle	**No. of One-Way Trips/Day**	**Trip Length (miles)**
Flatbed Truck[a,e]	10	0.1
Water Truck[f]	3	6.4

Five Acre Site - Structure Construction

Incremental Increase in Onsite Combustion Emissions from Construction Equipment

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day)

	CO	NOx	PM10
Equipment Type	lb/day	lb/day	lb/day
Cranes	5.60	15.06	0.78
Forklifts	4.06	6.91	0.77
Tractors/Loaders/Backhoes	6.72	12.78	1.33
Generator Sets	5.04	10.16	0.75
Electric Welders	N/A	N/A	N/A
Total	**21.4**	**44.9**	**3.6**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicles

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

	CO	NOx	PM10
Vehicle	lb/day	lb/day	lb/day
Flatbed Truck	0.05	0.07	0.00
Water Truck	1.00	1.31	0.02
Total	**1.05**	**1.38**	**0.02**

Total Incremental Combustion Emissions from Construction Activities

	CO	NOx	PM10
Sources	lb/day	lb/day	lb/day
On-Site Emissions	**22.5**	**46.3**	**3.7**
Significance Threshold[g]	***1,147***	***439***	***14***
Exceed Significance?	**NO**	**NO**	**NO**

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a) SCAQMD, estimated from survey data, Sept 2004

b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Aug 2004. Assumed equipment is diesel fueled except the welders which are powered by the generator.

d) CARB, EMFAC2002 (version 2.2) Burden Model, Winter 2005, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

e) Assumed haul truck travels 0.1 miles through facility

f) Assumed six foot wide water truck traverses over 200,000 square feet of disturbed area

g) Thresholds for the West San Bernardino Valley (Area 37) Source Receptor Area (SRA) at 25 meters.

Five Acre Site - Architectural Coating and Asphalt Paving

		Construction Activity
Five Acre Site		Architectural Coating and Asphalt Paving of Parking Lot
Construction Schedule -	**20**	**days**[a]

Equipment Type[a,b]	**No. of Equipment**	**hr/day**	**Crew Size**
Pavers	1	8.0	20
Rollers	2	8.0	
Paving Equipment	2	8.0	
Cement and Mortar Mixers	1	8.0	
Tractors/Loaders/Backhoes	2	8.0	

Construction Equipment Combustion Emission Factors

	CO	**NOx**	**PM10**
Equipment Type[c]	lb/hr	lb/hr	lb/hr
Pavers	0.429	0.745	0.053
Rollers	0.360	0.648	0.046
Paving Equipment	0.408	0.885	0.065
Cement and Mortar Mixers	0.046	0.072	0.005
Tractors/Loaders/Backhoes	0.420	0.799	0.083

Construction Vehicle (Mobile Source) Emission Factors

	CO	**NOx**	**PM10**
	lb/mile	lb/mile	lb/mile
Heavy-Duty Truck[d]	0.026167	0.034155	0.000626

Construction Worker Number of Trips and Trip Length

Vehicle	**No. of One-Way Trips/Day**	**Trip Length (miles)**
Delivery Truck[e]	20	0.1
Water Truck[f]	3	6.4

Five Acre Site - Architectural Coating and Asphalt Paving

Incremental Increase in Onsite Combustion Emissions from Construction Equipment

Equation: Emission Factor (lb/BHP-hr) x No. of Equipment x Work Day (hr/day) x Equipment rating (hp) x Load Factor (%/100) = Onsite Construction Emissions (lb/day

	CO	NOx	PM10
Equipment Type	lb/day	lb/day	lb/day
Pavers	3.43	5.96	0.42
Rollers	5.76	10.37	0.74
Paving Equipment	6.53	14.16	1.04
Cement and Mortar Mixers	0.37	0.58	0.04
Tractors/Loaders/Backhoes	6.72	12.78	1.33
Total	**22.8**	**43.8**	**3.6**

Incremental Increase in Onsite Combustion Emissions from Onroad Mobile Vehicles

Equation: Emission Factor (lb/mile) x No. of One-Way Trips/Day x 2 x Trip length (mile) = Mobile Emissions (lb/day)

	CO	NOx	PM10
Vehicle	lb/day	lb/day	lb/day
Delivery Truck	0.10	0.14	0.00
Water Truck	1.00	1.31	0.02
Total	**1.10**	**1.45**	**0.02**

Total Incremental Combustion Emissions from Construction Activities

	CO	NOx	PM10
Sources	lb/day	lb/day	lb/day
On-Site Emissions	**23.9**	**45.3**	**3.6**
Significance Threshold[g]	***1,147***	***439***	***14***
Exceed Significance?	**NO**	**NO**	**NO**

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b) Equipment name must match CARB Off-Road Model (see Off-Road Model EF worksheet) equipment name for sheet to look up EFs automatically

c) SCAB values provided by the ARB, Aug 2004. Assumed equipment is diesel fueled except the welders which are powered by the generator.

d) CARB, EMFAC2002 (version 2.2) Burden Model, Winter 2005, 75 F, 40% RH: EF, lb/yr = (EF, ton/yr x 2,000 lb/ton)/VMT

e) Assumed haul truck travels 0.1 miles through facility

f) Assumed six foot wide water truck traverses over 200,000 square feet of disturbed area

g) Thresholds for the West San Bernardino Valley (Area 37) Source Receptor Area (SRA) at 25 meters.

APPENDIX B

URBEMIS2007 MODEL PRINTOUTS

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\Keithl\Application Data\Urbemis\Version9a\Projects\CofW 2009 Sat.urb924

Project Name: Church of the Woods Saturday 2009

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.13	0.02	1.60	0.00	0.00	0.00	2.75

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.44	0.65	5.62	0.01	0.89	0.17	530.11

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.57	0.67	7.22	0.01	0.89	0.17	532.86

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Hearth							
Landscape	0.13	0.02	1.60	0.00	0.00	0.00	2.75
Consumer Products	0.00						
Architectural Coatings	0.00						
TOTALS (lbs/day, unmitigated)	0.13	0.02	1.60	0.00	0.00	0.00	2.75

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Soccer Complex	0.44	0.65	5.62	0.01	0.89	0.17	530.11
TOTALS (lbs/day, unmitigated)	0.44	0.65	5.62	0.01	0.89	0.17	530.11

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Soccer Complex		28.73	unknown	2.00	57.46	515.59
					57.46	515.59

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.6	1.4	98.2	0.4
Light Truck < 3750 lbs	7.4	2.7	93.2	4.1
Light Truck 3751-5750 lbs	22.9	0.4	99.6	0.0
Med Truck 5751-8500 lbs	10.6	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.6	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.5	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.9	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.5	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.8	71.4	28.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Soccer Complex				2.0	1.0	97.0

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Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\Keithl\Application Data\Urbemis\Version9a\Projects\CofW 2009 Sat.urb924

Project Name: Church of the Woods Saturday 2009

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.50	0.78	5.43	0.00	0.89	0.17	480.28

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.50	0.78	5.43	0.00	0.89	0.17	480.28

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Hearth

Landscaping - No Winter Emissions							
Consumer Products	0.00						
Architectural Coatings	0.00						
TOTALS (lbs/day, unmitigated)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Soccer Complex	0.50	0.78	5.43	0.00	0.89	0.17	480.28
TOTALS (lbs/day, unmitigated)	0.50	0.78	5.43	0.00	0.89	0.17	480.28

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 60 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Soccer Complex		28.73	unknown	2.00	57.46	515.59
					57.46	515.59

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.6	1.4	98.2	0.4
Light Truck < 3750 lbs	7.4	2.7	93.2	4.1
Light Truck 3751-5750 lbs	22.9	0.4	99.6	0.0
Med Truck 5751-8500 lbs	10.6	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.6	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.5	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.9	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.5	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.8	71.4	28.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Soccer Complex				2.0	1.0	97.0

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\Keithl\Application Data\Urbemis\Version9a\Projects\CofW 2009 Sun.urb924

Project Name: Church of the Woods 2009 Sunday

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.37	0.37	1.90	0.00	0.00	0.00	428.12

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	2.75	3.78	32.80	0.03	5.20	1.02	3,094.93

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	3.12	4.15	34.70	0.03	5.20	1.02	3,523.05

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.03	0.35	0.30	0.00	0.00	0.00	425.37

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Hearth - No Summer Emissions

Landscape	0.13	0.02	1.60	0.00	0.00	0.00	2.75
Consumer Products	0.00						
Architectural Coatings	0.21						
TOTALS (lbs/day, unmitigated)	0.37	0.37	1.90	0.00	0.00	0.00	428.12

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Place of worship	2.75	3.78	32.80	0.03	5.20	1.02	3,094.93
TOTALS (lbs/day, unmitigated)	2.75	3.78	32.80	0.03	5.20	1.02	3,094.93

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Place of worship		9.11	1000 sq ft	36.67	334.06	3,009.75
					334.06	3,009.75

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.6	1.4	98.2	0.4
Light Truck < 3750 lbs	7.4	2.7	93.2	4.1
Light Truck 3751-5750 lbs	22.9	0.4	99.6	0.0
Med Truck 5751-8500 lbs	10.6	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.6	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.5	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.9	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.5	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.8	71.4	28.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Place of worship				3.0	1.5	95.5

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Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\Keithl\Application Data\Urbemis\Version9a\Projects\CofW 2009 Sun.urb924

Project Name: Church of the Woods 2009 Sunday

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.24	0.35	0.30	0.00	0.00	0.00	425.37

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	2.98	4.56	31.69	0.03	5.20	1.02	2,804.05

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	3.22	4.91	31.99	0.03	5.20	1.02	3,229.42

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.03	0.35	0.30	0.00	0.00	0.00	425.37

Hearth	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landscaping - No Winter Emissions							
Consumer Products	0.00						
Architectural Coatings	0.21						
TOTALS (lbs/day, unmitigated)	0.24	0.35	0.30	0.00	0.00	0.00	425.37

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Place of worship	2.98	4.56	31.69	0.03	5.20	1.02	2,804.05
TOTALS (lbs/day, unmitigated)	2.98	4.56	31.69	0.03	5.20	1.02	2,804.05

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2009 Temperature (F): 60 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Place of worship		9.11	1000 sq ft	36.67	334.06	3,009.75
					334.06	3,009.75

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.6	1.4	98.2	0.4
Light Truck < 3750 lbs	7.4	2.7	93.2	4.1
Light Truck 3751-5750 lbs	22.9	0.4	99.6	0.0
Med Truck 5751-8500 lbs	10.6	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.6	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.5	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.9	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.5	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.8	71.4	28.6	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Place of worship				3.0	1.5	95.5

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Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\Keithl\Application Data\Urbemis\Version9a\Projects\CofW 2013 Sat.urb924

Project Name: Church of the Woods Saturday 2013

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.12	0.02	1.55	0.00	0.01	0.01	2.81

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.32	0.47	4.12	0.01	0.89	0.17	531.05

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.44	0.49	5.67	0.01	0.90	0.18	533.86

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Hearth							
Landscape	0.12	0.02	1.55	0.00	0.01	0.01	2.81
Consumer Products	0.00						
Architectural Coatings	0.00						
TOTALS (lbs/day, unmitigated)	0.12	0.02	1.55	0.00	0.01	0.01	2.81

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Soccer Complex	0.32	0.47	4.12	0.01	0.89	0.17	531.05
TOTALS (lbs/day, unmitigated)	0.32	0.47	4.12	0.01	0.89	0.17	531.05

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2013 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Soccer Complex		28.73	unknown	2.00	57.46	515.59
					57.46	515.59

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.3	0.4	99.4	0.2
Light Truck < 3750 lbs	7.3	1.4	95.9	2.7
Light Truck 3751-5750 lbs	23.1	0.4	99.6	0.0
Med Truck 5751-8500 lbs	10.7	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.6	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.5	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.9	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.6	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.8	53.6	46.4	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Soccer Complex				2.0	1.0	97.0

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Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\Keithl\Application Data\Urbemis\Version9a\Projects\CofW 2013 Sat.urb924

Project Name: Church of the Woods Saturday 2013

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.35	0.57	3.95	0.00	0.89	0.17	480.60

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.35	0.57	3.95	0.00	0.89	0.17	480.60

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Hearth							
Landscaping - No Winter Emissions							
Consumer Products	0.00						
Architectural Coatings	0.00						
TOTALS (lbs/day, unmitigated)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Soccer Complex	0.35	0.57	3.95	0.00	0.89	0.17	480.60
TOTALS (lbs/day, unmitigated)	0.35	0.57	3.95	0.00	0.89	0.17	480.60

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2013 Temperature (F): 60 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Soccer Complex		28.73	unknown	2.00	57.46	515.59
					57.46	515.59

4/17/2009 10:06:38 AM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.3	0.4	99.4	0.2
Light Truck < 3750 lbs	7.3	1.4	95.9	2.7
Light Truck 3751-5750 lbs	23.1	0.4	99.6	0.0
Med Truck 5751-8500 lbs	10.7	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.6	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.5	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.9	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.6	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.8	53.6	46.4	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Soccer Complex				2.0	1.0	97.0

4/17/2009 10:10:00 AM

Urbemis 2007 Version 9.2.4

Combined Summer Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\Keithl\Application Data\Urbemis\Version9a\Projects\CofW 2013 Sun.urb924

Project Name: Church of the Woods 2013 Sunday

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.69	0.87	2.26	0.00	0.01	0.01	1,021.52

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	4.81	6.58	57.62	0.08	12.45	2.42	7,425.19

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	5.50	7.45	59.88	0.08	12.46	2.43	8,446.71

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.06	0.85	0.71	0.00	0.00	0.00	1,018.71

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Hearth - No Summer Emissions

Landscape	0.12	0.02	1.55	0.00	0.01	0.01	2.81
Consumer Products	0.00						
Architectural Coatings	0.51						
TOTALS (lbs/day, unmitigated)	0.69	0.87	2.26	0.00	0.01	0.01	1,021.52

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Summer Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Place of worship	4.81	6.58	57.62	0.08	12.45	2.42	7,425.19
TOTALS (lbs/day, unmitigated)	4.81	6.58	57.62	0.08	12.45	2.42	7,425.19

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2013 Temperature (F): 80 Season: Summer

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Place of worship		9.11	1000 sq ft	87.82	800.04	7,207.96
					800.04	7,207.96

4/17/2009 10:10:00 AM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.3	0.4	99.4	0.2
Light Truck < 3750 lbs	7.3	1.4	95.9	2.7
Light Truck 3751-5750 lbs	23.1	0.4	99.6	0.0
Med Truck 5751-8500 lbs	10.7	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.6	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.5	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.9	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.6	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.8	53.6	46.4	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Place of worship				3.0	1.5	95.5

4/17/2009 10:10:27 AM

Urbemis 2007 Version 9.2.4

Combined Winter Emissions Reports (Pounds/Day)

File Name: C:\Documents and Settings\Keithl\Application Data\Urbemis\Version9a\Projects\CofW 2013 Sun.urb924

Project Name: Church of the Woods 2013 Sunday

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

Summary Report:

AREA SOURCE EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	0.57	0.85	0.71	0.00	0.00	0.00	1,018.71

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	5.12	7.91	55.19	0.06	12.45	2.42	6,719.94

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
TOTALS (lbs/day, unmitigated)	5.69	8.76	55.90	0.06	12.45	2.42	7,738.65

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOx	CO	SO2	PM10	PM2.5	CO2
Natural Gas	0.06	0.85	0.71	0.00	0.00	0.00	1,018.71

Hearth	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Landscaping - No Winter Emissions							
Consumer Products	0.00						
Architectural Coatings	0.51						
TOTALS (lbs/day, unmitigated)	0.57	0.85	0.71	0.00	0.00	0.00	1,018.71

Area Source Changes to Defaults

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Winter Pounds Per Day, Unmitigated

Source	ROG	NOX	CO	SO2	PM10	PM25	CO2
Place of worship	5.12	7.91	55.19	0.06	12.45	2.42	6,719.94
TOTALS (lbs/day, unmitigated)	5.12	7.91	55.19	0.06	12.45	2.42	6,719.94

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2013 Temperature (F): 60 Season: Winter

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Place of worship		9.11	1000 sq ft	87.82	800.04	7,207.96
					800.04	7,207.96

4/17/2009 10:10:27 AM

Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.3	0.4	99.4	0.2
Light Truck < 3750 lbs	7.3	1.4	95.9	2.7
Light Truck 3751-5750 lbs	23.1	0.4	99.6	0.0
Med Truck 5751-8500 lbs	10.7	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.6	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.5	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.9	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.6	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.8	53.6	46.4	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			
% of Trips - Commercial (by land use)						
Place of worship				3.0	1.5	95.5

APPENDIX C

LOCALIZED SIGNIFICANCE ANALYSIS

Table 1: Ambient Pollutant Concentrations Measured at the San Bernardino Air Monitoring Station

Pollutant	Standard	2005	2006	2007
CO	Maximum 1-hr concentration (ppm)	3.8	2.8	3.7
CO	Maximum 8-hr concentration (ppm)	2.5	2.2	2.3
PM_{10}	Maximum 24-hr concentration (µg/m^3)	72	92	219
$PM_{2.5}$	Maximum 24-hr concentration (µg/m^3)	106.2	55	72.1
NO_2	Maximum 1-hr concentration (ppm)	0.098	0.088	0.083

µg/m^3 = (ppm x MW x 1,000)/(24.5 L/mol at 25 C)

Table 2: Emission Rates from Table E in the AQ Report

Source	Emission Rate (lb/day)			
	NO_X	**CO**	**PM_{10}**	**$PM_{2.5}$**
Construction Emissions				
Construction Exhaust and Fugitive Dust	**238.7**	**89.1**	**13.6**	**6.9**

Table 3: Construction-Related Concentrations

number of area sources: **3** **Hrs/day:** **8**

Direction	Distance (m)	Unitized NO_X/CO 1-Hr conc. ug/m^3	1-Hr Concentrations NO_2 [1] µg/m^3 at 239 lb/day	1-Hr Concentrations CO µg/m^3 at 89 lb/day	Unitized CO 8-Hr conc. ug/m^3	8-Hr Conc. CO µg/m^3 at 89 lb/day	Unitized PM_{10} 24-Hr conc. ug/m^3	24-Hr Conc. PM_{10} µg/m^3 at 13.6 lb/day	Unitized $PM_{2.5}$ 1-Hr conc. ug/m^3	24-Hr Conc. $PM_{2.5}$ µg/m^3 at 6.9 lb/day
West	25	2,671	180.7128546	1249.167198	670.22595	313.5080321	298.4935	50.10935984	320.5056	11.61005868

Note 1: NOx concentration includes the NO_2 to NOx ratio (Final Localized Significance Threshold Methodology, page 2-8)
Note 2: Assumes construction equipment operates 8 hours per day.

Category	Maximum Increase in Ambient Concentrations for Off-Site Sensitive Receptors During Project Construction
PM_{10} (24-hour)[b]	
Maximum Concentration Increase (µg/m^3)	50.1
Threshold (µg/m^3)	10.4
Over/(Under)	39.7
Adverse Concentration	Yes
$PM_{2.5}$ (24-hour)[b]	
Maximum Concentration Increase (µg/m^3)	11.6
Threshold (µg/m^3)	10.4
Over/(Under)	1.2
Adverse Concentration	Yes
NO_2 (1-hour)	
Maximum Concentration Increase (µg/m^3)	180
Threshold (µg/m^3)	155
Over/(Under)	25
Adverse Concentration	Yes
CO (1-Hour)	
Maximum Concentration Increase (µg/m^3)	1,200
Threshold (µg/m^3)	18,657
Over/(Under)	(17,457)
Adverse Concentration	No
CO (8-Hour)	
Maximum Concentration Increase (µg/m^3)	310
Threshold (µg/m^3)	7,143
Over/(Under)	(6,833)
Adverse Concentration	No

Table 2-4. NO2-to-NOx Ratio as a Function of Downwind Distance

Downwind Distance (m)	NO2/NOx Ratio
20	0.053
50	0.059
70	0.064
100	0.074
200	0.114
500	0.258
1000	0.467
2000	0.75
3000	0.9
4000	0.978
5000	1

NO2/NOx Ratio for distance in Table 3: 0.054

```
**
****************************************
**
** ISCST3 Input Produced by:
** AERMOD View Ver. 6.2.0
** Lakes Environmental Software Inc.
** Date: 5/29/2009
** File: P:\CTW430\LST\COTWPM.INP
**
****************************************
**
**
****************************************
** ISCST3 Control Pathway
****************************************
**
**
CO STARTING
   TITLEONE CHURCH OF THE WOODS
   TITLETWO PM10 & PM2.5 CONSTRUCTION EMISSIONS
   MODELOPT CONC DDEP DRYDPLT  URBAN NOCALM
   AVERTIME 24 ANNUAL
   POLLUTID PM
   TERRHGTS ELEV
   RUNORNOT RUN
CO FINISHED
**
****************************************
** ISCST3 Source Pathway
****************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
   LOCATION AREA1 AREA 479663.000 3787688.000 1712.450
   LOCATION AREA2 AREA 479755.400 3787687.741 1707.630
   LOCATION AREA3 AREA 479731.691 3787780.370 1709.630
** Source Parameters **
   SRCPARAM AREA1 0.0001196 1.220 91.440 91.440 0.000 0.000
   SRCPARAM AREA2 0.0001196 1.219 91.440 91.440 0.000
   SRCPARAM AREA3 0.0001196 1.219 91.440 91.440 0.000

** Variable Emissions Type: "By Hour-of-Day"
** Variable Emission Scenario: "Scenario 1"
   EMISFACT AREA1-AREA3 HROFDY 0 0 0 0 0 0
   EMISFACT AREA1-AREA3 HROFDY 1 1 1 1 1 0
   EMISFACT AREA1-AREA3 HROFDY 1 1 1 0 0 0
   EMISFACT AREA1-AREA3 HROFDY 0 0 0 0 0 0
   PARTDIAM AREA1 1 2.5 10
   PARTDIAM AREA2 1 2.5 10
   PARTDIAM AREA3 1 2.5 10
   MASSFRAX AREA1 0.0787 0.1292 0.7922
   MASSFRAX AREA2 0.0787 0.1292 0.7922
   MASSFRAX AREA3 0.0787 0.1292 0.7922
   PARTDENS AREA1 2.3 2.3 2.3
   PARTDENS AREA2 2.3 2.3 2.3
   PARTDENS AREA3 2.3 2.3 2.3
   SRCGROUP ALL
SO FINISHED
**
****************************************
** ISCST3 Receptor Pathway
****************************************
**
**
RE STARTING
** DESCRREC "" ""
   DISCCART    479642.73   3787721.80 1717.72
   DISCCART    479640.13   3787766.06 1726.95
   DISCCART    479594.56   3787779.08 1736.19
   DISCCART    479589.36   3787740.03 1725.43
   DISCCART    479638.82   3787689.26 1714.96
RE FINISHED
**
****************************************
** ISCST3 Meteorology Pathway
****************************************
**
**
ME STARTING
   INPUTFIL redlands.dep
   ANEMHGHT 10 METERS
   SURFDATA 54161 1981 Redlands
   UAIRDATA 99999 1981 Redlands
ME FINISHED
**
****************************************
** ISCST3 Output Pathway
****************************************
```

```
**
**
OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 24 1ST
   PLOTFILE ANNUAL ALL COTWPM.IS\COB9DE~6.PLT
OU FINISHED

***********************************
*** SETUP Finishes Successfully ***
***********************************
```



```
                                          ***     MODEL SETUP OPTIONS SUMMARY       ***
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**Intermediate Terrain Processing is Selected

**Model Is Setup For Calculation of Average CONCentration Values.
**Model Is Setup For Calculation of Dry DEPosition Values.

  --  SCAVENGING/DEPOSITION LOGIC --
**Model Uses DRY DEPLETION.  DDPLETE =  T
**Model Uses NO WET DEPLETION.  WDPLETE =  F
**NO WET SCAVENGING Data Provided.
**NO GAS DRY DEPOSITION Data Provided.
**Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations

**Model Uses URBAN Dispersion.

**Model Uses User-Specified Options:
           1. Final Plume Rise.
           2. Stack-tip Downwash.
           3. Buoyancy-induced Dispersion.
           4. Not Use Calms Processing Routine.
           5. Not Use Missing Data Processing Routine.
           6. Default Wind Profile Exponents.
           7. Default Vertical Potential Temperature Gradients.

**Model Accepts Receptors on ELEV Terrain.

**Model Assumes No FLAGPOLE Receptor Heights.

**Model Calculates  1 Short Term Average(s) of:  24-HR
    and Calculates ANNUAL Averages

**This Run Includes:     3 Source(s);      1 Source Group(s); and       5 Receptor(s)

**The Model Assumes A Pollutant Type of:  PM

**Model Set To Continue RUNning After the Setup Testing.

**Output Options Selected:
         Model Outputs Tables of ANNUAL Averages by Receptor
         Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)
         Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

**Misc. Inputs:  Anem. Hgt. (m) =    10.00 ;    Decay Coef. =    0.000     ;    Rot. Angle =     0.0
                 Emission Units = GRAMS/SEC                                ;  Emission Rate Unit Factor =   0.10000E+07
                 Output Units   = MICROGRAMS/M**3

**Approximate Storage Requirements of Model =     1.2 MB of RAM.

**Input Runstream File:          COTWPM.INP
**Output Print File:             COTWPM.OUT
```


*** AREA SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC /METER**2)	COORD (SW CORNER) X (METERS)	Y (METERS)	BASE ELEV. (METERS)	RELEASE HEIGHT (METERS)	X-DIM OF AREA (METERS)	Y-DIM OF AREA (METERS)	ORIENT. OF AREA (DEG.)	INIT. SZ (METERS)	EMISSION RATE SCALAR VARY BY
AREA1	3	0.11960E-03	479663.0	3787688.0	1712.4	1.22	91.44	91.44	0.00	0.00	HROFDY
AREA2	3	0.11960E-03	479755.4	3787687.8	1707.6	1.22	91.44	91.44	0.00	0.00	HROFDY
AREA3	3	0.11960E-03	479731.7	3787780.2	1709.6	1.22	91.44	91.44	0.00	0.00	HROFDY

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
ALL	AREA1 , AREA2 , AREA3 ,

*** SOURCE PARTICULATE/GAS DATA ***

*** SOURCE ID = AREA1 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.07870, 0.12920, 0.79220,

PARTICLE DIAMETER (MICRONS) =
1.00000, 2.50000, 10.00000,

PARTICLE DENSITY (G/CM**3) =
2.30000, 2.30000, 2.30000,

*** SOURCE ID = AREA2 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.07870, 0.12920, 0.79220,

PARTICLE DIAMETER (MICRONS) =
1.00000, 2.50000, 10.00000,

PARTICLE DENSITY (G/CM**3) =
2.30000, 2.30000, 2.30000,

*** SOURCE ID = AREA3 ; SOURCE TYPE = AREA ***

MASS FRACTION =
0.07870, 0.12920, 0.79220,

PARTICLE DIAMETER (MICRONS) =
1.00000, 2.50000, 10.00000,

PARTICLE DENSITY (G/CM**3) =
2.30000, 2.30000, 2.30000,

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

SOURCE ID = AREA1 ; SOURCE TYPE = AREA :

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.00000E+00
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.00000E+00	17	.00000E+00	18	.00000E+00
19	.00000E+00	20	.00000E+00	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = AREA2 ; SOURCE TYPE = AREA :

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.00000E+00
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.00000E+00	17	.00000E+00	18	.00000E+00
19	.00000E+00	20	.00000E+00	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = AREA3 ; SOURCE TYPE = AREA :

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.00000E+00
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.00000E+00	17	.00000E+00	18	.00000E+00
19	.00000E+00	20	.00000E+00	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZFLAG)
(METERS)

(479642.7,	3787721.8,	1717.7,	0.0);	(479640.1,	3787766.0,	1726.9,	0.0);
(479594.6,	3787779.0,	1736.2,	0.0);	(479589.4,	3787740.0,	1725.4,	0.0);
(479638.8,	3787689.2,	1715.0,	0.0);				

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES; 0=NO)

1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
B	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
C	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00
D	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00
E	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00
F	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: redlands.dep
FORMAT: (4I2,2F9.4,F6.1,I2,2F7.1,f9.4,f10.1,f8.4,i4,f7.2)
SURFACE STATION NO.: 54161 UPPER AIR STATION NO.: 99999
NAME: REDLANDS NAME: REDLANDS
YEAR: 1981 YEAR: 1981

YR	MN	DY	HR	FLOW VECTOR	SPEED (M/S)	TEMP (K)	STAB CLASS	MIXING HEIGHT (M) RURAL	MIXING HEIGHT (M) URBAN	USTAR (M/S)	M-O LENGTH (M)	Z-0 (M)	IPCODE	PRATE (mm/HR)
81	01	01	01	292.3	1.00	284.3	7	522.6	170.0	0.0476	4.5	0.1500	0	0.00
81	01	01	02	282.4	0.00	284.3	7	507.0	170.0	0.0476	4.5	0.1500	0	0.00
81	01	01	03	287.5	0.00	283.1	7	491.4	170.0	0.0476	4.5	0.1500	0	0.00
81	01	01	04	301.0	0.00	283.1	7	475.8	170.0	0.0476	4.5	0.1500	0	0.00

81 01 01 05	286.5	0.00	282.6	7	460.3	170.0	0.0476	4.5	0.1500	0	0.00
81 01 01 06	297.0	0.00	283.1	7	444.7	170.0	0.0476	4.5	0.1500	0	0.00
81 01 01 07	297.0	0.00	285.4	6	1.4	170.7	0.0476	6.4	0.1500	0	0.00
81 01 01 08	314.6	1.00	287.6	5	47.0	192.0	0.1172	-18.8	0.1500	0	0.00
81 01 01 09	299.0	1.00	289.8	4	92.5	213.3	0.1490	-3.9	0.1500	0	0.00
81 01 01 10	54.2	1.34	291.5	3	138.0	234.7	0.1883	-5.4	0.1500	0	0.00
81 01 01 11	89.1	1.79	294.3	3	183.5	256.0	0.2316	-9.0	0.1500	0	0.00
81 01 01 12	103.1	1.34	297.6	2	229.0	277.3	0.1900	-5.1	0.1500	0	0.00
81 01 01 13	87.2	1.34	298.7	2	274.5	298.7	0.1878	-5.5	0.1500	0	0.00
81 01 01 14	124.2	1.79	299.8	3	320.0	320.0	0.2233	-11.7	0.1500	0	0.00
81 01 01 15	134.8	2.24	299.3	3	320.0	320.0	0.2485	-31.8	0.1500	0	0.00
81 01 01 16	98.2	2.24	298.7	4	320.0	320.0	0.1067	10.4	0.1500	0	0.00
81 01 01 17	110.1	2.24	295.4	5	325.6	318.5	0.1067	10.6	0.1500	0	0.00
81 01 01 18	210.1	1.00	291.5	6	357.2	310.3	0.0476	4.6	0.1500	0	0.00
81 01 01 19	268.0	1.00	289.8	7	388.8	302.1	0.0476	4.6	0.1500	0	0.00
81 01 01 20	303.2	1.00	287.0	7	420.4	293.9	0.0476	4.5	0.1500	0	0.00
81 01 01 21	291.1	1.34	286.5	7	452.0	285.7	0.0638	6.1	0.1500	0	0.00
81 01 01 22	294.5	1.34	287.0	7	483.5	277.4	0.0638	6.1	0.1500	0	0.00
81 01 01 23	293.2	0.00	285.9	7	515.1	269.2	0.0476	4.5	0.1500	0	0.00
81 01 01 24	292.2	0.00	285.4	7	546.7	261.0	0.0476	4.5	0.1500	0	0.00

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

CONC DDEP URBAN ELEV NOCALM DRYDPL

*** THE ANNUAL (1 YRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
479642.72	3787721.75	65.59036	479640.12	3787766.00	83.63554
479594.56	3787779.00	39.60800	479589.38	3787740.00	27.37644
479638.81	3787689.25	15.44825			

CONC DDEP URBAN ELEV NOCALM DRYDPL

*** THE ANNUAL (1 YRS) DRY DEPOSITION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** DEPO OF PM IN GRAMS/M**2/YR **

X-COORD (M)	Y-COORD (M)	DEPO	X-COORD (M)	Y-COORD (M)	DEPO
479642.72	3787721.75	12.49056	479640.12	3787766.00	15.81272
479594.56	3787779.00	7.36036	479589.38	3787740.00	5.16930
479638.81	3787689.25	3.32667			

CONC DDEP URBAN ELEV NOCALM DRYDPL

*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF PM IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
479642.72	3787721.75	298.49350	(81123024)	479640.12	3787766.00	292.12601	(81122724)
479594.56	3787779.00	156.64505	(81122724)	479589.38	3787740.00	117.71603	(81111724)
479638.81	3787689.25	200.30580	(81123024)				

CONC DDEP URBAN ELEV NOCALM DRYDPL

*** THE 1ST HIGHEST 24-HR DRY DEPOSITION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

```
                                    ** DEPO OF PM       IN GRAMS/M**2                            **

     X-COORD (M)  Y-COORD (M)        DEPO     (YYMMDDHH)             X-COORD (M)  Y-COORD (M)        DEPO     (YYMMDDHH)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
       479642.72   3787721.75        0.15789  (81123024)               479640.12   3787766.00        0.17127  (81030124)
       479594.56   3787779.00        0.07611  (81122724)               479589.38   3787740.00        0.05623  (81111724)
       479638.81   3787689.25        0.10371  (81123024)

 *** ISCST3 - VERSION 02035 ***    *** CHURCH OF THE WOODS                                                  ***        05/29/09
                                   *** PM10 & PM2.5 CONSTRUCTION EMISSIONS                                  ***        11:49:44
**MODELOPTs:                                                                                                           PAGE  13
CONC        DDEP        URBAN ELEV                                    NOCALM               DRYDPL

                                          *** THE SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***


                                    ** CONC OF PM       IN MICROGRAMS/M**3                       **

                                                                                                   NETWORK
GROUP ID                      AVERAGE CONC               RECEPTOR  (XR, YR, ZELEV, ZFLAG)   OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ALL      1ST HIGHEST VALUE IS      83.63554 AT (  479640.12,  3787766.00,   1726.95,      0.00)  DC      NA
         2ND HIGHEST VALUE IS      65.59036 AT (  479642.72,  3787721.75,   1717.72,      0.00)  DC      NA
         3RD HIGHEST VALUE IS      39.60800 AT (  479594.56,  3787779.00,   1736.19,      0.00)  DC      NA
         4TH HIGHEST VALUE IS      27.37644 AT (  479589.38,  3787740.00,   1725.43,      0.00)  DC      NA
         5TH HIGHEST VALUE IS      15.44825 AT (  479638.81,  3787689.25,   1714.96,      0.00)  DC      NA
         6TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)
         7TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)
         8TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)
         9TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)
        10TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
                      BD = BOUNDARY

 *** ISCST3 - VERSION 02035 ***    *** CHURCH OF THE WOODS                                                  ***        05/29/09
                                   *** PM10 & PM2.5 CONSTRUCTION EMISSIONS                                  ***        11:49:44
**MODELOPTs:                                                                                                           PAGE  14
CONC        DDEP        URBAN ELEV                                    NOCALM               DRYDPL

                                          *** THE SUMMARY OF HIGHEST 24-HR RESULTS ***


                                    ** CONC OF PM       IN MICROGRAMS/M**3                       **

                                                   DATE                                                            NETWORK
GROUP ID                      AVERAGE CONC     (YYMMDDHH)            RECEPTOR  (XR, YR, ZELEV, ZFLAG)     OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ALL      HIGH  1ST HIGH VALUE IS     298.49350  ON 81123024: AT (  479642.72,  3787721.75,   1717.72,      0.00)  DC      NA


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
                      BD = BOUNDARY

 *** ISCST3 - VERSION 02035 ***    *** CHURCH OF THE WOODS                                                  ***        05/29/09
                                   *** PM10 & PM2.5 CONSTRUCTION EMISSIONS                                  ***        11:49:44
**MODELOPTs:                                                                                                           PAGE  15
CONC        DDEP        URBAN ELEV                                    NOCALM               DRYDPL

                                          *** THE SUMMARY OF MAXIMUM ANNUAL (   1 YRS) RESULTS ***


                                    ** DEPO OF PM       IN GRAMS/M**2/YR                         **

                                                                                                   NETWORK
GROUP ID                        DRY DEPO                 RECEPTOR  (XR, YR, ZELEV, ZFLAG)   OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ALL      1ST HIGHEST VALUE IS      15.81272 AT (  479640.12,  3787766.00,   1726.95,      0.00)  DC      NA
         2ND HIGHEST VALUE IS      12.49056 AT (  479642.72,  3787721.75,   1717.72,      0.00)  DC      NA
         3RD HIGHEST VALUE IS       7.36036 AT (  479594.56,  3787779.00,   1736.19,      0.00)  DC      NA
         4TH HIGHEST VALUE IS       5.16930 AT (  479589.38,  3787740.00,   1725.43,      0.00)  DC      NA
         5TH HIGHEST VALUE IS       3.32667 AT (  479638.81,  3787689.25,   1714.96,      0.00)  DC      NA
         6TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)
         7TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)
         8TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)
         9TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)
        10TH HIGHEST VALUE IS       0.00000 AT (       0.00,        0.00,      0.00,      0.00)


 *** RECEPTOR TYPES:  GC = GRIDCART
```

```
                    GP = GRIDPOLR
                    DC = DISCCART
                    DP = DISCPOLR
                    BD = BOUNDARY
```



```
                                             *** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

                                       ** DEPO OF PM       IN GRAMS/M**2                                  **

                                                   DATE                                                              NETWORK
GROUP ID                             DRY DEPO    (YYMMDDHH)           RECEPTOR  (XR, YR, ZELEV, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ALL      HIGH  1ST HIGH VALUE IS       0.17127  ON 81030124: AT (  479640.12,  3787766.00,   1726.95,      0.00)  DC      NA

 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
                      BD = BOUNDARY
```



```
*** Message Summary : ISCST3 Model Execution ***

 --------- Summary of Total Messages --------

A Total of           0 Fatal Error Message(s)
A Total of           0 Warning Message(s)
A Total of        1398 Informational Message(s)

A Total of        1398 Calm Hours Identified

   ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***

   ********   WARNING MESSAGES   ********
              ***  NONE  ***

   ************************************
   *** ISCST3 Finishes Successfully ***
   ************************************
```

```
**
****************************************
**
** ISCST3 Input Produced by:
** AERMOD View Ver. 6.2.0
** Lakes Environmental Software Inc.
** Date: 5/29/2009
** File: P:\CTW430\LST\COTWGas.INP
**
****************************************
**
**
****************************************
** ISCST3 Control Pathway
****************************************
**
**
CO STARTING
   TITLEONE CHURCH OF THE WOODS
   TITLETWO CO and NOx CONSTRUCTION EMISSIONS
   MODELOPT CONC  URBAN NOCALM
   AVERTIME 1 8 24 ANNUAL
   POLLUTID CO
   TERRHGTS ELEV
   RUNORNOT RUN
   ERRORFIL COTWGas.err
CO FINISHED
**
****************************************
** ISCST3 Source Pathway
****************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
   LOCATION AREA1 AREA 479663.000 3787688.000 1712.450
   LOCATION AREA2 AREA 479755.400 3787687.741 1707.630
   LOCATION AREA3 AREA 479731.691 3787780.370 1709.630
** Source Parameters **
   SRCPARAM AREA1 0.0001196 1.220 91.440 91.440 0.000 0.000
   SRCPARAM AREA2 0.0001108 1.219 91.440 91.440 0.000
   SRCPARAM AREA3 0.0001242 1.219 91.440 91.440 0.000

** Variable Emissions Type: "By Hour-of-Day"
** Variable Emission Scenario: "Scenario 1"
   EMISFACT AREA1-AREA3 HROFDY 0 0 0 0 0 0
   EMISFACT AREA1-AREA3 HROFDY 1 1 1 1 1 0
   EMISFACT AREA1-AREA3 HROFDY 1 1 1 0 0 0
   EMISFACT AREA1-AREA3 HROFDY 0 0 0 0 0 0
   SRCGROUP ALL
SO FINISHED
**
****************************************
** ISCST3 Receptor Pathway
****************************************
**
**
RE STARTING
** DESCRREC "" ""
   DISCCART    479642.73   3787721.80 1717.72
   DISCCART    479640.13   3787766.06 1726.95
   DISCCART    479594.56   3787779.08 1736.19
   DISCCART    479589.36   3787740.03 1725.43
   DISCCART    479638.82   3787689.26 1714.96
RE FINISHED
**
****************************************
** ISCST3 Meteorology Pathway
****************************************
**
**
ME STARTING
   INPUTFIL redlands.dep
   ANEMHGHT 10 METERS
   SURFDATA 54161 1981
   UAIRDATA 99999 1981
ME FINISHED
**
****************************************
** ISCST3 Output Pathway
****************************************
**
**
OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 1 1ST
   RECTABLE 8 1ST
   RECTABLE 24 1ST
   PLOTFILE 1 ALL 1ST COTWGAS.IS\COTWGas1.PLT
```

```
   PLOTFILE 8 ALL 1ST COTWGAS.IS\COTWGas8.PLT
   PLOTFILE ANNUAL ALL COTWGAS.IS\CO5A9F~2.PLT
OU FINISHED

************************************
*** SETUP Finishes Successfully ***
************************************


 *** ISCST3 - VERSION 02035 ***    *** CHURCH OF THE WOODS                                                  ***        05/29/09
                                   *** CO and NOx CONSTRUCTION EMISSIONS                                    ***        11:47:03
**MODELOPTs:                                                                                                           PAGE   1
CONC                    URBAN ELEV                                      NOCALM

                                            ***     MODEL SETUP OPTIONS SUMMARY       ***
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**Intermediate Terrain Processing is Selected

**Model Is Setup For Calculation of Average CONCentration Values.

  --  SCAVENGING/DEPOSITION LOGIC --
**Model Uses NO DRY DEPLETION.  DDPLETE =  F
**Model Uses NO WET DEPLETION.  WDPLETE =  F
**NO WET SCAVENGING Data Provided.
**NO GAS DRY DEPOSITION Data Provided.
**Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations

**Model Uses URBAN Dispersion.

**Model Uses User-Specified Options:
           1. Final Plume Rise.
           2. Stack-tip Downwash.
           3. Buoyancy-induced Dispersion.
           4. Not Use Calms Processing Routine.
           5. Not Use Missing Data Processing Routine.
           6. Default Wind Profile Exponents.
           7. Default Vertical Potential Temperature Gradients.

**Model Accepts Receptors on ELEV Terrain.

**Model Assumes No FLAGPOLE Receptor Heights.

**Model Calculates  3 Short Term Average(s) of:   1-HR   8-HR  24-HR
    and Calculates ANNUAL Averages

**This Run Includes:     3 Source(s);      1 Source Group(s); and       5 Receptor(s)

**The Model Assumes A Pollutant Type of:  CO

**Model Set To Continue RUNning After the Setup Testing.

**Output Options Selected:
         Model Outputs Tables of ANNUAL Averages by Receptor
         Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)
         Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

**Misc. Inputs:  Anem. Hgt. (m) =    10.00 ;    Decay Coef. =    0.000     ;    Rot. Angle =     0.0
                 Emission Units = GRAMS/SEC                                 ;  Emission Rate Unit Factor =   0.10000E+07
                 Output Units   = MICROGRAMS/M**3

**Approximate Storage Requirements of Model =     1.2 MB of RAM.

**Input Runstream File:          COTWGas.INP
**Output Print File:             COTWGas.OUT
**Detailed Error/Message File:   COTWGas.err

 *** ISCST3 - VERSION 02035 ***    *** CHURCH OF THE WOODS                                                  ***        05/29/09
                                   *** CO and NOx CONSTRUCTION EMISSIONS                                    ***        11:47:03
**MODELOPTs:                                                                                                           PAGE   2
CONC                    URBAN ELEV                                      NOCALM


                                                  *** AREA SOURCE DATA ***

             NUMBER EMISSION RATE  COORD (SW CORNER)  BASE     RELEASE  X-DIM     Y-DIM    ORIENT.    INIT.  EMISSION RATE
   SOURCE     PART.  (GRAMS/SEC       X        Y      ELEV.    HEIGHT  OF AREA   OF AREA   OF AREA     SZ     SCALAR VARY
     ID       CATS.   /METER**2)   (METERS) (METERS) (METERS) (METERS) (METERS)  (METERS)   (DEG.)  (METERS)      BY
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

  AREA1         0   0.11960E-03  479663.0 3787688.0  1712.4     1.22     91.44     91.44      0.00     0.00     HROFDY
  AREA2         0   0.11080E-03  479755.4 3787687.8  1707.6     1.22     91.44     91.44      0.00     0.00     HROFDY
  AREA3         0   0.12420E-03  479731.7 3787780.2  1709.6     1.22     91.44     91.44      0.00     0.00     HROFDY

 *** ISCST3 - VERSION 02035 ***    *** CHURCH OF THE WOODS                                                  ***        05/29/09
                                   *** CO and NOx CONSTRUCTION EMISSIONS                                    ***        11:47:03
**MODELOPTs:                                                                                                           PAGE   3
CONC                    URBAN ELEV                                      NOCALM
```

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID SOURCE IDs

ALL AREA1 , AREA2 , AREA3 ,

* SOURCE EMISSION RATE SCALARS WHICH VARY FOR EACH HOUR OF THE DAY *

SOURCE ID = AREA1 ; SOURCE TYPE = AREA :

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.00000E+00
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.00000E+00	17	.00000E+00	18	.00000E+00
19	.00000E+00	20	.00000E+00	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = AREA2 ; SOURCE TYPE = AREA :

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.00000E+00
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.00000E+00	17	.00000E+00	18	.00000E+00
19	.00000E+00	20	.00000E+00	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

SOURCE ID = AREA3 ; SOURCE TYPE = AREA :

HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR	HOUR	SCALAR
1	.00000E+00	2	.00000E+00	3	.00000E+00	4	.00000E+00	5	.00000E+00	6	.00000E+00
7	.10000E+01	8	.10000E+01	9	.10000E+01	10	.10000E+01	11	.10000E+01	12	.00000E+00
13	.10000E+01	14	.10000E+01	15	.10000E+01	16	.00000E+00	17	.00000E+00	18	.00000E+00
19	.00000E+00	20	.00000E+00	21	.00000E+00	22	.00000E+00	23	.00000E+00	24	.00000E+00

*** DISCRETE CARTESIAN RECEPTORS ***
(X-COORD, Y-COORD, ZELEV, ZFLAG)
(METERS)

(479642.7, 3787721.8, 1717.7, 0.0); (479640.1, 3787766.0, 1726.9, 0.0);
(479594.6, 3787779.0, 1736.2, 0.0); (479589.4, 3787740.0, 1725.4, 0.0);
(479638.8, 3787689.2, 1715.0, 0.0);

*** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
(1=YES; 0=NO)

```
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1
```

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6

A	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
B	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
C	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00	.20000E+00
D	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00	.25000E+00
E	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00
F	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00	.30000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: redlands.dep
FORMAT: (4I2,2F9.4,F6.1,I2,2F7.1,f9.4,f10.1,f8.4,i4,f7.2)
SURFACE STATION NO.: 54161 UPPER AIR STATION NO.: 99999
NAME: UNKNOWN NAME: UNKNOWN
YEAR: 1981 YEAR: 1981

YR	MN	DY	HR	FLOW VECTOR	SPEED (M/S)	TEMP (K)	STAB CLASS	MIXING HEIGHT (M) RURAL	MIXING HEIGHT (M) URBAN	USTAR (M/S)	M-O LENGTH (M)	Z-0 (M)	IPCODE	PRATE (mm/HR)
81	01	01	01	292.3	1.00	284.3	7	522.6	170.0	0.0000	0.0	0.0000	0	0.00
81	01	01	02	282.4	0.00	284.3	7	507.0	170.0	0.0000	0.0	0.0000	0	0.00
81	01	01	03	287.5	0.00	283.1	7	491.4	170.0	0.0000	0.0	0.0000	0	0.00
81	01	01	04	301.0	0.00	283.1	7	475.8	170.0	0.0000	0.0	0.0000	0	0.00
81	01	01	05	286.5	0.00	282.6	7	460.3	170.0	0.0000	0.0	0.0000	0	0.00
81	01	01	06	297.0	0.00	283.1	7	444.7	170.0	0.0000	0.0	0.0000	0	0.00
81	01	01	07	297.0	0.00	285.4	6	1.4	170.7	0.0000	0.0	0.0000	0	0.00
81	01	01	08	314.6	1.00	287.6	5	47.0	192.0	0.0000	0.0	0.0000	0	0.00
81	01	01	09	299.0	1.00	289.8	4	92.5	213.3	0.0000	0.0	0.0000	0	0.00
81	01	01	10	54.2	1.34	291.5	3	138.0	234.7	0.0000	0.0	0.0000	0	0.00
81	01	01	11	89.1	1.79	294.3	3	183.5	256.0	0.0000	0.0	0.0000	0	0.00
81	01	01	12	103.1	1.34	297.6	2	229.0	277.3	0.0000	0.0	0.0000	0	0.00
81	01	01	13	87.2	1.34	298.7	2	274.5	298.7	0.0000	0.0	0.0000	0	0.00
81	01	01	14	124.2	1.79	299.8	3	320.0	320.0	0.0000	0.0	0.0000	0	0.00
81	01	01	15	134.8	2.24	299.3	3	320.0	320.0	0.0000	0.0	0.0000	0	0.00
81	01	01	16	98.2	2.24	298.7	4	320.0	320.0	0.0000	0.0	0.0000	0	0.00
81	01	01	17	110.1	2.24	295.4	5	325.6	318.5	0.0000	0.0	0.0000	0	0.00
81	01	01	18	210.1	1.00	291.5	6	357.2	310.3	0.0000	0.0	0.0000	0	0.00
81	01	01	19	268.0	1.00	289.8	7	388.8	302.1	0.0000	0.0	0.0000	0	0.00
81	01	01	20	303.2	1.00	287.0	7	420.4	293.9	0.0000	0.0	0.0000	0	0.00
81	01	01	21	291.1	1.34	286.5	7	452.0	285.7	0.0000	0.0	0.0000	0	0.00
81	01	01	22	294.5	1.34	287.0	7	483.5	277.4	0.0000	0.0	0.0000	0	0.00
81	01	01	23	293.2	0.00	285.9	7	515.1	269.2	0.0000	0.0	0.0000	0	0.00
81	01	01	24	292.2	0.00	285.4	7	546.7	261.0	0.0000	0.0	0.0000	0	0.00

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

*** THE ANNUAL (1 YRS) AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF CO IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	X-COORD (M)	Y-COORD (M)	CONC
479642.72	3787721.75	70.73635	479640.12	3787766.00	91.23839
479594.56	3787779.00	44.77377	479589.38	3787740.00	30.87379
479638.81	3787689.25	16.81153			

CONC URBAN ELEV NOCALM

*** THE 1ST HIGHEST 1-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF CO IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
479642.72	3787721.75	2670.50342	(81082507)	479640.12	3787766.00	2579.78247	(81090907)
479594.56	3787779.00	1608.43298	(81011808)	479589.38	3787740.00	1565.57178	(81092607)
479638.81	3787689.25	2514.42480	(81081407)				

*** ISCST3 - VERSION 02035 *** *** CHURCH OF THE WOODS *** 05/29/09
*** CO and NOx CONSTRUCTION EMISSIONS *** 11:47:03
**MODELOPTs: PAGE 10
CONC URBAN ELEV NOCALM

*** THE 1ST HIGHEST 8-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF CO IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
479642.72	3787721.75	670.22595	(81123016)	479640.12	3787766.00	644.53558	(81122908)
479594.56	3787779.00	400.94324	(81122908)	479589.38	3787740.00	375.50937	(81111708)
479638.81	3787689.25	463.55954	(81123016)				

*** ISCST3 - VERSION 02035 *** *** CHURCH OF THE WOODS *** 05/29/09
*** CO and NOx CONSTRUCTION EMISSIONS *** 11:47:03
**MODELOPTs: PAGE 11
CONC URBAN ELEV NOCALM

*** THE 1ST HIGHEST 24-HR AVERAGE CONCENTRATION VALUES FOR SOURCE GROUP: ALL ***
INCLUDING SOURCE(S): AREA1 , AREA2 , AREA3 ,

*** DISCRETE CARTESIAN RECEPTOR POINTS ***

** CONC OF CO IN MICROGRAMS/M**3 **

X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)	X-COORD (M)	Y-COORD (M)	CONC	(YYMMDDHH)
479642.72	3787721.75	320.50558	(81123024)	479640.12	3787766.00	314.81503	(81122724)
479594.56	3787779.00	173.85817	(81122724)	479589.38	3787740.00	134.89024	(81111724)
479638.81	3787689.25	215.78337	(81123024)				

*** ISCST3 - VERSION 02035 *** *** CHURCH OF THE WOODS *** 05/29/09
*** CO and NOx CONSTRUCTION EMISSIONS *** 11:47:03
**MODELOPTs: PAGE 12
CONC URBAN ELEV NOCALM

*** THE SUMMARY OF MAXIMUM ANNUAL (1 YRS) RESULTS ***

** CONC OF CO IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
ALL	1ST HIGHEST VALUE IS	91.23839 AT	(479640.12, 3787766.00, 1726.95, 0.00)	DC	NA
	2ND HIGHEST VALUE IS	70.73635 AT	(479642.72, 3787721.75, 1717.72, 0.00)	DC	NA
	3RD HIGHEST VALUE IS	44.77377 AT	(479594.56, 3787779.00, 1736.19, 0.00)	DC	NA
	4TH HIGHEST VALUE IS	30.87379 AT	(479589.38, 3787740.00, 1725.43, 0.00)	DC	NA
	5TH HIGHEST VALUE IS	16.81153 AT	(479638.81, 3787689.25, 1714.96, 0.00)	DC	NA
	6TH HIGHEST VALUE IS	0.00000 AT	(0.00, 0.00, 0.00, 0.00)		
	7TH HIGHEST VALUE IS	0.00000 AT	(0.00, 0.00, 0.00, 0.00)		
	8TH HIGHEST VALUE IS	0.00000 AT	(0.00, 0.00, 0.00, 0.00)		
	9TH HIGHEST VALUE IS	0.00000 AT	(0.00, 0.00, 0.00, 0.00)		
	10TH HIGHEST VALUE IS	0.00000 AT	(0.00, 0.00, 0.00, 0.00)		

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

*** ISCST3 - VERSION 02035 *** *** CHURCH OF THE WOODS *** 05/29/09
*** CO and NOx CONSTRUCTION EMISSIONS *** 11:47:03
**MODELOPTs: PAGE 13
CONC URBAN ELEV NOCALM

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

```
                                   ** CONC OF CO       IN MICROGRAMS/M**3                               **

                                             DATE                                                                          NETWORK
GROUP ID                        AVERAGE CONC     (YYMMDDHH)            RECEPTOR  (XR, YR, ZELEV, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ALL      HIGH  1ST HIGH VALUE IS    2670.50342  ON 81082507: AT (  479642.72,  3787721.75,   1717.72,      0.00)  DC      NA


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
                      BD = BOUNDARY

 *** ISCST3 - VERSION 02035 ***    *** CHURCH OF THE WOODS                                                 ***        05/29/09
                                   *** CO and NOx CONSTRUCTION EMISSIONS                                   ***        11:47:03
**MODELOPTs:                                                                                                          PAGE  14
CONC                   URBAN ELEV                                              NOCALM

                                           *** THE SUMMARY OF HIGHEST  8-HR RESULTS ***

                                   ** CONC OF CO       IN MICROGRAMS/M**3                               **

                                             DATE                                                                          NETWORK
GROUP ID                        AVERAGE CONC     (YYMMDDHH)            RECEPTOR  (XR, YR, ZELEV, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ALL      HIGH  1ST HIGH VALUE IS     670.22595  ON 81123016: AT (  479642.72,  3787721.75,   1717.72,      0.00)  DC      NA


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
                      BD = BOUNDARY

 *** ISCST3 - VERSION 02035 ***    *** CHURCH OF THE WOODS                                                 ***        05/29/09
                                   *** CO and NOx CONSTRUCTION EMISSIONS                                   ***        11:47:03
**MODELOPTs:                                                                                                          PAGE  15
CONC                   URBAN ELEV                                              NOCALM

                                           *** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

                                   ** CONC OF CO       IN MICROGRAMS/M**3                               **

                                             DATE                                                                          NETWORK
GROUP ID                        AVERAGE CONC     (YYMMDDHH)            RECEPTOR  (XR, YR, ZELEV, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

ALL      HIGH  1ST HIGH VALUE IS     320.50558  ON 81123024: AT (  479642.72,  3787721.75,   1717.72,      0.00)  DC      NA


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
                      BD = BOUNDARY

 *** ISCST3 - VERSION 02035 ***    *** CHURCH OF THE WOODS                                                 ***        05/29/09
                                   *** CO and NOx CONSTRUCTION EMISSIONS                                   ***        11:47:03
**MODELOPTs:                                                                                                          PAGE  16
CONC                   URBAN ELEV                                              NOCALM


*** Message Summary : ISCST3 Model Execution ***

 --------- Summary of Total Messages --------

A Total of           0 Fatal Error Message(s)
A Total of           0 Warning Message(s)
A Total of        1398 Informational Message(s)

A Total of        1398 Calm Hours Identified


   ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***


   ********   WARNING MESSAGES   ********
              ***  NONE  ***


   ************************************
   *** ISCST3 Finishes Successfully ***
   ************************************
```

APPENDIX D

CALINE4 CO HOT SPOTS MODEL PRINTOUTS

CHURCH OF THE WOODS

AIR QUALITY CO HOT SPOT ANALYSIS

CALINE4 MODEL PRINTOUTS

EXISTING BASELINE CONDITIONS

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: Existing-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	1707. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	10. DEGREES	TEMP=	10.0 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	154	5.6	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	337	4.0	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	88	7.8	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	302	5.8	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	449	4.1	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	3.8	.0	10.0
G. SR-189 EBA	-150	0	0	0	AG	186	7.0	.0	10.0
H. SR-189 EBD	0	0	150	0	AG	0	3.6	.0	10.0
I. SR-189 EBL	-150	-2	0	0	AG	183	7.7	.0	10.0
J. SR-189 WBA	150	0	0	0	AG	0	3.6	.0	10.0
K. SR-189 WBD	0	0	-150	0	AG	127	4.2	.0	10.0
L. SR-189 WBL	150	2	0	0	AG	0	3.6	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	242	3.8	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	337	3.8	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	302	3.8	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	449	3.8	.0	10.0
Q. SR-189 EBAX	-750	0	-150	0	AG	369	3.6	.0	10.0
R. SR-189 EBDX	150	0	750	0	AG	0	3.6	.0	10.0
S. SR-189 WBAX	750	0	150	0	AG	0	3.6	.0	10.0
T. SR-189 WBDX	-150	0	-750	0	AG	127	3.6	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION

JOB: Church of the Woods
RUN: Existing-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	7	1.8
3. SW	-8	-7	1.8
4. NE	8	7	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	7	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	7	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	7	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	7	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: Existing-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	276.	.9	.0	.0	.0	.0	.1	.0	.2	.0
2. NW	173.	.9	.1	.0	.1	.0	.3	.0	.1	.0
3. SW	6.	.8	.0	.1	.0	.3	.0	.0	.1	.0
4. NE	264.	.9	.0	.1	.0	.1	.0	.0	.2	.0
5. ES mdblk	271.	.3	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	99.	.7	.0	.0	.0	.0	.0	.0	.3	.0
7. WS mdblk	82.	.8	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	268.	.3	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	353.	.7	.2	.0	.1	.0	.2	.0	.0	.0
10. NW mdblk	175.	.7	.0	.1	.0	.3	.0	.0	.0	.0
11. SW mdblk	6.	.7	.1	.0	.0	.0	.3	.0	.0	.0
12. NE mdblk	186.	.7	.0	.2	.0	.2	.0	.0	.0	.0
13. ES blk	270.	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	95.	.5	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	85.	.5	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	269.	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	354.	.6	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.5	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	5.	.6	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.6	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: Existing-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.3	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.3	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.4	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.1
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.2	.0	.0	.2	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.1	.0	.0	.4	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.3	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: Existing-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Bear Spr NBA	2	-150	2	0	AG	15	6.1	.0	10.0
B. Bear Spr NBD	2	0	2	150	AG	30	4.1	.0	10.0
C. Bear Spr NBL	2	-150	0	0	AG	15	7.8	.0	10.0
D. Bear Spr SBA	-2	150	-2	0	AG	22	6.1	.0	10.0
E. Bear Spr SBD	-2	0	-2	-150	AG	26	4.1	.0	10.0
F. Bear Spr SBL	-2	150	0	0	AG	13	7.8	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	485	6.5	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	500	4.0	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	16	7.7	.0	10.0
J. SR-18 WBA	150	5	0	5	AG	483	6.5	.0	10.0
K. SR-18 WBD	0	5	-150	5	AG	503	4.1	.0	10.0
L. SR-18 WBL	150	5	0	0	AG	10	7.7	.0	10.0
M. Bear Sp NBAX	2	-750	2	-150	AG	30	3.8	.0	10.0
N. Bear Sp NBDX	2	150	2	750	AG	30	3.8	.0	10.0
O. Bear Sp SBAX	-2	750	-2	150	AG	35	3.8	.0	10.0
P. Bear Sp SBDX	-2	-150	-2	-750	AG	26	3.8	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	501	3.6	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	500	3.6	.0	10.0
S. SR-18 WBAX	750	5	150	5	AG	493	3.6	.0	10.0
T. SR-18 WBDX	-150	5	-750	5	AG	503	3.6	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: Existing-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-12	1.8
2. NW	-8	12	1.8
3. SW	-8	-12	1.8
4. NE	8	12	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	12	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	12	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	12	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	12	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: Existing-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	277.	.9	.0	.0	.0	.0	.0	.0	.5	.0
2. NW	97.	.9	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	278.	.9	.0	.0	.0	.0	.0	.0	.6	.0
4. NE	98.	.8	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	277.	.8	.0	.0	.0	.0	.0	.0	.0	.4
6. WN mdblk	97.	.8	.0	.0	.0	.0	.0	.0	.2	.0
7. WS mdblk	83.	.9	.0	.0	.0	.0	.0	.0	.6	.0
8. EN mdblk	263.	.9	.0	.0	.0	.0	.0	.0	.1	.1
9. SE mdblk	355.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	175.	.2	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	4.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	185.	.2	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.6	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.6	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.6	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	177.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	3.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	184.	.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: Existing-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.4
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.4	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.4	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: Existing-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Project NBA	0	-150	0	0	AG	0	3.8	.0	10.0
B. Project NBD	0	0	0	150	AG	0	3.8	.0	10.0
C. Project NBL	2	-150	0	0	AG	0	3.8	.0	10.0
D. Project SBA	-5	150	-5	0	AG	0	3.8	.0	10.0
E. Project SBD	-5	0	-5	-150	AG	0	3.8	.0	10.0
F. Project SBL	-5	150	0	0	AG	0	3.8	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	434	5.8	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	434	3.8	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	0	3.6	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	578	6.1	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	578	3.9	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	3.6	.0	10.0
M. Project NBAX	0	-750	0	-150	AG	0	3.8	.0	10.0
N. Project NBDX	0	150	0	750	AG	0	3.8	.0	10.0
O. Project SBAX	-5	750	-5	150	AG	0	3.8	.0	10.0
P. Project SBDX	-5	-150	-5	-750	AG	0	3.8	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	434	3.6	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	434	3.6	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	578	3.6	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	578	3.6	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: Existing-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-12	10	1.8
3. SW	-12	-12	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-12	150	1.8
11. SW mdblk	-12	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-12	600	1.8
19. SW blk	-12	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: Existing-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	277.	.7	.0	.0	.0	.0	.0	.0	.4	.0
2. NW	97.	.9	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	277.	.8	.0	.0	.0	.0	.0	.0	.4	.0
4. NE	97.	.9	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	277.	.7	.0	.0	.0	.0	.0	.0	.0	.3
6. WN mdblk	97.	.8	.0	.0	.0	.0	.0	.0	.2	.0
7. WS mdblk	83.	.8	.0	.0	.0	.0	.0	.0	.5	.0
8. EN mdblk	263.	.9	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	291.	.1	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	111.	.1	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	69.	.1	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	249.	.1	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.7	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.6	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.7	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	4.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	176.	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: Existing-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1
4. NE	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.4
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.4	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: Existing-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	3.8	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	171	4.4	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	3.8	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	285	8.4	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	0	3.8	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	3.8	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	263	5.5	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	263	3.7	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	171	7.7	.0	10.0
J. SR-18 WBA	150	2	0	2	AG	293	5.5	.0	10.0
K. SR-18 WBD	0	2	-150	2	AG	578	3.9	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	3.6	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	3.8	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	171	3.8	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	285	3.8	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	0	3.8	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	434	3.6	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	263	3.6	.0	10.0
S. SR-18 WBAX	750	2	150	2	AG	293	3.6	.0	10.0
T. SR-18 WBDX	-150	2	-750	2	AG	578	3.6	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION

JOB: Church of the Woods
RUN: Existing-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-8	8	1.8
3. SW	-8	-12	1.8
4. NE	7	8	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	8	1.8
17. SE blk	7	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: Existing-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	277.	.8	.0	.0	.0	.0	.0	.0	.3	.0
2. NW	262.	.8	.0	.0	.0	.0	.0	.0	.1	.0
3. SW	6.	.9	.0	.1	.0	.4	.0	.0	.1	.0
4. NE	262.	1.1	.0	.0	.0	.2	.0	.0	.1	.0
5. ES mdblk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.2
6. WN mdblk	98.	.8	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	81.	.9	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	265.	.6	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	357.	.3	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.6	.0	.1	.0	.5	.0	.0	.0	.0
11. SW mdblk	1.	.3	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	190.	.6	.0	.2	.0	.4	.0	.0	.0	.0
13. ES blk	276.	.5	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.7	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.7	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.4	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	358.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.4	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	359.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.4	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: Existing-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.2	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.2	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.2	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.1	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.3	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.4
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.2	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: Existing-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	171	5.6	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	310	4.0	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	3.8	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	285	5.7	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	285	4.0	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	169	7.8	.0	10.0
G. Daley Ca EBA	-150	0	0	0	AG	0	3.6	.0	10.0
H. Daley Ca EBD	0	0	150	0	AG	169	4.2	.0	10.0
I. Daley Ca EBL	-150	-2	0	0	AG	0	3.6	.0	10.0
J. Daley Ca WBA	150	2	0	2	AG	139	7.3	.0	10.0
K. Daley Ca WBD	0	2	-150	2	AG	0	3.6	.0	10.0
L. Daley Ca WBL	150	2	0	0	AG	0	3.6	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	171	3.8	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	310	3.8	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	454	3.8	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	285	3.8	.0	10.0
Q. Daley C EBAX	-750	0	-150	0	AG	0	3.6	.0	10.0
R. Daley C EBDX	150	0	750	0	AG	169	3.6	.0	10.0
S. Daley C WBAX	750	2	150	2	AG	139	3.6	.0	10.0
T. Daley C WBDX	-150	2	-750	2	AG	0	3.6	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: Existing-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	8	1.8
3. SW	-8	-7	1.8
4. NE	8	8	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	8	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: Existing-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.9	.0	.2	.0	.2	.0	.2	.0	.0
2. NW	7.	.8	.0	.1	.0	.3	.0	.2	.0	.0
3. SW	7.	.8	.0	.1	.0	.3	.0	.2	.0	.0
4. NE	352.	.7	.0	.2	.0	.2	.0	.2	.0	.0
5. ES mdblk	280.	.4	.0	.0	.0	.0	.0	.0	.0	.1
6. WN mdblk	91.	.2	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	88.	.2	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	261.	.4	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	356.	.5	.2	.0	.0	.0	.1	.0	.0	.0
10. NW mdblk	172.	.8	.0	.2	.0	.3	.0	.3	.0	.0
11. SW mdblk	5.	.6	.1	.0	.0	.0	.2	.0	.0	.0
12. NE mdblk	187.	.7	.0	.2	.0	.2	.0	.2	.0	.0
13. ES blk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	88.	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	87.	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.3	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	355.	.4	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.6	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	5.	.4	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.6	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: Existing-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0
17. SE blk	.0	.0	.0	.0	.2	.0	.0	.2	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.4	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.1	.0	.0	.2	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.3	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: Existing-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	3.8	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	139	4.4	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	3.8	.0	10.0
D. Daley Ca SBA	-4	150	-4	0	AG	0	3.8	.0	10.0
E. Daley Ca SBD	-4	0	-4	-150	AG	0	3.8	.0	10.0
F. Daley Ca SBL	-5	150	0	0	AG	169	7.8	.0	10.0
G. SR-18 EBA	-150	-2	0	-2	AG	263	5.5	.0	10.0
H. SR-18 EBD	0	-2	150	-2	AG	432	3.8	.0	10.0
I. SR-18 EBL	-150	-2	0	0	AG	0	3.6	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	432	5.8	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	293	3.7	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	3.6	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	3.8	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	139	3.8	.0	10.0
O. Daley C SBAX	-4	750	-4	150	AG	169	3.8	.0	10.0
P. Daley C SBDX	-4	-150	-4	-750	AG	0	3.8	.0	10.0
Q. SR-18 EBAX	-750	-2	-150	-2	AG	263	3.6	.0	10.0
R. SR-18 EBDX	150	-2	750	-2	AG	432	3.6	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	432	3.6	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	293	3.6	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: Existing-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-8	1.8
2. NW	-10	10	1.8
3. SW	-10	-8	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-8	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-8	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-10	150	1.8
11. SW mdblk	-10	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-8	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-8	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-10	600	1.8
19. SW blk	-10	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: Existing-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.7	.0	.1	.0	.0	.0	.2	.0	.1
2. NW	96.	.8	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	83.	.7	.0	.0	.0	.0	.0	.0	.0	.3
4. NE	97.	.7	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	278.	.7	.0	.0	.0	.0	.0	.0	.0	.3
6. WN mdblk	95.	.5	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	84.	.6	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	263.	.7	.0	.0	.0	.0	.0	.0	.0	.2
9. SE mdblk	359.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.5	.0	.0	.0	.0	.0	.4	.0	.0
11. SW mdblk	2.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	189.	.3	.0	.1	.0	.0	.0	.2	.0	.0
13. ES blk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	95.	.4	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.4	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.6	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	1.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.3	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	2.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	185.	.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: Existing-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.3	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0

CHURCH OF THE WOODS

AIR QUALITY CO HOT SPOT ANALYSIS

CALINE4 MODEL PRINTOUTS

OPENING YEAR (2009) WITHOUT PROJECT SCENARIO

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	162	5.1	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	349	3.7	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	120	7.1	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	316	5.3	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	554	3.8	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	3.5	.0	10.0
G. SR-189 EBA	-150	0	0	0	AG	278	6.7	.0	10.0
H. SR-189 EBD	0	0	150	0	AG	0	3.3	.0	10.0
I. SR-189 EBL	-150	-2	0	0	AG	187	7.0	.0	10.0
J. SR-189 WBA	150	0	0	0	AG	0	3.3	.0	10.0
K. SR-189 WBD	0	0	-150	0	AG	160	3.8	.0	10.0
L. SR-189 WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	282	3.5	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	349	3.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	316	3.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	554	3.5	.0	10.0
Q. SR-189 EBAX	-750	0	-150	0	AG	465	3.3	.0	10.0
R. SR-189 EBDX	150	0	750	0	AG	0	3.3	.0	10.0
S. SR-189 WBAX	750	0	150	0	AG	0	3.3	.0	10.0
T. SR-189 WBDX	-150	0	-750	0	AG	160	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	7	1.8
3. SW	-8	-7	1.8
4. NE	8	7	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	7	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	7	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	7	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	7	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	276.	1.0	.0	.0	.0	.0	.1	.0	.3	.0
2. NW	173.	1.0	.1	.0	.1	.0	.4	.0	.1	.0
3. SW	6.	.9	.0	.1	.0	.3	.0	.0	.1	.0
4. NE	264.	1.0	.0	.1	.0	.1	.0	.0	.3	.0
5. ES mdblk	271.	.3	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	99.	.8	.0	.0	.0	.0	.0	.0	.4	.0
7. WS mdblk	82.	.9	.0	.0	.0	.0	.0	.0	.4	.0
8. EN mdblk	268.	.3	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	352.	.8	.2	.0	.2	.0	.2	.0	.0	.0
10. NW mdblk	175.	.7	.0	.1	.0	.3	.0	.0	.0	.0
11. SW mdblk	6.	.7	.1	.0	.1	.0	.4	.0	.0	.0
12. NE mdblk	186.	.7	.0	.2	.0	.2	.0	.0	.0	.0
13. ES blk	270.	.1	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.5	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	85.	.5	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	269.	.1	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	354.	.6	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.5	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	5.	.6	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.5	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.3	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.1
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.2	.0	.0	.3	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.2	.0	.0	.4	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.3	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009nP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Bear Spr NBA	2	-150	2	0	AG	16	5.5	.0	10.0
B. Bear Spr NBD	2	0	2	150	AG	32	3.7	.0	10.0
C. Bear Spr NBL	2	-150	0	0	AG	16	7.1	.0	10.0
D. Bear Spr SBA	-2	150	-2	0	AG	23	5.5	.0	10.0
E. Bear Spr SBD	-2	0	-2	-150	AG	28	3.7	.0	10.0
F. Bear Spr SBL	-2	150	0	0	AG	14	7.1	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	522	6.3	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	538	3.8	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	17	7.0	.0	10.0
J. SR-18 WBA	150	5	0	5	AG	569	6.3	.0	10.0
K. SR-18 WBD	0	5	-150	5	AG	590	3.8	.0	10.0
L. SR-18 WBL	150	5	0	0	AG	11	7.0	.0	10.0
M. Bear Sp NBAX	2	-750	2	-150	AG	32	3.5	.0	10.0
N. Bear Sp NBDX	2	150	2	750	AG	32	3.5	.0	10.0
O. Bear Sp SBAX	-2	750	-2	150	AG	37	3.5	.0	10.0
P. Bear Sp SBDX	-2	-150	-2	-750	AG	28	3.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	539	3.3	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	538	3.3	.0	10.0
S. SR-18 WBAX	750	5	150	5	AG	580	3.3	.0	10.0
T. SR-18 WBDX	-150	5	-750	5	AG	590	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009nP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-12	1.8
2. NW	-8	12	1.8
3. SW	-8	-12	1.8
4. NE	8	12	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	12	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	12	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	12	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	12	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009nP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	277.	.9	.0	.0	.0	.0	.0	.0	.5	.0
2. NW	97.	.9	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	278.	.9	.0	.0	.0	.0	.0	.0	.6	.0
4. NE	98.	.9	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	277.	.8	.0	.0	.0	.0	.0	.0	.0	.4
6. WN mdblk	97.	.8	.0	.0	.0	.0	.0	.0	.2	.0
7. WS mdblk	83.	1.0	.0	.0	.0	.0	.0	.0	.6	.0
8. EN mdblk	263.	1.0	.0	.0	.0	.0	.0	.0	.1	.1
9. SE mdblk	355.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	175.	.2	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	5.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	185.	.2	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.7	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.6	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.6	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	177.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	3.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	183.	.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009nP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.4
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.4	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.4	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Project NBA	0	-150	0	0	AG	0	3.5	.0	10.0
B. Project NBD	0	0	0	150	AG	0	3.5	.0	10.0
C. Project NBL	2	-150	0	0	AG	0	3.5	.0	10.0
D. Project SBA	-5	150	-5	0	AG	0	3.5	.0	10.0
E. Project SBD	-5	0	-5	-150	AG	0	3.5	.0	10.0
F. Project SBL	-5	150	0	0	AG	0	3.5	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	473	5.3	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	473	3.5	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	0	3.3	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	673	5.9	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	673	3.6	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Project NBAX	0	-750	0	-150	AG	0	3.5	.0	10.0
N. Project NBDX	0	150	0	750	AG	0	3.5	.0	10.0
O. Project SBAX	-5	750	-5	150	AG	0	3.5	.0	10.0
P. Project SBDX	-5	-150	-5	-750	AG	0	3.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	473	3.3	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	473	3.3	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	673	3.3	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	673	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-12	10	1.8
3. SW	-12	-12	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-12	150	1.8
11. SW mdblk	-12	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-12	600	1.8
19. SW blk	-12	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	277.	.8	.0	.0	.0	.0	.0	.0	.4	.0
2. NW	97.	.9	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	82.	.7	.0	.0	.0	.0	.0	.0	.0	.3
4. NE	98.	.9	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	277.	.7	.0	.0	.0	.0	.0	.0	.0	.3
6. WN mdblk	97.	.8	.0	.0	.0	.0	.0	.0	.2	.0
7. WS mdblk	83.	.8	.0	.0	.0	.0	.0	.0	.4	.0
8. EN mdblk	263.	1.0	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	291.	.1	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	139.	.1	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	37.	.1	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	249.	.1	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.7	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.6	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.7	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	5.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	173.	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	175.	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.1
2. NW	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.1	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.4
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.4	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	3.5	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	204	4.2	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	3.5	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	373	7.6	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	0	3.5	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	3.5	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	269	5.0	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	269	3.4	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	204	7.5	.0	10.0
J. SR-18 WBA	150	2	0	2	AG	300	5.0	.0	10.0
K. SR-18 WBD	0	2	-150	2	AG	673	3.6	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	3.5	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	204	3.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	373	3.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	0	3.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	473	3.3	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	269	3.3	.0	10.0
S. SR-18 WBAX	750	2	150	2	AG	300	3.3	.0	10.0
T. SR-18 WBDX	-150	2	-750	2	AG	673	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-8	8	1.8
3. SW	-8	-12	1.8
4. NE	7	8	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	8	1.8
17. SE blk	7	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.8	.0	.1	.0	.4	.0	.0	.0	.0
2. NW	262.	.9	.0	.0	.0	.0	.0	.0	.1	.0
3. SW	6.	1.0	.0	.1	.0	.5	.0	.0	.1	.0
4. NE	262.	1.2	.0	.0	.0	.2	.0	.0	.1	.0
5. ES mdblk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.2
6. WN mdblk	98.	.8	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	80.	.9	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	266.	.6	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	357.	.3	.0	.0	.0	.1	.0	.0	.0	.0
10. NW mdblk	171.	.7	.0	.1	.0	.5	.0	.0	.0	.0
11. SW mdblk	1.	.3	.0	.0	.0	.1	.0	.0	.0	.0
12. NE mdblk	190.	.7	.0	.2	.0	.4	.0	.0	.0	.0
13. ES blk	276.	.4	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.7	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.7	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.4	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	358.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.5	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	359.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.5	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.2	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.2	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.2	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.3	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.4
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.1	.3	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.2	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	204	5.2	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	353	3.7	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	3.5	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	373	5.3	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	373	3.7	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	186	7.1	.0	10.0
G. Daley Ca EBA	-150	0	0	0	AG	0	3.3	.0	10.0
H. Daley Ca EBD	0	0	150	0	AG	186	3.8	.0	10.0
I. Daley Ca EBL	-150	-2	0	0	AG	0	3.3	.0	10.0
J. Daley Ca WBA	150	2	0	2	AG	149	6.7	.0	10.0
K. Daley Ca WBD	0	2	-150	2	AG	0	3.3	.0	10.0
L. Daley Ca WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	204	3.5	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	353	3.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	559	3.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	373	3.5	.0	10.0
Q. Daley C EBAX	-750	0	-150	0	AG	0	3.3	.0	10.0
R. Daley C EBDX	150	0	750	0	AG	186	3.3	.0	10.0
S. Daley C WBAX	750	2	150	2	AG	149	3.3	.0	10.0
T. Daley C WBDX	-150	2	-750	2	AG	0	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	8	1.8
3. SW	-8	-7	1.8
4. NE	8	8	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	8	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.9	.0	.2	.0	.2	.0	.2	.0	.0
2. NW	7.	.8	.0	.1	.0	.4	.0	.2	.0	.0
3. SW	7.	.8	.0	.2	.0	.3	.0	.2	.0	.0
4. NE	352.	.8	.0	.2	.0	.2	.0	.2	.0	.0
5. ES mdblk	280.	.4	.0	.0	.0	.0	.0	.0	.0	.1
6. WN mdblk	91.	.2	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	88.	.2	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	261.	.4	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	355.	.6	.2	.0	.0	.0	.1	.0	.0	.0
10. NW mdblk	172.	.9	.0	.2	.0	.4	.0	.3	.0	.0
11. SW mdblk	5.	.6	.1	.0	.0	.0	.2	.0	.0	.0
12. NE mdblk	188.	.8	.0	.2	.0	.2	.0	.2	.0	.0
13. ES blk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	88.	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	87.	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.3	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	355.	.4	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.7	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	5.	.5	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.6	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0
17. SE blk	.0	.0	.0	.0	.2	.0	.0	.2	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.4	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.1	.0	.0	.3	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.3	.3	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	3.5	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	149	4.0	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	3.5	.0	10.0
D. Daley Ca SBA	-4	150	-4	0	AG	0	3.5	.0	10.0
E. Daley Ca SBD	-4	0	-4	-150	AG	0	3.5	.0	10.0
F. Daley Ca SBL	-5	150	0	0	AG	186	7.1	.0	10.0
G. SR-18 EBA	-150	-2	0	-2	AG	269	5.0	.0	10.0
H. SR-18 EBD	0	-2	150	-2	AG	455	3.5	.0	10.0
I. SR-18 EBL	-150	-2	0	0	AG	0	3.3	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	449	5.3	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	300	3.4	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	3.5	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	149	3.5	.0	10.0
O. Daley C SBAX	-4	750	-4	150	AG	186	3.5	.0	10.0
P. Daley C SBDX	-4	-150	-4	-750	AG	0	3.5	.0	10.0
Q. SR-18 EBAX	-750	-2	-150	-2	AG	269	3.3	.0	10.0
R. SR-18 EBDX	150	-2	750	-2	AG	455	3.3	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	449	3.3	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	300	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-8	1.8
2. NW	-10	10	1.8
3. SW	-10	-8	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-8	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-8	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-10	150	1.8
11. SW mdblk	-10	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-8	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-8	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-10	600	1.8
19. SW blk	-10	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.7	.0	.1	.0	.0	.0	.2	.0	.1
2. NW	96.	.8	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	83.	.6	.0	.0	.0	.0	.0	.0	.0	.3
4. NE	97.	.7	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	278.	.6	.0	.0	.0	.0	.0	.0	.0	.3
6. WN mdblk	95.	.5	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	84.	.6	.0	.0	.0	.0	.0	.0	.2	.0
8. EN mdblk	263.	.7	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	359.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.5	.0	.0	.0	.0	.0	.3	.0	.0
11. SW mdblk	2.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	189.	.3	.0	.1	.0	.0	.0	.2	.0	.0
13. ES blk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	95.	.4	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.4	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.6	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	1.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.3	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	2.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	185.	.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.3	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0

CHURCH OF THE WOODS

AIR QUALITY CO HOT SPOT ANALYSIS

CALINE4 MODEL PRINTOUTS

OPENING YEAR (2009) WITH PROJECT AND MITIGATION SCENARIO

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009P-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	204	5.2	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	391	3.7	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	145	7.1	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	358	5.3	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	621	3.9	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	3.5	.0	10.0
G. SR-189 EBA	-150	0	0	0	AG	303	7.2	.0	10.0
H. SR-189 EBD	0	0	150	0	AG	0	3.3	.0	10.0
I. SR-189 EBL	-150	-2	0	0	AG	187	7.0	.0	10.0
J. SR-189 WBA	150	0	0	0	AG	0	3.3	.0	10.0
K. SR-189 WBD	0	0	-150	0	AG	185	3.8	.0	10.0
L. SR-189 WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	349	3.5	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	391	3.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	358	3.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	621	3.5	.0	10.0
Q. SR-189 EBAX	-750	0	-150	0	AG	490	3.3	.0	10.0
R. SR-189 EBDX	150	0	750	0	AG	0	3.3	.0	10.0
S. SR-189 WBAX	750	0	150	0	AG	0	3.3	.0	10.0
T. SR-189 WBDX	-150	0	-750	0	AG	185	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009P-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	7	1.8
3. SW	-8	-7	1.8
4. NE	8	7	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	7	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	7	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	7	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	7	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009P-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	276.	1.2	.0	.0	.0	.0	.2	.0	.4	.0
2. NW	173.	1.2	.1	.0	.2	.0	.4	.0	.2	.0
3. SW	6.	1.0	.0	.2	.0	.3	.0	.0	.2	.0
4. NE	264.	1.1	.0	.1	.0	.1	.0	.0	.4	.0
5. ES mdblk	271.	.3	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	99.	.9	.0	.0	.0	.0	.0	.0	.4	.0
7. WS mdblk	82.	1.0	.0	.0	.0	.0	.0	.0	.4	.0
8. EN mdblk	268.	.3	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	352.	.9	.2	.0	.2	.0	.3	.0	.0	.0
10. NW mdblk	175.	.7	.0	.1	.0	.3	.0	.0	.0	.0
11. SW mdblk	6.	.8	.1	.0	.1	.0	.4	.0	.0	.0
12. NE mdblk	186.	.7	.0	.3	.0	.2	.0	.0	.0	.0
13. ES blk	270.	.1	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.6	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	85.	.5	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	269.	.1	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	354.	.7	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.6	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	5.	.7	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.6	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009P-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.3	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.1
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.3	.0	.0	.3	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.3	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.2	.0	.0	.4	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.3	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009P-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Bear Spr NBA	2	-150	2	0	AG	16	5.5	.0	10.0
B. Bear Spr NBD	2	0	2	150	AG	49	3.7	.0	10.0
C. Bear Spr NBL	2	-150	0	0	AG	16	7.1	.0	10.0
D. Bear Spr SBA	-2	150	-2	0	AG	23	5.5	.0	10.0
E. Bear Spr SBD	-2	0	-2	-150	AG	28	3.7	.0	10.0
F. Bear Spr SBL	-2	150	0	0	AG	31	7.1	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	564	6.3	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	597	3.8	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	17	7.0	.0	10.0
J. SR-18 WBA	150	5	0	5	AG	628	7.0	.0	10.0
K. SR-18 WBD	0	5	-150	5	AG	632	4.1	.0	10.0
L. SR-18 WBL	150	5	0	0	AG	11	7.0	.0	10.0
M. Bear Sp NBAX	2	-750	2	-150	AG	32	3.5	.0	10.0
N. Bear Sp NBDX	2	150	2	750	AG	49	3.5	.0	10.0
O. Bear Sp SBAX	-2	750	-2	150	AG	54	3.5	.0	10.0
P. Bear Sp SBDX	-2	-150	-2	-750	AG	28	3.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	581	3.3	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	597	3.3	.0	10.0
S. SR-18 WBAX	750	5	150	5	AG	639	3.3	.0	10.0
T. SR-18 WBDX	-150	5	-750	5	AG	632	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009P-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-12	1.8
2. NW	-8	12	1.8
3. SW	-8	-12	1.8
4. NE	8	12	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	12	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	12	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	12	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	12	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009P-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	277.	1.0	.0	.0	.0	.0	.0	.0	.6	.0
2. NW	97.	1.1	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	278.	1.0	.0	.0	.0	.0	.0	.0	.6	.0
4. NE	98.	1.1	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	278.	.9	.0	.0	.0	.0	.0	.0	.0	.4
6. WN mdblk	97.	.9	.0	.0	.0	.0	.0	.0	.2	.0
7. WS mdblk	83.	1.1	.0	.0	.0	.0	.0	.0	.6	.0
8. EN mdblk	263.	1.2	.0	.0	.0	.0	.0	.0	.1	.1
9. SE mdblk	356.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	174.	.3	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	4.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	185.	.3	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.7	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.7	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.7	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.7	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.2	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	176.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	3.	.2	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	184.	.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009P-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1
2. NW	.0	.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.4
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.4	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.4	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009P-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Project NBA	0	-150	0	0	AG	0	3.5	.0	10.0
B. Project NBD	0	0	0	150	AG	167	4.0	.0	10.0
C. Project NBL	2	-150	0	0	AG	0	3.5	.0	10.0
D. Project SBA	-5	150	-5	0	AG	58	6.4	.0	10.0
E. Project SBD	-5	0	-5	-150	AG	0	3.5	.0	10.0
F. Project SBL	-5	150	0	0	AG	109	7.1	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	473	5.3	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	582	3.5	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	58	7.0	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	782	6.4	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	731	3.8	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Project NBAX	0	-750	0	-150	AG	0	3.5	.0	10.0
N. Project NBDX	0	150	0	750	AG	167	3.5	.0	10.0
O. Project SBAX	-5	750	-5	150	AG	167	3.5	.0	10.0
P. Project SBDX	-5	-150	-5	-750	AG	0	3.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	531	3.3	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	582	3.3	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	782	3.3	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	731	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009P-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-12	10	1.8
3. SW	-12	-12	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-12	150	1.8
11. SW mdblk	-12	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-12	600	1.8
19. SW blk	-12	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009P-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	82.	.9	.0	.0	.0	.0	.0	.0	.0	.4
2. NW	97.	1.2	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	82.	.9	.0	.0	.0	.0	.0	.0	.0	.3
4. NE	98.	1.2	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	278.	.9	.0	.0	.0	.0	.0	.0	.0	.4
6. WN mdblk	96.	.9	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	83.	1.0	.0	.0	.0	.0	.0	.0	.4	.0
8. EN mdblk	263.	1.2	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	358.	.3	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	169.	.5	.0	.0	.0	.0	.0	.2	.0	.0
11. SW mdblk	2.	.3	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	189.	.4	.0	.1	.0	.0	.0	.1	.0	.0
13. ES blk	276.	.8	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.8	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.7	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.8	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	360.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.3	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	1.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009P-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0
2. NW	.0	.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.9	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.1	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.1	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.5
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.4	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.5	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009P-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	3.5	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	271	4.2	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	3.5	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	440	7.6	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	0	3.5	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	3.5	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	311	5.2	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	311	3.4	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	271	7.5	.0	10.0
J. SR-18 WBA	150	2	0	2	AG	342	5.2	.0	10.0
K. SR-18 WBD	0	2	-150	2	AG	782	3.8	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	3.5	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	271	3.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	440	3.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	0	3.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	582	3.3	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	311	3.3	.0	10.0
S. SR-18 WBAX	750	2	150	2	AG	342	3.3	.0	10.0
T. SR-18 WBDX	-150	2	-750	2	AG	782	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009P-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-8	8	1.8
3. SW	-8	-12	1.8
4. NE	7	8	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	8	1.8
17. SE blk	7	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009P-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	277.	.9	.0	.0	.0	.0	.0	.0	.3	.0
2. NW	262.	1.1	.0	.0	.0	.0	.0	.0	.1	.0
3. SW	6.	1.2	.0	.2	.0	.5	.0	.0	.1	.0
4. NE	262.	1.4	.0	.0	.0	.2	.0	.0	.1	.0
5. ES mdblk	276.	.7	.0	.0	.0	.0	.0	.0	.0	.2
6. WN mdblk	98.	1.0	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	80.	1.1	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	266.	.7	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	357.	.3	.0	.0	.0	.1	.0	.0	.0	.0
10. NW mdblk	171.	.9	.0	.2	.0	.6	.0	.0	.0	.0
11. SW mdblk	1.	.4	.0	.0	.0	.1	.0	.0	.0	.0
12. NE mdblk	190.	.8	.0	.2	.0	.5	.0	.0	.0	.0
13. ES blk	276.	.5	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.8	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.8	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.5	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	358.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.6	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	359.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.6	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009P-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.2	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.1
2. NW	.3	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.1	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.3	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.2	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.4	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.5
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.4	.0	.0	.3
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.3	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.2	.3	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009P-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	271	5.2	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	420	3.7	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	3.5	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	440	5.4	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	440	3.7	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	186	7.1	.0	10.0
G. Daley Ca EBA	-150	0	0	0	AG	0	3.3	.0	10.0
H. Daley Ca EBD	0	0	150	0	AG	186	3.8	.0	10.0
I. Daley Ca EBL	-150	-2	0	0	AG	0	3.3	.0	10.0
J. Daley Ca WBA	150	2	0	2	AG	149	6.7	.0	10.0
K. Daley Ca WBD	0	2	-150	2	AG	0	3.3	.0	10.0
L. Daley Ca WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	271	3.5	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	420	3.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	626	3.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	440	3.5	.0	10.0
Q. Daley C EBAX	-750	0	-150	0	AG	0	3.3	.0	10.0
R. Daley C EBDX	150	0	750	0	AG	186	3.3	.0	10.0
S. Daley C WBAX	750	2	150	2	AG	149	3.3	.0	10.0
T. Daley C WBDX	-150	2	-750	2	AG	0	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009P-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	8	1.8
3. SW	-8	-7	1.8
4. NE	8	8	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	8	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009P-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	1.0	.0	.3	.0	.3	.0	.2	.0	.0
2. NW	7.	.9	.0	.2	.0	.4	.0	.2	.0	.0
3. SW	7.	.9	.0	.2	.0	.4	.0	.2	.0	.0
4. NE	352.	.9	.0	.3	.0	.3	.0	.2	.0	.0
5. ES mdblk	280.	.4	.0	.0	.0	.0	.0	.0	.0	.1
6. WN mdblk	91.	.2	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	88.	.2	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	261.	.4	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	355.	.7	.2	.0	.0	.0	.2	.0	.0	.0
10. NW mdblk	172.	1.0	.0	.2	.0	.4	.0	.3	.0	.0
11. SW mdblk	5.	.7	.1	.0	.0	.0	.3	.0	.0	.0
12. NE mdblk	188.	.8	.0	.3	.0	.3	.0	.2	.0	.0
13. ES blk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	88.	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	87.	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.3	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	355.	.5	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.7	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.6	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.7	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009P-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0
17. SE blk	.0	.0	.0	.0	.2	.0	.0	.2	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.4	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.1	.0	.0	.3	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.3	.3	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2009P-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	3.5	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	149	4.0	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	3.5	.0	10.0
D. Daley Ca SBA	-4	150	-4	0	AG	0	3.5	.0	10.0
E. Daley Ca SBD	-4	0	-4	-150	AG	0	3.5	.0	10.0
F. Daley Ca SBL	-5	150	0	0	AG	186	7.1	.0	10.0
G. SR-18 EBA	-150	-2	0	-2	AG	311	5.2	.0	10.0
H. SR-18 EBD	0	-2	150	-2	AG	497	3.5	.0	10.0
I. SR-18 EBL	-150	-2	0	0	AG	0	3.3	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	491	5.3	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	342	3.4	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	3.3	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	3.5	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	149	3.5	.0	10.0
O. Daley C SBAX	-4	750	-4	150	AG	186	3.5	.0	10.0
P. Daley C SBDX	-4	-150	-4	-750	AG	0	3.5	.0	10.0
Q. SR-18 EBAX	-750	-2	-150	-2	AG	311	3.3	.0	10.0
R. SR-18 EBDX	150	-2	750	-2	AG	497	3.3	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	491	3.3	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	342	3.3	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2009P-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-8	1.8
2. NW	-10	10	1.8
3. SW	-10	-8	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-8	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-8	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-10	150	1.8
11. SW mdblk	-10	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-8	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-8	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-10	600	1.8
19. SW blk	-10	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2009P-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.7	.0	.1	.0	.0	.0	.2	.0	.1
2. NW	97.	.9	.0	.0	.0	.0	.0	.0	.0	.2
3. SW	83.	.7	.0	.0	.0	.0	.0	.0	.0	.3
4. NE	97.	.8	.0	.0	.0	.0	.0	.0	.0	.2
5. ES mdblk	278.	.7	.0	.0	.0	.0	.0	.0	.0	.3
6. WN mdblk	95.	.6	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	84.	.6	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	263.	.8	.0	.0	.0	.0	.0	.0	.0	.2
9. SE mdblk	359.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.5	.0	.0	.0	.0	.0	.3	.0	.0
11. SW mdblk	2.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	189.	.3	.0	.1	.0	.0	.0	.2	.0	.0
13. ES blk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	95.	.5	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.5	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.6	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	1.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.3	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	2.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	185.	.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2009P-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.3	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0

CHURCH OF THE WOODS

AIR QUALITY CO HOT SPOT ANALYSIS

CALINE4 MODEL PRINTOUTS

FUTURE YEAR (2013) WITHOUT PROJECT SCENARIO

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	178	3.5	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	374	2.6	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	129	4.8	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	345	3.7	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	601	2.8	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	2.5	.0	10.0
G. SR-189 EBA	-150	0	0	0	AG	298	4.6	.0	10.0
H. SR-189 EBD	0	0	150	0	AG	0	2.4	.0	10.0
I. SR-189 EBL	-150	-2	0	0	AG	196	4.8	.0	10.0
J. SR-189 WBA	150	0	0	0	AG	0	2.4	.0	10.0
K. SR-189 WBD	0	0	-150	0	AG	171	2.7	.0	10.0
L. SR-189 WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	307	2.5	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	374	2.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	345	2.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	601	2.5	.0	10.0
Q. SR-189 EBAX	-750	0	-150	0	AG	494	2.4	.0	10.0
R. SR-189 EBDX	150	0	750	0	AG	0	2.4	.0	10.0
S. SR-189 WBAX	750	0	150	0	AG	0	2.4	.0	10.0
T. SR-189 WBDX	-150	0	-750	0	AG	171	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	7	1.8
3. SW	-8	-7	1.8
4. NE	8	7	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	7	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	7	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	7	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	7	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	276.	.8	.0	.0	.0	.0	.1	.0	.2	.0
2. NW	173.	.8	.0	.0	.1	.0	.3	.0	.1	.0
3. SW	6.	.6	.0	.1	.0	.2	.0	.0	.1	.0
4. NE	264.	.7	.0	.0	.0	.0	.0	.0	.2	.0
5. ES mdblk	271.	.2	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	99.	.6	.0	.0	.0	.0	.0	.0	.3	.0
7. WS mdblk	82.	.6	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	268.	.2	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	352.	.6	.1	.0	.1	.0	.2	.0	.0	.0
10. NW mdblk	175.	.5	.0	.0	.0	.2	.0	.0	.0	.0
11. SW mdblk	6.	.6	.0	.0	.0	.0	.3	.0	.0	.0
12. NE mdblk	186.	.5	.0	.2	.0	.1	.0	.0	.0	.0
13. ES blk	270.	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.4	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.4	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	269.	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	354.	.5	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.4	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	5.	.5	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.4	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.2	.0	.0	.2	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.1	.0	.0	.3	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.2	.1	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013nP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Bear Spr NBA	2	-150	2	0	AG	17	3.9	.0	10.0
B. Bear Spr NBD	2	0	2	150	AG	35	2.7	.0	10.0
C. Bear Spr NBL	2	-150	0	0	AG	17	4.8	.0	10.0
D. Bear Spr SBA	-2	150	-2	0	AG	26	3.9	.0	10.0
E. Bear Spr SBD	-2	0	-2	-150	AG	31	2.7	.0	10.0
F. Bear Spr SBL	-2	150	0	0	AG	15	4.8	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	546	4.4	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	563	2.7	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	19	4.8	.0	10.0
J. SR-18 WBA	150	5	0	5	AG	593	4.4	.0	10.0
K. SR-18 WBD	0	5	-150	5	AG	616	2.9	.0	10.0
L. SR-18 WBL	150	5	0	0	AG	12	4.8	.0	10.0
M. Bear Sp NBAX	2	-750	2	-150	AG	34	2.5	.0	10.0
N. Bear Sp NBDX	2	150	2	750	AG	35	2.5	.0	10.0
O. Bear Sp SBAX	-2	750	-2	150	AG	41	2.5	.0	10.0
P. Bear Sp SBDX	-2	-150	-2	-750	AG	31	2.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	565	2.4	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	563	2.4	.0	10.0
S. SR-18 WBAX	750	5	150	5	AG	605	2.4	.0	10.0
T. SR-18 WBDX	-150	5	-750	5	AG	616	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013nP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-12	1.8
2. NW	-8	12	1.8
3. SW	-8	-12	1.8
4. NE	8	12	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	12	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	12	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	12	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	12	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013nP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	277.	.7	.0	.0	.0	.0	.0	.0	.4	.0
2. NW	97.	.7	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	278.	.7	.0	.0	.0	.0	.0	.0	.4	.0
4. NE	98.	.7	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	277.	.6	.0	.0	.0	.0	.0	.0	.0	.3
6. WN mdblk	97.	.6	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	83.	.7	.0	.0	.0	.0	.0	.0	.4	.0
8. EN mdblk	263.	.7	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	355.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	175.	.2	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	4.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	185.	.2	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.5	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.5	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.5	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.5	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	177.	.1	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	3.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	184.	.1	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013nP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.1	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.3
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.3	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	1707. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	10. DEGREES	TEMP=	10.0 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Project NBA	0	-150	0	0	AG	0	2.5	.0	10.0
B. Project NBD	0	0	0	150	AG	0	2.5	.0	10.0
C. Project NBL	2	-150	0	0	AG	0	2.5	.0	10.0
D. Project SBA	-5	150	-5	0	AG	0	2.5	.0	10.0
E. Project SBD	-5	0	-5	-150	AG	0	2.5	.0	10.0
F. Project SBL	-5	150	0	0	AG	0	2.5	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	504	3.9	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	504	2.5	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	0	2.4	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	717	4.4	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	717	2.7	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Project NBAX	0	-750	0	-150	AG	0	2.5	.0	10.0
N. Project NBDX	0	150	0	750	AG	0	2.5	.0	10.0
O. Project SBAX	-5	750	-5	150	AG	0	2.5	.0	10.0
P. Project SBDX	-5	-150	-5	-750	AG	0	2.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	504	2.4	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	504	2.4	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	717	2.4	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	717	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-12	10	1.8
3. SW	-12	-12	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-12	150	1.8
11. SW mdblk	-12	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-12	600	1.8
19. SW blk	-12	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	277.	.6	.0	.0	.0	.0	.0	.0	.3	.0
2. NW	97.	.7	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	82.	.6	.0	.0	.0	.0	.0	.0	.0	.2
4. NE	98.	.7	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	277.	.6	.0	.0	.0	.0	.0	.0	.0	.2
6. WN mdblk	97.	.6	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	83.	.6	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	263.	.8	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	291.	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	139.	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	37.	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	147.	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.5	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.5	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.5	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.5	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	5.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	175.	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.3
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.3	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	2.5	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	222	3.0	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	2.5	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	403	5.2	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	0	2.5	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	2.5	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	282	3.5	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	282	2.4	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	222	5.1	.0	10.0
J. SR-18 WBA	150	2	0	2	AG	314	3.6	.0	10.0
K. SR-18 WBD	0	2	-150	2	AG	717	2.7	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	2.5	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	222	2.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	403	2.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	0	2.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	504	2.4	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	282	2.4	.0	10.0
S. SR-18 WBAX	750	2	150	2	AG	314	2.4	.0	10.0
T. SR-18 WBDX	-150	2	-750	2	AG	717	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-8	8	1.8
3. SW	-8	-12	1.8
4. NE	7	8	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	8	1.8
17. SE blk	7	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.6	.0	.1	.0	.3	.0	.0	.0	.0
2. NW	262.	.7	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	6.	.8	.0	.0	.0	.3	.0	.0	.0	.0
4. NE	262.	.9	.0	.0	.0	.1	.0	.0	.0	.0
5. ES mdblk	276.	.4	.0	.0	.0	.0	.0	.0	.0	.1
6. WN mdblk	98.	.6	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	80.	.7	.0	.0	.0	.0	.0	.0	.2	.0
8. EN mdblk	266.	.5	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	357.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.5	.0	.1	.0	.4	.0	.0	.0	.0
11. SW mdblk	1.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	190.	.5	.0	.1	.0	.3	.0	.0	.0	.0
13. ES blk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.5	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.5	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.3	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	358.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.4	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	359.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.4	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.2	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.2	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.1	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.2	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.3
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	222	3.6	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	385	2.6	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	2.5	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	403	3.8	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	403	2.7	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	204	5.1	.0	10.0
G. Daley Ca EBA	-150	0	0	0	AG	0	2.4	.0	10.0
H. Daley Ca EBD	0	0	150	0	AG	204	2.8	.0	10.0
I. Daley Ca EBL	-150	-2	0	0	AG	0	2.4	.0	10.0
J. Daley Ca WBA	150	2	0	2	AG	163	4.9	.0	10.0
K. Daley Ca WBD	0	2	-150	2	AG	0	2.4	.0	10.0
L. Daley Ca WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	222	2.5	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	385	2.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	607	2.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	403	2.5	.0	10.0
Q. Daley C EBAX	-750	0	-150	0	AG	0	2.4	.0	10.0
R. Daley C EBDX	150	0	750	0	AG	204	2.4	.0	10.0
S. Daley C WBAX	750	2	150	2	AG	163	2.4	.0	10.0
T. Daley C WBDX	-150	2	-750	2	AG	0	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	8	1.8
3. SW	-8	-7	1.8
4. NE	8	8	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	8	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.7	.0	.2	.0	.2	.0	.2	.0	.0
2. NW	7.	.6	.0	.1	.0	.3	.0	.2	.0	.0
3. SW	7.	.6	.0	.1	.0	.3	.0	.2	.0	.0
4. NE	352.	.6	.0	.2	.0	.2	.0	.2	.0	.0
5. ES mdblk	280.	.3	.0	.0	.0	.0	.0	.0	.0	.1
6. WN mdblk	91.	.2	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	88.	.2	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	261.	.3	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	355.	.4	.1	.0	.0	.0	.1	.0	.0	.0
10. NW mdblk	172.	.7	.0	.1	.0	.3	.0	.2	.0	.0
11. SW mdblk	5.	.5	.0	.0	.0	.0	.2	.0	.0	.0
12. NE mdblk	188.	.6	.0	.2	.0	.2	.0	.1	.0	.0
13. ES blk	276.	.2	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	88.	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	87.	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.2	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	355.	.3	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.5	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.4	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.5	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.1	.0	.0	.1	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.1	.3	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.2	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	2.5	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	163	2.9	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	2.5	.0	10.0
D. Daley Ca SBA	-4	150	-4	0	AG	0	2.5	.0	10.0
E. Daley Ca SBD	-4	0	-4	-150	AG	0	2.5	.0	10.0
F. Daley Ca SBL	-5	150	0	0	AG	204	5.1	.0	10.0
G. SR-18 EBA	-150	-2	0	-2	AG	282	3.5	.0	10.0
H. SR-18 EBD	0	-2	150	-2	AG	486	2.5	.0	10.0
I. SR-18 EBL	-150	-2	0	0	AG	0	2.4	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	477	3.7	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	314	2.5	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	2.5	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	163	2.5	.0	10.0
O. Daley C SBAX	-4	750	-4	150	AG	204	2.5	.0	10.0
P. Daley C SBDX	-4	-150	-4	-750	AG	0	2.5	.0	10.0
Q. SR-18 EBAX	-750	-2	-150	-2	AG	282	2.4	.0	10.0
R. SR-18 EBDX	150	-2	750	-2	AG	486	2.4	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	477	2.4	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	314	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-8	1.8
2. NW	-10	10	1.8
3. SW	-10	-8	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-8	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-8	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-10	150	1.8
11. SW mdblk	-10	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-8	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-8	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-10	600	1.8
19. SW blk	-10	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.5	.0	.0	.0	.0	.0	.2	.0	.0
2. NW	96.	.6	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	83.	.5	.0	.0	.0	.0	.0	.0	.0	.2
4. NE	97.	.5	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	278.	.5	.0	.0	.0	.0	.0	.0	.0	.2
6. WN mdblk	95.	.4	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	84.	.4	.0	.0	.0	.0	.0	.0	.2	.0
8. EN mdblk	263.	.5	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	359.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.4	.0	.0	.0	.0	.0	.3	.0	.0
11. SW mdblk	2.	.1	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	189.	.3	.0	.0	.0	.0	.0	.1	.0	.0
13. ES blk	276.	.4	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	95.	.3	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.3	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.4	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	1.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	2.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	185.	.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CHURCH OF THE WOODS

AIR QUALITY CO HOT SPOT ANALYSIS

CALINE4 MODEL PRINTOUTS

FUTURE YEAR (2013) WITH PROJECT AND MITIGATION SCENARIO

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013P-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	278	3.6	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	474	2.7	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	189	4.8	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	445	3.8	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	761	2.9	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	2.5	.0	10.0
G. SR-189 EBA	-150	0	0	0	AG	358	4.9	.0	10.0
H. SR-189 EBD	0	0	150	0	AG	0	2.4	.0	10.0
I. SR-189 EBL	-150	-2	0	0	AG	196	4.8	.0	10.0
J. SR-189 WBA	150	0	0	0	AG	0	2.4	.0	10.0
K. SR-189 WBD	0	0	-150	0	AG	231	2.8	.0	10.0
L. SR-189 WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	467	2.5	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	474	2.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	445	2.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	761	2.5	.0	10.0
Q. SR-189 EBAX	-750	0	-150	0	AG	554	2.4	.0	10.0
R. SR-189 EBDX	150	0	750	0	AG	0	2.4	.0	10.0
S. SR-189 WBAX	750	0	150	0	AG	0	2.4	.0	10.0
T. SR-189 WBDX	-150	0	-750	0	AG	231	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013P-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	7	1.8
3. SW	-8	-7	1.8
4. NE	8	7	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	7	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	7	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	7	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	7	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013P-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	276.	1.0	.0	.0	.0	.0	.1	.0	.3	.0
2. NW	173.	1.0	.1	.0	.1	.0	.4	.0	.1	.0
3. SW	7.	.8	.0	.1	.0	.3	.0	.0	.1	.0
4. NE	264.	.9	.0	.1	.0	.1	.0	.0	.3	.0
5. ES mdblk	271.	.3	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	99.	.7	.0	.0	.0	.0	.0	.0	.3	.0
7. WS mdblk	82.	.8	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	268.	.3	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	352.	.8	.2	.0	.2	.0	.2	.0	.0	.0
10. NW mdblk	175.	.6	.0	.1	.0	.3	.0	.0	.0	.0
11. SW mdblk	7.	.7	.1	.0	.1	.0	.4	.0	.0	.0
12. NE mdblk	186.	.6	.0	.2	.0	.2	.0	.0	.0	.0
13. ES blk	270.	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.5	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.5	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	269.	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	354.	.6	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.5	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.6	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.5	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013P-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.1	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.1
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.2	.0	.0	.3	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.2	.0	.0	.4	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.2	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013P-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Bear Spr NBA	2	-150	2	0	AG	17	3.9	.0	10.0
B. Bear Spr NBD	2	0	2	150	AG	75	2.7	.0	10.0
C. Bear Spr NBL	2	-150	0	0	AG	17	4.8	.0	10.0
D. Bear Spr SBA	-2	150	-2	0	AG	26	3.9	.0	10.0
E. Bear Spr SBD	-2	0	-2	-150	AG	31	2.7	.0	10.0
F. Bear Spr SBL	-2	150	0	0	AG	55	4.8	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	646	4.8	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	703	3.4	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	19	4.8	.0	10.0
J. SR-18 WBA	150	5	0	5	AG	733	5.0	.0	10.0
K. SR-18 WBD	0	5	-150	5	AG	716	3.4	.0	10.0
L. SR-18 WBL	150	5	0	0	AG	12	4.8	.0	10.0
M. Bear Sp NBAX	2	-750	2	-150	AG	34	2.5	.0	10.0
N. Bear Sp NBDX	2	150	2	750	AG	75	2.5	.0	10.0
O. Bear Sp SBAX	-2	750	-2	150	AG	81	2.5	.0	10.0
P. Bear Sp SBDX	-2	-150	-2	-750	AG	31	2.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	665	2.4	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	703	2.4	.0	10.0
S. SR-18 WBAX	750	5	150	5	AG	745	2.4	.0	10.0
T. SR-18 WBDX	-150	5	-750	5	AG	716	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013P-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-12	1.8
2. NW	-8	12	1.8
3. SW	-8	-12	1.8
4. NE	8	12	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	12	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	12	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	12	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	12	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013P-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	278.	.8	.0	.0	.0	.0	.0	.0	.5	.0
2. NW	98.	.9	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	81.	.8	.0	.0	.0	.0	.0	.0	.0	.4
4. NE	98.	.9	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	278.	.8	.0	.0	.0	.0	.0	.0	.0	.4
6. WN mdblk	97.	.8	.0	.0	.0	.0	.0	.0	.2	.0
7. WS mdblk	83.	.9	.0	.0	.0	.0	.0	.0	.5	.0
8. EN mdblk	263.	1.0	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	357.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	173.	.2	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	4.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	186.	.2	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.6	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.6	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.6	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	3.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	184.	.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013P-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.3
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.3	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013P-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Project NBA	0	-150	0	0	AG	0	2.5	.0	10.0
B. Project NBD	0	0	0	150	AG	400	3.2	.0	10.0
C. Project NBL	2	-150	0	0	AG	0	2.5	.0	10.0
D. Project SBA	-5	150	-5	0	AG	140	4.4	.0	10.0
E. Project SBD	-5	0	-5	-150	AG	0	2.5	.0	10.0
F. Project SBL	-5	150	0	0	AG	260	5.1	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	504	3.9	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	764	2.7	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	140	4.8	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	977	5.0	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	857	3.0	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Project NBAX	0	-750	0	-150	AG	0	2.5	.0	10.0
N. Project NBDX	0	150	0	750	AG	400	2.5	.0	10.0
O. Project SBAX	-5	750	-5	150	AG	400	2.5	.0	10.0
P. Project SBDX	-5	-150	-5	-750	AG	0	2.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	644	2.4	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	764	2.4	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	977	2.4	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	857	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013P-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-12	10	1.8
3. SW	-12	-12	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-12	150	1.8
11. SW mdblk	-12	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-12	600	1.8
19. SW blk	-12	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013P-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	1.0	.0	.2	.0	.0	.0	.2	.0	.2
2. NW	97.	1.3	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	82.	.8	.0	.0	.0	.0	.0	.0	.0	.3
4. NE	98.	1.1	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	278.	.9	.0	.0	.0	.0	.0	.0	.0	.4
6. WN mdblk	96.	.9	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	83.	.9	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	263.	1.2	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	358.	.3	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	169.	.6	.0	.1	.0	.1	.0	.3	.0	.0
11. SW mdblk	3.	.3	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	190.	.6	.0	.2	.0	.0	.0	.2	.0	.0
13. ES blk	276.	.7	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.6	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.6	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.7	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	360.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.4	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	1.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.4	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013P-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.7	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.1	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.1	.1	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.8	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.4	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.4
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.3	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.4	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.2	.1	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013P-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	2.5	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	382	3.2	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	2.5	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	563	5.2	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	0	2.5	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	2.5	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	382	3.6	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	382	2.5	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	382	5.2	.0	10.0
J. SR-18 WBA	150	2	0	2	AG	414	3.7	.0	10.0
K. SR-18 WBD	0	2	-150	2	AG	977	3.5	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	2.5	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	382	2.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	563	2.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	0	2.5	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	764	2.4	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	382	2.4	.0	10.0
S. SR-18 WBAX	750	2	150	2	AG	414	2.4	.0	10.0
T. SR-18 WBDX	-150	2	-750	2	AG	977	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013P-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-8	8	1.8
3. SW	-8	-12	1.8
4. NE	7	8	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	8	1.8
17. SE blk	7	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013P-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	278.	.9	.0	.0	.0	.0	.0	.0	.2	.0
2. NW	261.	1.1	.0	.0	.0	.0	.0	.0	.1	.0
3. SW	6.	1.1	.0	.2	.0	.4	.0	.0	.1	.0
4. NE	262.	1.4	.0	.0	.0	.2	.0	.0	.1	.0
5. ES mdblk	276.	.6	.0	.0	.0	.0	.0	.0	.0	.2
6. WN mdblk	98.	1.0	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	80.	1.0	.0	.0	.0	.0	.0	.0	.3	.0
8. EN mdblk	267.	.6	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	357.	.3	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.8	.0	.2	.0	.5	.0	.0	.0	.0
11. SW mdblk	1.	.3	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	191.	.8	.0	.2	.0	.4	.0	.0	.0	.0
13. ES blk	276.	.4	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.7	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	83.	.7	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.4	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.1	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.5	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	358.	.1	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.5	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013P-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.2	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.3	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.1	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.3	.0	.5	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.2	.0	.6	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.4	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.4
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.4	.0	.0	.2
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.3	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.2	.2	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013P-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	382	3.7	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	545	2.7	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	2.5	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	563	3.9	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	563	2.7	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	204	5.1	.0	10.0
G. Daley Ca EBA	-150	0	0	0	AG	0	2.4	.0	10.0
H. Daley Ca EBD	0	0	150	0	AG	204	2.8	.0	10.0
I. Daley Ca EBL	-150	-2	0	0	AG	0	2.4	.0	10.0
J. Daley Ca WBA	150	2	0	2	AG	163	4.9	.0	10.0
K. Daley Ca WBD	0	2	-150	2	AG	0	2.4	.0	10.0
L. Daley Ca WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	382	2.5	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	545	2.5	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	767	2.5	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	563	2.5	.0	10.0
Q. Daley C EBAX	-750	0	-150	0	AG	0	2.4	.0	10.0
R. Daley C EBDX	150	0	750	0	AG	204	2.4	.0	10.0
S. Daley C WBAX	750	2	150	2	AG	163	2.4	.0	10.0
T. Daley C WBDX	-150	2	-750	2	AG	0	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013P-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	8	1.8
3. SW	-8	-7	1.8
4. NE	8	8	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	8	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013P-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	352.	.9	.0	.3	.0	.2	.0	.2	.0	.0
2. NW	7.	.8	.0	.2	.0	.4	.0	.2	.0	.0
3. SW	7.	.8	.0	.2	.0	.4	.0	.2	.0	.0
4. NE	352.	.8	.0	.3	.0	.2	.0	.2	.0	.0
5. ES mdblk	280.	.3	.0	.0	.0	.0	.0	.0	.0	.1
6. WN mdblk	91.	.2	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	88.	.2	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	261.	.3	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	355.	.6	.2	.0	.0	.0	.1	.0	.0	.0
10. NW mdblk	172.	.9	.0	.2	.0	.4	.0	.2	.0	.0
11. SW mdblk	6.	.6	.2	.0	.0	.0	.3	.0	.0	.0
12. NE mdblk	188.	.7	.0	.3	.0	.2	.0	.1	.0	.0
13. ES blk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	88.	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	87.	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.2	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	355.	.5	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.6	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.5	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.6	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013P-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.2	.0	.0	.2	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.2	.4	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.1	.0	.0	.3	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.3	.3	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2013P-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	2.5	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	163	2.9	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	2.5	.0	10.0
D. Daley Ca SBA	-4	150	-4	0	AG	0	2.5	.0	10.0
E. Daley Ca SBD	-4	0	-4	-150	AG	0	2.5	.0	10.0
F. Daley Ca SBL	-5	150	0	0	AG	204	5.1	.0	10.0
G. SR-18 EBA	-150	-2	0	-2	AG	382	3.6	.0	10.0
H. SR-18 EBD	0	-2	150	-2	AG	586	2.5	.0	10.0
I. SR-18 EBL	-150	-2	0	0	AG	0	2.4	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	577	3.9	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	414	2.5	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	2.4	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	2.5	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	163	2.5	.0	10.0
O. Daley C SBAX	-4	750	-4	150	AG	204	2.5	.0	10.0
P. Daley C SBDX	-4	-150	-4	-750	AG	0	2.5	.0	10.0
Q. SR-18 EBAX	-750	-2	-150	-2	AG	382	2.4	.0	10.0
R. SR-18 EBDX	150	-2	750	-2	AG	586	2.4	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	577	2.4	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	414	2.4	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2013P-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-8	1.8
2. NW	-10	10	1.8
3. SW	-10	-8	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-8	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-8	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-10	150	1.8
11. SW mdblk	-10	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-8	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-8	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-10	600	1.8
19. SW blk	-10	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2013P-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.6	.0	.0	.0	.0	.0	.2	.0	.1
2. NW	97.	.7	.0	.0	.0	.0	.0	.0	.0	.1
3. SW	83.	.6	.0	.0	.0	.0	.0	.0	.0	.2
4. NE	97.	.6	.0	.0	.0	.0	.0	.0	.0	.1
5. ES mdblk	278.	.6	.0	.0	.0	.0	.0	.0	.0	.3
6. WN mdblk	95.	.5	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	84.	.5	.0	.0	.0	.0	.0	.0	.2	.0
8. EN mdblk	263.	.6	.0	.0	.0	.0	.0	.0	.0	.1
9. SE mdblk	359.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.4	.0	.0	.0	.0	.0	.3	.0	.0
11. SW mdblk	3.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	189.	.3	.0	.0	.0	.0	.0	.1	.0	.0
13. ES blk	276.	.5	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.4	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.4	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.5	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	1.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	2.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	185.	.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2013P-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.3	.2	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.3	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CHURCH OF THE WOODS

AIR QUALITY CO HOT SPOT ANALYSIS

CALINE4 MODEL PRINTOUTS

FUTURE YEAR (2030) WITHOUT PROJECT SCENARIO

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	272	1.4	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	512	1.1	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	184	1.8	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	516	1.5	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	877	1.2	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	1.0	.0	10.0
G. SR-189 EBA	-150	0	0	0	AG	412	1.9	.0	10.0
H. SR-189 EBD	0	0	150	0	AG	0	1.0	.0	10.0
I. SR-189 EBL	-150	-2	0	0	AG	240	1.9	.0	10.0
J. SR-189 WBA	150	0	0	0	AG	0	1.0	.0	10.0
K. SR-189 WBD	0	0	-150	0	AG	235	1.1	.0	10.0
L. SR-189 WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	456	1.0	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	512	1.0	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	516	1.0	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	877	1.0	.0	10.0
Q. SR-189 EBAX	-750	0	-150	0	AG	652	1.0	.0	10.0
R. SR-189 EBDX	150	0	750	0	AG	0	1.0	.0	10.0
S. SR-189 WBAX	750	0	150	0	AG	0	1.0	.0	10.0
T. SR-189 WBDX	-150	0	-750	0	AG	235	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	7	1.8
3. SW	-8	-7	1.8
4. NE	8	7	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	7	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	7	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	7	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	7	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	276.	.4	.0	.0	.0	.0	.0	.0	.1	.0
2. NW	173.	.4	.0	.0	.0	.0	.2	.0	.0	.0
3. SW	7.	.4	.0	.0	.0	.1	.0	.0	.0	.0
4. NE	264.	.4	.0	.0	.0	.0	.0	.0	.1	.0
5. ES mdblk	271.	.1	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	99.	.3	.0	.0	.0	.0	.0	.0	.1	.0
7. WS mdblk	82.	.3	.0	.0	.0	.0	.0	.0	.1	.0
8. EN mdblk	268.	.1	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	352.	.3	.0	.0	.0	.0	.1	.0	.0	.0
10. NW mdblk	175.	.3	.0	.0	.0	.1	.0	.0	.0	.0
11. SW mdblk	7.	.3	.0	.0	.0	.0	.2	.0	.0	.0
12. NE mdblk	186.	.3	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	270.	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.2	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.2	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	269.	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	354.	.2	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.3	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030nP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030wP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Bear Spr NBA	2	-150	2	0	AG	27	1.5	.0	10.0
B. Bear Spr NBD	2	0	2	150	AG	94	1.1	.0	10.0
C. Bear Spr NBL	2	-150	0	0	AG	27	1.8	.0	10.0
D. Bear Spr SBA	-2	150	-2	0	AG	41	1.5	.0	10.0
E. Bear Spr SBD	-2	0	-2	-150	AG	48	1.1	.0	10.0
F. Bear Spr SBL	-2	150	0	0	AG	63	1.8	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	766	1.8	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	833	1.6	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	29	1.8	.0	10.0
J. SR-18 WBA	150	5	0	5	AG	853	1.9	.0	10.0
K. SR-18 WBD	0	5	-150	5	AG	849	1.6	.0	10.0
L. SR-18 WBL	150	5	0	0	AG	18	1.8	.0	10.0
M. Bear Sp NBAX	2	-750	2	-150	AG	54	1.0	.0	10.0
N. Bear Sp NBDX	2	150	2	750	AG	94	1.0	.0	10.0
O. Bear Sp SBAX	-2	750	-2	150	AG	104	1.0	.0	10.0
P. Bear Sp SBDX	-2	-150	-2	-750	AG	48	1.0	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	795	1.0	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	833	1.0	.0	10.0
S. SR-18 WBAX	750	5	150	5	AG	871	1.0	.0	10.0
T. SR-18 WBDX	-150	5	-750	5	AG	849	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030wP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-12	1.8
2. NW	-8	12	1.8
3. SW	-8	-12	1.8
4. NE	8	12	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	12	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	12	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	12	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	12	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030wP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	278.	.4	.0	.0	.0	.0	.0	.0	.2	.0
2. NW	98.	.4	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	81.	.4	.0	.0	.0	.0	.0	.0	.0	.2
4. NE	99.	.4	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	278.	.4	.0	.0	.0	.0	.0	.0	.0	.2
6. WN mdblk	97.	.4	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	83.	.4	.0	.0	.0	.0	.0	.0	.2	.0
8. EN mdblk	262.	.5	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	356.	.1	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	173.	.1	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	5.	.1	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	186.	.1	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.3	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.3	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.3	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	3.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	185.	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030wP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	1707. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	10. DEGREES	TEMP=	10.0 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Project NBA	0	-150	0	0	AG	0	1.0	.0	10.0
B. Project NBD	0	0	0	150	AG	0	1.0	.0	10.0
C. Project NBL	2	-150	0	0	AG	0	1.0	.0	10.0
D. Project SBA	-5	150	-5	0	AG	0	1.0	.0	10.0
E. Project SBD	-5	0	-5	-150	AG	0	1.0	.0	10.0
F. Project SBL	-5	150	0	0	AG	0	1.0	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	672	1.6	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	672	1.1	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	0	1.0	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	961	1.8	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	961	1.4	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Project NBAX	0	-750	0	-150	AG	0	1.0	.0	10.0
N. Project NBDX	0	150	0	750	AG	0	1.0	.0	10.0
O. Project SBAX	-5	750	-5	150	AG	0	1.0	.0	10.0
P. Project SBDX	-5	-150	-5	-750	AG	0	1.0	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	672	1.0	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	672	1.0	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	961	1.0	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	961	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-12	10	1.8
3. SW	-12	-12	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-12	150	1.8
11. SW mdblk	-12	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-12	600	1.8
19. SW blk	-12	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	278.	.3	.0	.0	.0	.0	.0	.0	.2	.0
2. NW	97.	.4	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	278.	.3	.0	.0	.0	.0	.0	.0	.2	.0
4. NE	98.	.4	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	277.	.3	.0	.0	.0	.0	.0	.0	.0	.1
6. WN mdblk	97.	.4	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	83.	.4	.0	.0	.0	.0	.0	.0	.2	.0
8. EN mdblk	263.	.4	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	322.	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	142.	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	37.	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	217.	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.3	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.3	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.3	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	360.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	178.	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	2.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	180.	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030nP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	1.0	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	327	1.3	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	1.0	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	577	1.9	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	0	1.0	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	1.0	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	345	1.4	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	345	1.0	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	327	1.9	.0	10.0
J. SR-18 WBA	150	2	0	2	AG	384	1.4	.0	10.0
K. SR-18 WBD	0	2	-150	2	AG	961	1.4	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	1.0	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	327	1.0	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	577	1.0	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	0	1.0	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	672	1.0	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	345	1.0	.0	10.0
S. SR-18 WBAX	750	2	150	2	AG	384	1.0	.0	10.0
T. SR-18 WBDX	-150	2	-750	2	AG	961	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-8	8	1.8
3. SW	-8	-12	1.8
4. NE	7	8	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	8	1.8
17. SE blk	7	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	278.	.3	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	262.	.4	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	6.	.4	.0	.0	.0	.2	.0	.0	.0	.0
4. NE	262.	.5	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	275.	.2	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	98.	.4	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	80.	.4	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	267.	.2	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	357.	.1	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.3	.0	.0	.0	.2	.0	.0	.0	.0
11. SW mdblk	1.	.1	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	191.	.3	.0	.0	.0	.2	.0	.0	.0	.0
13. ES blk	276.	.2	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.3	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	83.	.3	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.2	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	358.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030nP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.1	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	327	1.4	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	576	1.1	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	1.0	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	577	1.5	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	577	1.1	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	307	1.9	.0	10.0
G. Daley Ca EBA	-150	0	0	0	AG	0	1.0	.0	10.0
H. Daley Ca EBD	0	0	150	0	AG	307	1.2	.0	10.0
I. Daley Ca EBL	-150	-2	0	0	AG	0	1.0	.0	10.0
J. Daley Ca WBA	150	2	0	2	AG	249	1.9	.0	10.0
K. Daley Ca WBD	0	2	-150	2	AG	0	1.0	.0	10.0
L. Daley Ca WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	327	1.0	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	576	1.0	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	884	1.0	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	577	1.0	.0	10.0
Q. Daley C EBAX	-750	0	-150	0	AG	0	1.0	.0	10.0
R. Daley C EBDX	150	0	750	0	AG	307	1.0	.0	10.0
S. Daley C WBAX	750	2	150	2	AG	249	1.0	.0	10.0
T. Daley C WBDX	-150	2	-750	2	AG	0	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	8	1.8
3. SW	-8	-7	1.8
4. NE	8	8	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	8	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	352.	.4	.0	.1	.0	.0	.0	.0	.0	.0
2. NW	7.	.4	.0	.0	.0	.1	.0	.0	.0	.0
3. SW	7.	.4	.0	.0	.0	.1	.0	.0	.0	.0
4. NE	352.	.3	.0	.1	.0	.0	.0	.0	.0	.0
5. ES mdblk	280.	.2	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	91.	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	88.	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	261.	.2	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	355.	.2	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	172.	.4	.0	.0	.0	.2	.0	.1	.0	.0
11. SW mdblk	5.	.3	.0	.0	.0	.0	.1	.0	.0	.0
12. NE mdblk	188.	.3	.0	.1	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.1	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	88.	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	87.	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.1	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	355.	.2	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.3	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.2	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030nP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	1.0	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	249	1.2	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	1.0	.0	10.0
D. Daley Ca SBA	-4	150	-4	0	AG	0	1.0	.0	10.0
E. Daley Ca SBD	-4	0	-4	-150	AG	0	1.0	.0	10.0
F. Daley Ca SBL	-5	150	0	0	AG	307	1.9	.0	10.0
G. SR-18 EBA	-150	-2	0	-2	AG	345	1.4	.0	10.0
H. SR-18 EBD	0	-2	150	-2	AG	652	1.1	.0	10.0
I. SR-18 EBL	-150	-2	0	0	AG	0	1.0	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	633	1.6	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	384	1.0	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	1.0	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	249	1.0	.0	10.0
O. Daley C SBAX	-4	750	-4	150	AG	307	1.0	.0	10.0
P. Daley C SBDX	-4	-150	-4	-750	AG	0	1.0	.0	10.0
Q. SR-18 EBAX	-750	-2	-150	-2	AG	345	1.0	.0	10.0
R. SR-18 EBDX	150	-2	750	-2	AG	652	1.0	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	633	1.0	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	384	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-8	1.8
2. NW	-10	10	1.8
3. SW	-10	-8	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-8	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-8	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-10	150	1.8
11. SW mdblk	-10	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-8	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-8	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-10	600	1.8
19. SW blk	-10	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.3	.0	.0	.0	.0	.0	.1	.0	.0
2. NW	97.	.3	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	83.	.3	.0	.0	.0	.0	.0	.0	.0	.1
4. NE	97.	.3	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	279.	.3	.0	.0	.0	.0	.0	.0	.0	.1
6. WN mdblk	95.	.2	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	84.	.2	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	262.	.3	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	359.	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.2	.0	.0	.0	.0	.0	.1	.0	.0
11. SW mdblk	3.	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	189.	.1	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.2	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	95.	.2	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.2	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.2	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	1.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.1	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	3.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.1	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030nP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CHURCH OF THE WOODS

AIR QUALITY CO HOT SPOT ANALYSIS

CALINE4 MODEL PRINTOUTS

FUTURE YEAR (2030) WITH PROJECT AND MITIGATION SCENARIO

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030wP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	372	1.4	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	612	1.1	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	244	1.9	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	616	1.6	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	1037	1.4	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	1.0	.0	10.0
G. SR-189 EBA	-150	0	0	0	AG	472	1.9	.0	10.0
H. SR-189 EBD	0	0	150	0	AG	0	1.0	.0	10.0
I. SR-189 EBL	-150	-2	0	0	AG	240	1.9	.0	10.0
J. SR-189 WBA	150	0	0	0	AG	0	1.0	.0	10.0
K. SR-189 WBD	0	0	-150	0	AG	295	1.1	.0	10.0
L. SR-189 WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	616	1.0	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	612	1.0	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	616	1.0	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	1037	1.0	.0	10.0
Q. SR-189 EBAX	-750	0	-150	0	AG	712	1.0	.0	10.0
R. SR-189 EBDX	150	0	750	0	AG	0	1.0	.0	10.0
S. SR-189 WBAX	750	0	150	0	AG	0	1.0	.0	10.0
T. SR-189 WBDX	-150	0	-750	0	AG	295	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030wP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	7	1.8
3. SW	-8	-7	1.8
4. NE	8	7	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	7	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	7	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	7	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	7	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030wP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	276.	.5	.0	.0	.0	.0	.0	.0	.1	.0
2. NW	173.	.5	.0	.0	.0	.0	.2	.0	.0	.0
3. SW	172.	.4	.0	.0	.0	.0	.2	.0	.0	.0
4. NE	264.	.4	.0	.0	.0	.0	.0	.0	.1	.0
5. ES mdblk	271.	.1	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	99.	.3	.0	.0	.0	.0	.0	.0	.2	.0
7. WS mdblk	82.	.4	.0	.0	.0	.0	.0	.0	.2	.0
8. EN mdblk	268.	.1	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	352.	.4	.0	.0	.0	.0	.1	.0	.0	.0
10. NW mdblk	175.	.3	.0	.0	.0	.2	.0	.0	.0	.0
11. SW mdblk	7.	.4	.0	.0	.0	.0	.2	.0	.0	.0
12. NE mdblk	186.	.3	.0	.1	.0	.0	.0	.0	.0	.0
13. ES blk	269.	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.2	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.2	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	269.	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	354.	.3	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.3	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030wP-01 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.1	.0	.0	.1	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030wP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Bear Spr NBA	2	-150	2	0	AG	27	1.5	.0	10.0
B. Bear Spr NBD	2	0	2	150	AG	94	1.1	.0	10.0
C. Bear Spr NBL	2	-150	0	0	AG	27	1.8	.0	10.0
D. Bear Spr SBA	-2	150	-2	0	AG	41	1.5	.0	10.0
E. Bear Spr SBD	-2	0	-2	-150	AG	48	1.1	.0	10.0
F. Bear Spr SBL	-2	150	0	0	AG	63	1.8	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	766	1.8	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	833	1.6	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	29	1.8	.0	10.0
J. SR-18 WBA	150	5	0	5	AG	853	1.9	.0	10.0
K. SR-18 WBD	0	5	-150	5	AG	849	1.6	.0	10.0
L. SR-18 WBL	150	5	0	0	AG	18	1.8	.0	10.0
M. Bear Sp NBAX	2	-750	2	-150	AG	54	1.0	.0	10.0
N. Bear Sp NBDX	2	150	2	750	AG	94	1.0	.0	10.0
O. Bear Sp SBAX	-2	750	-2	150	AG	104	1.0	.0	10.0
P. Bear Sp SBDX	-2	-150	-2	-750	AG	48	1.0	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	795	1.0	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	833	1.0	.0	10.0
S. SR-18 WBAX	750	5	150	5	AG	871	1.0	.0	10.0
T. SR-18 WBDX	-150	5	-750	5	AG	849	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030wP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-12	1.8
2. NW	-8	12	1.8
3. SW	-8	-12	1.8
4. NE	8	12	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	12	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	12	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	12	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	12	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030wP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	278.	.4	.0	.0	.0	.0	.0	.0	.2	.0
2. NW	98.	.4	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	81.	.4	.0	.0	.0	.0	.0	.0	.0	.2
4. NE	99.	.4	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	278.	.4	.0	.0	.0	.0	.0	.0	.0	.2
6. WN mdblk	97.	.4	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	83.	.4	.0	.0	.0	.0	.0	.0	.2	.0
8. EN mdblk	262.	.5	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	356.	.1	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	173.	.1	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	5.	.1	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	186.	.1	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.3	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.3	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.3	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	175.	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	3.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	185.	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030wP-02 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030wP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	1707. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	10. DEGREES	TEMP=	10.0 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Project NBA	0	-150	0	0	AG	0	1.0	.0	10.0
B. Project NBD	0	0	0	150	AG	400	1.3	.0	10.0
C. Project NBL	2	-150	0	0	AG	0	1.0	.0	10.0
D. Project SBA	-5	150	-5	0	AG	140	1.7	.0	10.0
E. Project SBD	-5	0	-5	-150	AG	0	1.0	.0	10.0
F. Project SBL	-5	150	0	0	AG	260	1.9	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	672	1.6	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	932	1.4	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	140	1.8	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	1221	1.8	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	1101	1.4	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Project NBAX	0	-750	0	-150	AG	0	1.0	.0	10.0
N. Project NBDX	0	150	0	750	AG	400	1.0	.0	10.0
O. Project SBAX	-5	750	-5	150	AG	400	1.0	.0	10.0
P. Project SBDX	-5	-150	-5	-750	AG	0	1.0	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	812	1.0	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	932	1.0	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	1221	1.0	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	1101	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030wP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-12	10	1.8
3. SW	-12	-12	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-12	150	1.8
11. SW mdblk	-12	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-12	600	1.8
19. SW blk	-12	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030wP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.4	.0	.0	.0	.0	.0	.0	.0	.1
2. NW	98.	.6	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	82.	.4	.0	.0	.0	.0	.0	.0	.0	.2
4. NE	262.	.5	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	278.	.5	.0	.0	.0	.0	.0	.0	.0	.2
6. WN mdblk	97.	.5	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	83.	.5	.0	.0	.0	.0	.0	.0	.2	.0
8. EN mdblk	263.	.5	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	358.	.1	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	169.	.3	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	2.	.1	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	190.	.2	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	277.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.3	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.3	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.4	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	360.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.2	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	1.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.2	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030wP-03 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.1	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030wP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	1707. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	10. DEGREES	TEMP=	10.0 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	1.0	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	487	1.6	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	1.0	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	737	1.9	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	0	1.0	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	0	1.0	.0	10.0
G. SR-18 EBA	-150	-5	0	-5	AG	445	1.4	.0	10.0
H. SR-18 EBD	0	-5	150	-5	AG	445	1.0	.0	10.0
I. SR-18 EBL	-150	-5	0	0	AG	487	1.9	.0	10.0
J. SR-18 WBA	150	2	0	2	AG	484	1.4	.0	10.0
K. SR-18 WBD	0	2	-150	2	AG	1221	1.4	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	1.0	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	487	1.0	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	737	1.0	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	0	1.0	.0	10.0
Q. SR-18 EBAX	-750	-5	-150	-5	AG	932	1.0	.0	10.0
R. SR-18 EBDX	150	-5	750	-5	AG	445	1.0	.0	10.0
S. SR-18 WBAX	750	2	150	2	AG	484	1.0	.0	10.0
T. SR-18 WBDX	-150	2	-750	2	AG	1221	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030wP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-12	1.8
2. NW	-8	8	1.8
3. SW	-8	-12	1.8
4. NE	7	8	1.8
5. ES mdblk	150	-12	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-12	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-12	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-12	1.8
16. EN blk	600	8	1.8
17. SE blk	7	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030wP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.4	.0	.1	.0	.2	.0	.0	.0	.0
2. NW	261.	.5	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	6.	.6	.0	.1	.0	.2	.0	.0	.0	.0
4. NE	262.	.7	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	98.	.5	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	79.	.5	.0	.0	.0	.0	.0	.0	.1	.0
8. EN mdblk	267.	.3	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	357.	.1	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.4	.0	.1	.0	.2	.0	.0	.0	.0
11. SW mdblk	1.	.2	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	191.	.4	.0	.1	.0	.2	.0	.0	.0	.0
13. ES blk	276.	.2	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.4	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	83.	.3	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.2	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	357.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.3	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	358.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030wP-04 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.1	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.1	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.2	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.2
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.2	.0	.0	.1
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030wP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U=	.5 M/S	Z0=	100. CM	ALT=	1707. (M)
BRG=	WORST CASE	VD=	.0 CM/S		
CLAS=	7 (G)	VS=	.0 CM/S		
MIXH=	1000. M	AMB=	.0 PPM		
SIGTH=	10. DEGREES	TEMP=	10.0 DEGREE (C)		

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	2	-150	2	0	AG	487	1.5	.0	10.0
B. Daley Ca NBD	2	0	2	150	AG	736	1.2	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	1.0	.0	10.0
D. Daley Ca SBA	-2	150	-2	0	AG	737	1.7	.0	10.0
E. Daley Ca SBD	-2	0	-2	-150	AG	737	1.2	.0	10.0
F. Daley Ca SBL	-2	150	0	0	AG	307	1.9	.0	10.0
G. Daley Ca EBA	-150	0	0	0	AG	0	1.0	.0	10.0
H. Daley Ca EBD	0	0	150	0	AG	307	1.2	.0	10.0
I. Daley Ca EBL	-150	-2	0	0	AG	0	1.0	.0	10.0
J. Daley Ca WBA	150	2	0	2	AG	249	1.9	.0	10.0
K. Daley Ca WBD	0	2	-150	2	AG	0	1.0	.0	10.0
L. Daley Ca WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Daley C NBAX	2	-750	2	-150	AG	487	1.0	.0	10.0
N. Daley C NBDX	2	150	2	750	AG	736	1.0	.0	10.0
O. Daley C SBAX	-2	750	-2	150	AG	1044	1.0	.0	10.0
P. Daley C SBDX	-2	-150	-2	-750	AG	737	1.0	.0	10.0
Q. Daley C EBAX	-750	0	-150	0	AG	0	1.0	.0	10.0
R. Daley C EBDX	150	0	750	0	AG	307	1.0	.0	10.0
S. Daley C WBAX	750	2	150	2	AG	249	1.0	.0	10.0
T. Daley C WBDX	-150	2	-750	2	AG	0	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030wP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	8	-7	1.8
2. NW	-8	8	1.8
3. SW	-8	-7	1.8
4. NE	8	8	1.8
5. ES mdblk	150	-7	1.8
6. WN mdblk	-150	8	1.8
7. WS mdblk	-150	-7	1.8
8. EN mdblk	150	8	1.8
9. SE mdblk	8	-150	1.8
10. NW mdblk	-8	150	1.8
11. SW mdblk	-8	-150	1.8
12. NE mdblk	8	150	1.8
13. ES blk	600	-7	1.8
14. WN blk	-600	8	1.8
15. WS blk	-600	-7	1.8
16. EN blk	600	8	1.8
17. SE blk	8	-600	1.8
18. NW blk	-8	600	1.8
19. SW blk	-8	-600	1.8
20. NE blk	8	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030wP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	352.	.5	.0	.1	.0	.1	.0	.0	.0	.0
2. NW	8.	.4	.0	.0	.0	.2	.0	.0	.0	.0
3. SW	7.	.4	.0	.0	.0	.2	.0	.0	.0	.0
4. NE	352.	.4	.0	.2	.0	.1	.0	.0	.0	.0
5. ES mdblk	280.	.2	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	91.	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	88.	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	261.	.2	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	355.	.3	.1	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	172.	.5	.0	.0	.0	.2	.0	.1	.0	.0
11. SW mdblk	6.	.3	.0	.0	.0	.0	.1	.0	.0	.0
12. NE mdblk	188.	.4	.0	.2	.0	.1	.0	.0	.0	.0
13. ES blk	276.	.1	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	88.	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	87.	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	265.	.1	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	354.	.2	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.3	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	6.	.3	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.3	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030wP-05 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.2	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 1

JOB: Church of the Woods
RUN: 2030wP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

I. SITE VARIABLES

U= .5 M/S Z0= 100. CM ALT= 1707. (M)
BRG= WORST CASE VD= .0 CM/S
CLAS= 7 (G) VS= .0 CM/S
MIXH= 1000. M AMB= .0 PPM
SIGTH= 10. DEGREES TEMP= 10.0 DEGREE (C)

II. LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (M) X1	Y1	X2	Y2	TYPE	VPH	EF (G/MI)	H (M)	W (M)
A. Daley Ca NBA	0	-150	0	0	AG	0	1.0	.0	10.0
B. Daley Ca NBD	0	0	0	150	AG	249	1.2	.0	10.0
C. Daley Ca NBL	2	-150	0	0	AG	0	1.0	.0	10.0
D. Daley Ca SBA	-4	150	-4	0	AG	0	1.0	.0	10.0
E. Daley Ca SBD	-4	0	-4	-150	AG	0	1.0	.0	10.0
F. Daley Ca SBL	-5	150	0	0	AG	307	1.9	.0	10.0
G. SR-18 EBA	-150	-2	0	-2	AG	445	1.4	.0	10.0
H. SR-18 EBD	0	-2	150	-2	AG	752	1.1	.0	10.0
I. SR-18 EBL	-150	-2	0	0	AG	0	1.0	.0	10.0
J. SR-18 WBA	150	4	0	4	AG	733	1.7	.0	10.0
K. SR-18 WBD	0	4	-150	4	AG	484	1.0	.0	10.0
L. SR-18 WBL	150	2	0	0	AG	0	1.0	.0	10.0
M. Daley C NBAX	0	-750	0	-150	AG	0	1.0	.0	10.0
N. Daley C NBDX	0	150	0	750	AG	249	1.0	.0	10.0
O. Daley C SBAX	-4	750	-4	150	AG	307	1.0	.0	10.0
P. Daley C SBDX	-4	-150	-4	-750	AG	0	1.0	.0	10.0
Q. SR-18 EBAX	-750	-2	-150	-2	AG	445	1.0	.0	10.0
R. SR-18 EBDX	150	-2	750	-2	AG	752	1.0	.0	10.0
S. SR-18 WBAX	750	4	150	4	AG	733	1.0	.0	10.0
T. SR-18 WBDX	-150	4	-750	4	AG	484	1.0	.0	10.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 2

JOB: Church of the Woods
RUN: 2030wP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

III. RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (M) X	Y	Z
1. SE	7	-8	1.8
2. NW	-10	10	1.8
3. SW	-10	-8	1.8
4. NE	7	10	1.8
5. ES mdblk	150	-8	1.8
6. WN mdblk	-150	10	1.8
7. WS mdblk	-150	-8	1.8
8. EN mdblk	150	10	1.8
9. SE mdblk	7	-150	1.8
10. NW mdblk	-10	150	1.8
11. SW mdblk	-10	-150	1.8
12. NE mdblk	7	150	1.8
13. ES blk	600	-8	1.8
14. WN blk	-600	10	1.8
15. WS blk	-600	-8	1.8
16. EN blk	600	10	1.8
17. SE blk	7	-600	1.8
18. NW blk	-10	600	1.8
19. SW blk	-10	-600	1.8
20. NE blk	7	600	1.8

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 3

JOB: Church of the Woods
RUN: 2030wP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE)

RECEPTOR	BRG (DEG)	PRED CONC (PPM)	CONC/LINK (PPM) A	B	C	D	E	F	G	H
1. SE	353.	.3	.0	.0	.0	.0	.0	.1	.0	.0
2. NW	97.	.4	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	83.	.3	.0	.0	.0	.0	.0	.0	.0	.1
4. NE	98.	.3	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	279.	.3	.0	.0	.0	.0	.0	.0	.0	.1
6. WN mdblk	95.	.2	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	84.	.2	.0	.0	.0	.0	.0	.0	.1	.0
8. EN mdblk	262.	.3	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	359.	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	171.	.2	.0	.0	.0	.0	.0	.1	.0	.0
11. SW mdblk	3.	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	189.	.1	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	276.	.3	.0	.0	.0	.0	.0	.0	.0	.0
14. WN blk	96.	.2	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	84.	.2	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	264.	.3	.0	.0	.0	.0	.0	.0	.0	.0
17. SE blk	1.	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	174.	.1	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	3.	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	186.	.1	.0	.0	.0	.0	.0	.0	.0	.0

CALINE4: CALIFORNIA LINE SOURCE DISPERSION MODEL
JUNE 1989 VERSION
PAGE 4

JOB: Church of the Woods
RUN: 2030wP-06 (WORST CASE ANGLE)
POLLUTANT: Carbon Monoxide

IV. MODEL RESULTS (WORST CASE WIND ANGLE) (CONT.)

RECEPTOR	CONC/LINK (PPM) I	J	K	L	M	N	O	P	Q	R	S	T
1. SE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
2. NW	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
3. SW	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
4. NE	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
5. ES mdblk	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
6. WN mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
7. WS mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
8. EN mdblk	.0	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
9. SE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
10. NW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
11. SW mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
12. NE mdblk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
13. ES blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0	.0
14. WN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
15. WS blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
16. EN blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1	.0
17. SE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
18. NW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
19. SW blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
20. NE blk	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0

PCR Services Corporation

Supplemental Air Quality Analysis

August 2009

8/6/2009 04:08:29 PM

Urbemis 2007 Version 9.2.4

Detail Report for Summer Construction Unmitigated Emissions (Pounds/Day)

File Name:

Project Name: Church of the Woods

Project Location: San Bernadino County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

CONSTRUCTION EMISSION ESTIMATES (Summer Pounds Per Day, Unmitigated)

	ROG
Time Slice 10/5/2009-10/16/2009	64.72
Asphalt 10/05/2009-10/16/2009	6.08
Paving Off-Gas	0.79
Paving Off Road Diesel	4.97
Paving On Road Diesel	0.26
Paving Worker Trips	0.07
Coating 10/05/2009-10/16/2009	58.64
Architectural Coating	58.61
Coating Worker Trips	0.03

Phase Assumptions

Phase: Paving 10/5/2009 - 10/16/2009 - Default Paving Description

Acres to be Paved: 3

Off-Road Equipment:

1 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

2 Paving Equipment (104 hp) operating at a 0.53 load factor for 8 hours per day

2 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Architectural Coating 10/5/2009 - 10/16/2009 - Default Architectural Coating Description

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

8/6/2009 04:09:03 PM

Urbemis 2007 Version 9.2.4

Detail Report for Winter Construction Unmitigated Emissions (Pounds/Day)

File Name:

Project Name: Church of the Woods

Project Location: San Bernadino County

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

CONSTRUCTION EMISSION ESTIMATES (Winter Pounds Per Day, Unmitigated)

	ROG
Time Slice 10/5/2009-10/16/2009	64.72
Asphalt 10/05/2009-10/16/2009	6.08
Paving Off-Gas	0.79
Paving Off Road Diesel	4.97
Paving On Road Diesel	0.26
Paving Worker Trips	0.07
Coating 10/05/2009-10/16/2009	58.64
Architectural Coating	58.61
Coating Worker Trips	0.03

Phase Assumptions

Phase: Paving 10/5/2009 - 10/16/2009 - Default Paving Description

Acres to be Paved: 3

Off-Road Equipment:

1 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

2 Paving Equipment (104 hp) operating at a 0.53 load factor for 8 hours per day

2 Rollers (95 hp) operating at a 0.56 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

Phase: Architectural Coating 10/5/2009 - 10/16/2009 - Default Architectural Coating Description

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

LSA Associates, Inc.

Supplemental Correspondence

March 30, 2010

LSA

LSA ASSOCIATES, INC.
1500 IOWA AVENUE, SUITE 200
RIVERSIDE, CALIFORNIA 92507

951.781.9310 TEL
951.781.4277 FAX

OTHER OFFICES:
IRVINE
PT. RICHMOND
SAN LUIS OBISPO
PALM SPRINGS
FORT COLLINS

BERKELEY
ROCKLIN
SOUTH SAN FRANCISCO
CARLSBAD
FRESNO

MEMORANDUM

DATE: March 30, 2010

TO: Patrick Hopkins, Church of the Woods

FROM: Keith Lay, LSA Associates, Inc.

SUBJECT: Opening Year for the Air Quality and Noise Analyses for the Church of the Woods

Air Quality Analysis

The air quality analysis for the Church of the Woods development included the following scenarios:

- Existing Conditions;
- 2009 Opening Year Conditions;
- 2013 Project Build out Conditions; and
- Future (2030) Conditions.

Stationary Source Emissions. The URBEMIS2007 model was used to calculate the 2009 and 2013 stationary source emissions. The 2009 emissions include the stationary sources associated with Phase 1 of the proposed project. The 2013 emissions include the stationary sources associated with the build out of the development. The increase in the project size between 2009 and 2013 more than offsets the decrease in emission rates due to improvements in technology. Therefore, 2013 represents the worst case stationary source air quality conditions for the proposed project.

Mobile Source Emissions. The 2009 vehicle emission calculations included in the air quality analysis are based on the daily and peak hour trips associated with Phase I of the development. The 2013 and 2030 emission calculations are based on the trips associated with the build out of the development. Therefore, the year 2013 and 2030 conditions generate higher emissions and concentrations than the 2009 conditions. Due to improvements in engine technology 2013 vehicle emissions are higher than 2030 vehicle emissions. The year 2013 represents the worst case mobile source air quality conditions for the proposed project.

Removing the 2009 opening year from the draft Environmental Impact Report (DEIR) would not affect the results or conclusions of the air quality analysis.

Noise Impact Analysis

The noise analysis that was prepared for the Church of the Woods development only included the existing and 2030 conditions. Therefore, removing the 2009 opening year from the draft Environmental Impact Report (DEIR) would not affect the results or conclusions of the noise impact analysis.

Appendix C

Biological Resources Reports

PCR Services Corporation

Habitat Re-Assessment for the Southern Rubber Boa

August 20, 2007

August 20, 2007

Mr. Matt Slowik
COUNTY OF SAN BERNARDINO –
LAND USE SERVICES DEPARTMENT
County Government Center
385 North Arrowhead Avenue
San Bernardino, CA 92415-0182

Re: RESULTS OF A HABITAT RE-ASSESSMENT FOR THE SOUTHERN RUBBER BOA (*CHARINA BOTTAE UMBRATICA*) ON THE CHURCH OF THE WOODS PROJECT SITE, CITY OF RIM FOREST, SAN BERNARDINO COUNTY, CALIFORNIA

Dear Mr. Slowik:

A re-assessment of potential habitat for the southern rubber boa (*Charina bottae umbratica*) (SRB) [State Threatened (ST) and Forest Service Sensitive (FSS) species] was conducted to determine if the removal of trees from the site has changed the amount of suitable habitat present within the Church of the Woods Project Site (Site), located in the City of Rim Forest, San Bernardino County, California (Figure 1, *Regional Map*, attached). This letter report summarizes the methodology and findings of the habitat re-assessment.

SITE LOCATION AND DESCRIPTION

The Site encompasses approximately 37 acres just north of Highway 18 (Rim of the World Highway) between Bear Springs Road and Daley Canyon Road. In a local context, the Site lies in Section 29, Township 2 North, Range 3 West, on the Harrison Mountain Quadrangle (Figure 2, *Vicinity Map*, attached). The Site is currently undeveloped, with hilly to steep mountain terrain largely covered by montane coniferous forest. The Site includes a northeasterly trending drainage that runs along the center of the Site and falls to the northeast. Elevations across the Site vary from a high of approximately 5,740 feet above mean sea level (amsl) at the western border to a low of approximately 5,400 feet amsl at the northeast corner of the Site. The majority of the Site contains slopes that range from 0 to 40 percent, with approximately five acres of steep slopes over 40 percent. A natural drainage course runs diagonally through the Site from the southwest corner to the northeast corner. There is an 8-inch sewer line that also traverses the Site and is generally parallel to but outside the drainage course.

BACKGROUND

The SRB inhabits mixed-conifer and oak-conifer forests, in the vicinity of "streams of wet meadows," at elevations between 4,900 and 8,200 feet. The SRB requires loose, moist soil for burrowing and seeks cover in rotting logs. As illustrated on the *San Bernardino County Official*

Land Use Plan map[1], the property is located within the boundaries of historic SRB habitat.

In 2002 and 2003, Thomas Leslie Corporation (TLC) conducted protocol surveys and documented potentially suitable habitat encompassing 0.671 acre. Potentially suitable habitat that was documented as being present during these surveys include; small to large sized downed (fallen) logs, previously cut tree stumps, rock outcrops, piles of leaves and branches, litter/duff (decomposed or partially decomposed vegetative matter), and a few small openings in the Westside ponderosa pine forest cover with a sparse cover of bracken ferns (*Pteridium aquilinum*) and other herbaceous plants.

No SRB were found during the 2002 or 2003 surveys. A third year of protocol surveys was not performed due to the expiration of TLC's Scientific Collecting Permit and Memorandum of Understanding (MOU) from the California Department of Fish and Game (CDFG) for the SRB.

In July 2007, PCR Services Corporation (PCR) wildlife biologist, Jason Berkley, who holds an MOU for this species (CDFG Collectors Permit SC-000187), conducted a re-assessment of the Site based on changes made from the removal of trees due to the bark beetle infestation.

EXISTING CONDITIONS

Vegetation

The Site is dominated by Westside ponderosa pine forest that makes up approximately 95 percent of the Site as shown in Figure 3, *Vegetation Communities* (attached). Riparian habitat and ruderal/disturbed habitat make up the remaining 5 percent of the Site. Overall, the Westside ponderosa pine forest community forms a high quality habitat on the Site. The dominant plant species include Ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffreyi*), white fir (*Abies concolor*), incense cedar (*Calocedrus decurrens*) and black oak (*Quercus kelloggii*). The understory consists of mountain pink currant (*Ribes nevadense*), mountain dogwood (*Cornus nuttallii*), deer brush (*Ceanothus integerrimus*), California coffeeberry (*Rhamnus californica*), and western bracken fern.

Riparian habitat occurs along a flowing stream that flows down the middle of the Site from the southwest to the northeast corner and is dominated by arroyo willow (*Salix lasiolepis*) with a shrub layer of mountain dogwood.

Ruderal/disturbed areas on the Site comprise a sparse variety of annual, locally-common non-native grasses and forbs, and adventitious native species (disturbance followers) that grow along old logging roads and "skid" trails. Species found within ruderal/disturbed vegetation include: common ragweed (*Ambrosia artemisiifolia*), prickly lettuce (*Lactuca serriola*), black bindweed (*Polygonum convolvulus*), cheat grass (*Bromus tectorum*), ripgut grass (*Bromus diandrus*), native

[1] SBC. 2000

white yarrow (*Achillea millefolium*), tarplant (*Hemizonia paniculata*), morning glory (*Calystegia occidentalis*), and California goldenrod (*Solidago californica*).

METHODOLOGY

The entire site was re-assessed for potentially suitable SRB habitat following the removal of the damaged trees. No focused surveys for individual SRB were conducted. The entire site was carefully walked with all suitable SRB habitats manually measured to determine the total acreage present on the Site.

RESULTS

A total of 0.54 acre of potentially suitable SRB habitat was documented on the Site during this re-assessment.

The amount of suitable SRB habitat present on the Church of the Woods project site decreased from the previous surveys. Since the TLC surveys in 2003, trees have been removed from the site due to the bark beetle infestation. Not only have trees been cut down, but some fallen trees that were present were also removed. The removal and chipping of trees on the project site has created wood debris on the skid roads and openings created more open space and less vegetative cover needed to support the SRB. Most of these areas are now very open and exposed to direct sunlight, rendering them less able to retain moisture and serve as suitable for the SRB. The removal has also made areas more accessible and/or visible than previous TLC surveys; therefore, these areas have been measured and are included in total 0.54 acre of suitable habitat.

The following tables on page 4 and 5 detail the suitable habitat areas delineated during the 2007 survey.

If you have any questions regarding the methodology and/or findings of this report, please do not hesitate to call Jason Berkley at (949) 753-7001.

Sincerely,
PCR SERVICES CORPORATION

Jason Berkley
Wildlife Biologist

Steve Nelson
Director of Biological Services

Attachments

Table 1

Rock Outcrops

Description	Measurements	Total Square Feet
Granite Outcrop	10'x 15'	150
Granite Outcrop	15'x 20'	300
Granite Outcrop	15' x 20'	300
Granite Outcrop	20' x 15'	300
Granite Outcrop	100'x 100'	10,000
Granite Outcrop	40' x 30'	1200
Granite Outcrop	30' x 30'	900
Granite Outcrop	10' x 10'	100
Granite Outcrop	20' x 20'	400
Granite Outcrop	8' x 12	100
Granite Outcrop	20' x 40'	800
Granite Outcrop	10' x 12'	120
Granite Outcrop	20' x 30'	600
Granite Outcrop	10' x 20'	200
Granite Outcrop	10' x 30'	600
Granite Outcrop	10' x 20'	200
Granite Outcrop	20' x 20'	400
Granite Outcrop	8' x 12'	100
Granite Outcrop	15' x 30'	450
	Total square feet	**17,220**
	Total acreage	**0.40**

Source: PCR Services Corporation, 2007

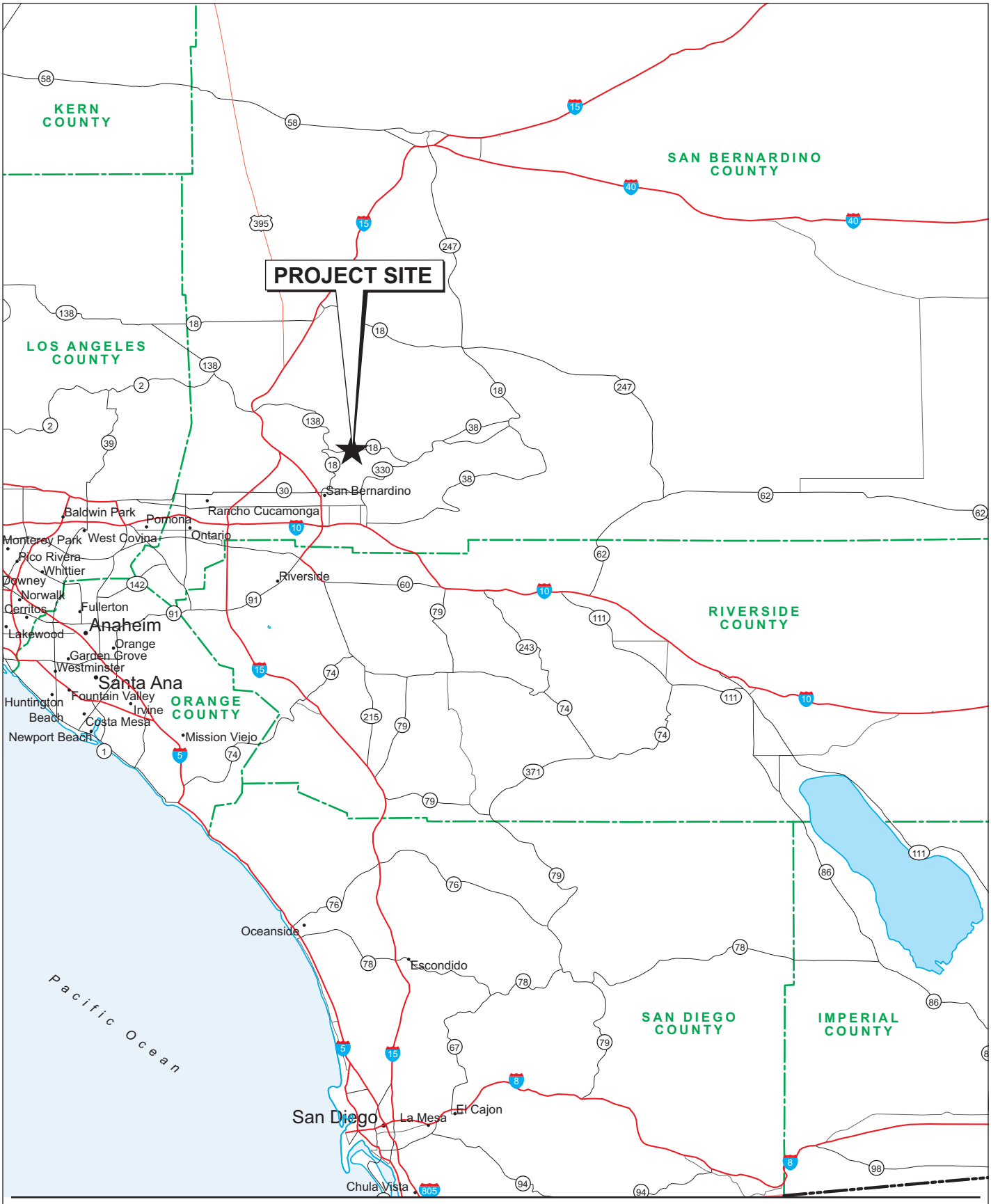
Table 2

Logs and Stumps

Description	Measurements	Total Square Feet
Logs and Stump	20’ and 30”	50
Log	3.75’ x 1.5’	5.6
Log	10.5’ x 24”	21
Log and stump	8.5’ and 24”	17
Log and stump	16’ and 12”	16
Log and stump	12” and 18’	18
Log	12” x 50’	50
Log and stump	20’ and 20”	50
Stump	18”	25
Stump	24”	25
Stump	18”	20
Stump	12”	15
Log and Stump	10’ and 26”	50
Stump	24”	15
Stump	22”	15
Stump	18”	20
Log	30’ x 18”	100
Log	30’ x 24”	120
Log	20’ x 24”	80
Log	30’ x 12”	90
Stump	24”	25
Log	60’ x 36”	300
Stump	18”	10
Stump	36”	25
Stump	24”	25
Log	20’ x 24”	80
Stump	18”	10
Log	20’ x 18”	70
Stump	40”	35
Stump	48”	35
Log	15’ x 12”	45
Log	18’ x 24”	80
Log	30’ x 12”	90
Stump	36”	35
Log	20’ x 18”	70
Log	20’ x 42”	110
Log	30’x 12”	100
Log	30’x 12”	100
2 Logs	30’ and 20’ x 24”	200
Log	40’ x 18”	130
Stump	18”	20
Stump	12”	10
Stump	18”	10
Stump	18”	25
Stump	12”	15

Description	Measurements	Total Square Feet
Log	20’ x 18”	70
Log	15’ x 24”	25
Log	30’ x 24”	120
Log	36”	25
Stump	42”	35
Log	20’ x 12”	50
Log	18’ x 18”	25
Log	22’ x 18”	70
Log	20’ x 24”	80
	Total Square feet	2957.6
	Total acreage	0.14
	Total acreage	0.54

Source: PCR Services Corporation, 2007



PCR

Source: PCR Services Corporation, 2007.

Figure 1
Church of the Woods Regional Map

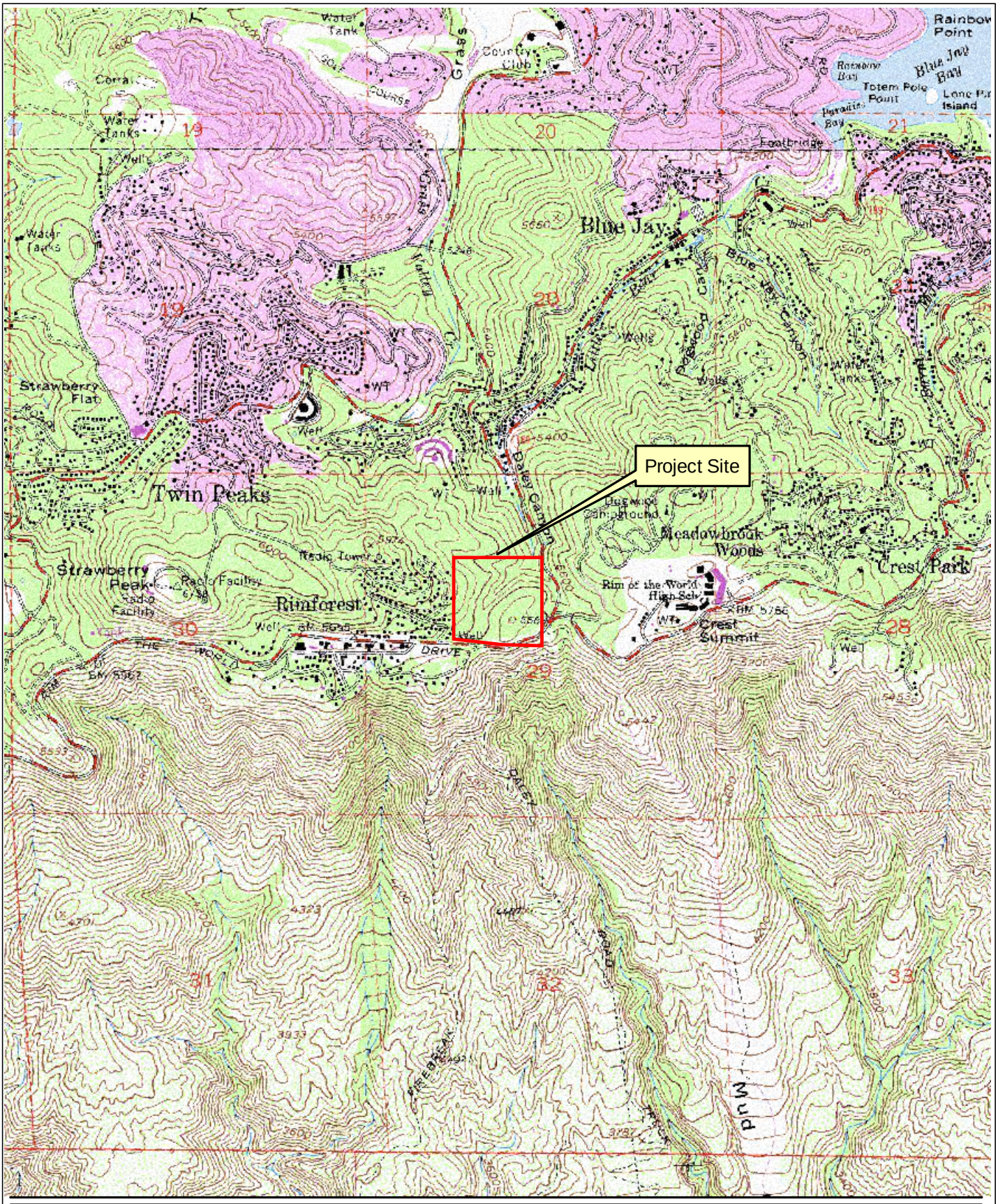
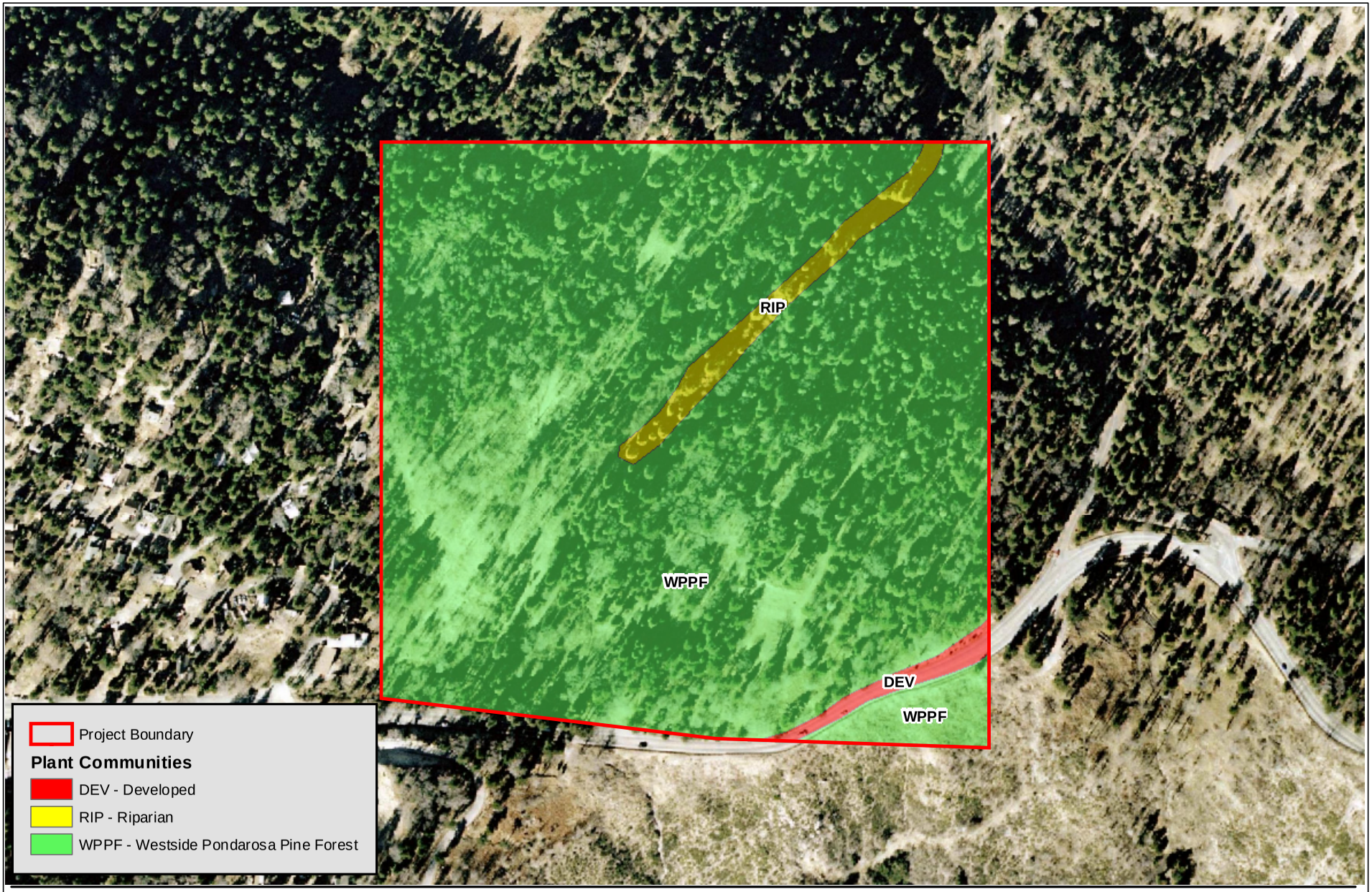


Figure 2
Church of the Woods
Vicinity Map

Source: USGS Topographic Series (Harrison Mountain, CA); PCR Services Corporation, 2007.



PCR

N

300 0 300 Feet

Source: Google Earth, 2006; PCR Services Corporation, 2006.

Figure 3
Church of the Woods
Vegetation Communities

PCR Services Corporation

Results of a Trapping Program for the San Bernardino Flying Squirrel

July 27, 2007

July 27, 2007

Mr. Matt Slowik
COUNTY OF SAN BERNARDINO –
LAND USE SERVICES DEPARTMENT
County Government Center
385 North Arrowhead Avenue
San Bernardino, CA 92415-0182

Re: RESULTS OF A TRAPPING PROGRAM FOR THE SAN BERNARDINO FLYING SQUIRREL (*GLAUCOMYS SAUBRINUS CALIFONICUS*) ON THE CHURCH OF THE WOODS PROJECT SITE, CITY OF RIM FOREST, SAN BERNARDINO COUNTY, CALIFORNIA

Dear Mr. Slowik:

A focused trapping program was conducted to determine the presence/absence of the San Bernardino flying squirrel (*Glaucomys saubrinus califonicus*) (SBFS), a Forest Service Sensitive Species (FSS), within the Church of the Woods Project Site (Site), located in the City of Rim Forest, San Bernardino County, California (Figure 1, *Regional Map*, attached). This letter report summarizes the methodology and findings of the focused trapping surveys.

INTRODUCTION

The SBFS is one of 25 subspecies of northern flying squirrel. The SBFS is depicted as a disjunct population separated from the southern Sierra Nevada by the Mojave Desert. Occupied habitat within the San Bernardino Mountains comprises a swath from Lake Silverwood, across the spine of the mountain range to the vicinity of Onyx Peak and then swings south to include parts of the San Gorgonio Wilderness down to the Thurman Flats area along Mill Creek.

The habitat for the SBFS is characterized as mature to over-mature mixed conifer forest composed mostly of Jeffrey pine and white fir with a black oak component, with relatively high numbers of snags and downed logs. The habitat is relatively open and lacks a dense undergrowth component. The canopy is relatively closed. Breeding individuals seem to prefer riparian habitats and juveniles tend to prefer upland habitats.

PROJECT LOCATION AND SITE DESCRIPTION

The Site is approximately 37 acres just north of Highway 18 (Rim of the World Highway) between Bear Springs Road and Daley Canyon Road. In a local context, the Site lies in Section 29, Township 2 North, Range 3 West, on the Harrison Mountain Quadrangle (Figure 2, *Vicinity Map*, attached). The Site is currently undeveloped, with hilly to steep mountain terrain largely covered by montane coniferous forest. The Site includes a northeasterly trending valley that runs along the center of the Site and falls to the northeast. Elevations across the Site vary slightly from a high of

approximately 5,740 feet above mean sea level (amsl) at the western border to a low of approximately 5,400 feet amsl at the northeast corner of the Site. The majority of the Site contains slopes that range from 0 to 40 percent, with approximately five acres of steep slopes over 40 percent. A natural drainage course runs diagonally through the Site from the southwest corner to the northeast corner. There is an 8-inch sewer line that also traverses the Site and is generally parallel to the drainage course.

EXISTING CONDITIONS

Vegetation

The Site is dominated by Westside ponderosa pine forest that makes up approximately 95 percent of the Site. Riparian habitat and ruderal/disturbed habitat make up the remaining 5 percent of the Site. Overall, the Westside ponderosa pine forest community forms a high quality habitat on the Site. The dominant plant species include Ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*Pinus jeffreyi*), white fir (*Abies concolor*), incense cedar (*Calocedrus decurrens*) and black oak (*Quercus kelloggii*). The understory consist of mountain pink currant (*Ribes nevadense*), mountain dogwood (*Cornus nuttallii*), deer brush (*Ceanothus integerrimus*), California coffeeberry (*Rhamnus californica*), and western bracken fern (*Pteridium aquilinum* var. *pubescens*).

Riparian habitat occurs along a flowing stream that flows down the middle of the Site from the southwest to the northeast corner and is dominated by arroyo willow (*Salix lasiolepis*) with a shrub layer of mountain dogwood.

Ruderal/disturbed areas on the Site comprise a sparse variety of annual, locally-common non-native grasses and forbs, and adventitious native species (disturbance followers) that grow along old logging roads and skid trails. Species found within ruderal/disturbed vegetation include: common ragweed (*Ambrosia artemisiifolia*), prickly lettuce (*Lactuca serriola*), black bindweed (*Polygonum convolvulus*), cheat grass (*Bromus tectorum*), ripgut grass (*Bromus diandrus*), native white yarrow (*Achillea millefolium*), tarplant (*Hemizonia paniculata*), morning glory (*Calystegia occidentalis*), and California goldenrod (*Solidago californica*).

METHODOLOGY

The methodology used during the focused trapping program followed the guidelines set forth in the "Demography of Northern Flying Squirrels Informs Ecosystem Management of Western Interior Forests".[1]

Prior to setting traps, the entire Site was surveyed in an effort to identify potential habitat for the SBFS, to ultimately determine trap line placement. Following the initial study, traps were set

[1] *Lehmkuhl, John F., Kistler, Keith D., Begley, James S. and Boulanger, John: Demography of Northern Flying Squirrels Informs Ecosystems Management of Western Interior Forests. Ecological Applications, 16(2), 2006. 584-600.*

between March and July, depending on weather conditions (i.e., snow and rain). Traps were set in a grid, two traps per station, one on the ground and one approximately five feet above the ground on the closest largest tree from the grid point. These traps were checked daily for five consecutive days and all species captured were measured, weighed, marked, photographed, and released.

A total of eight trap lines totaling 110 traps were set and checked for a total of four nights. Each trapping night consisted of 110 trap nights (one trap = one trap set and checked for one night) for a total of 614 trap nights as shown in Figure 4, *Trapline Locations*, attached. Nine inch (modified) Sherman live traps were alternated throughout the trap lines. Each trap was baited with an oatmeal/seed mix. Traps were opened at sunset and checked at sunrise.

All trapping was conducted by Jason Berkley, as authorized by the California Department of Fish and Game (CDFG) Collectors Permit SC-000187. The trapping was conducted from April 17 to April 20, and July 9 to July 11, 2007.

RESULTS

No SBFS were captured during the trapping program. A total of three small mammal species were captured or documented during the trapping program. These species include the deer mouse (*Peromyscus maniculatus*), brush mouse (*Peromyscus boyleii*), Merriam's chipmunk (*Neotamais merriami*), dusky-footed woodrat (*Neotoma fuscipes*), and California vole (*Macrotus californicus*) as shown in Table 1, *2007 San Bernardino Flying Squirrel Trapping Program*, on page 4.

Due to rain and snow on both the fifth and sixth nights of trapping (April 19 and 20), trapping was aborted. The snow that arrived early on the morning of April 20 did not improve with time and after checking the traps that morning, it was decided that the traps be collected to avoid harm to wildlife that would have been trapped later that day. These trapping days were made up on

July 9 through July 11 when weather conditions were more desirable. In conclusion, no SBFS were captured during the first four nights or during the last two nights of trapping in July.

If you have any questions regarding the methodology and/or findings of this report, please do not hesitate to call Jason Berkley at (949) 753-7001.

Sincerely,
PCR SERVICES CORPORATION

Jason Berkley
Wildlife Biologist

Steve Nelson
Director of Biological Services

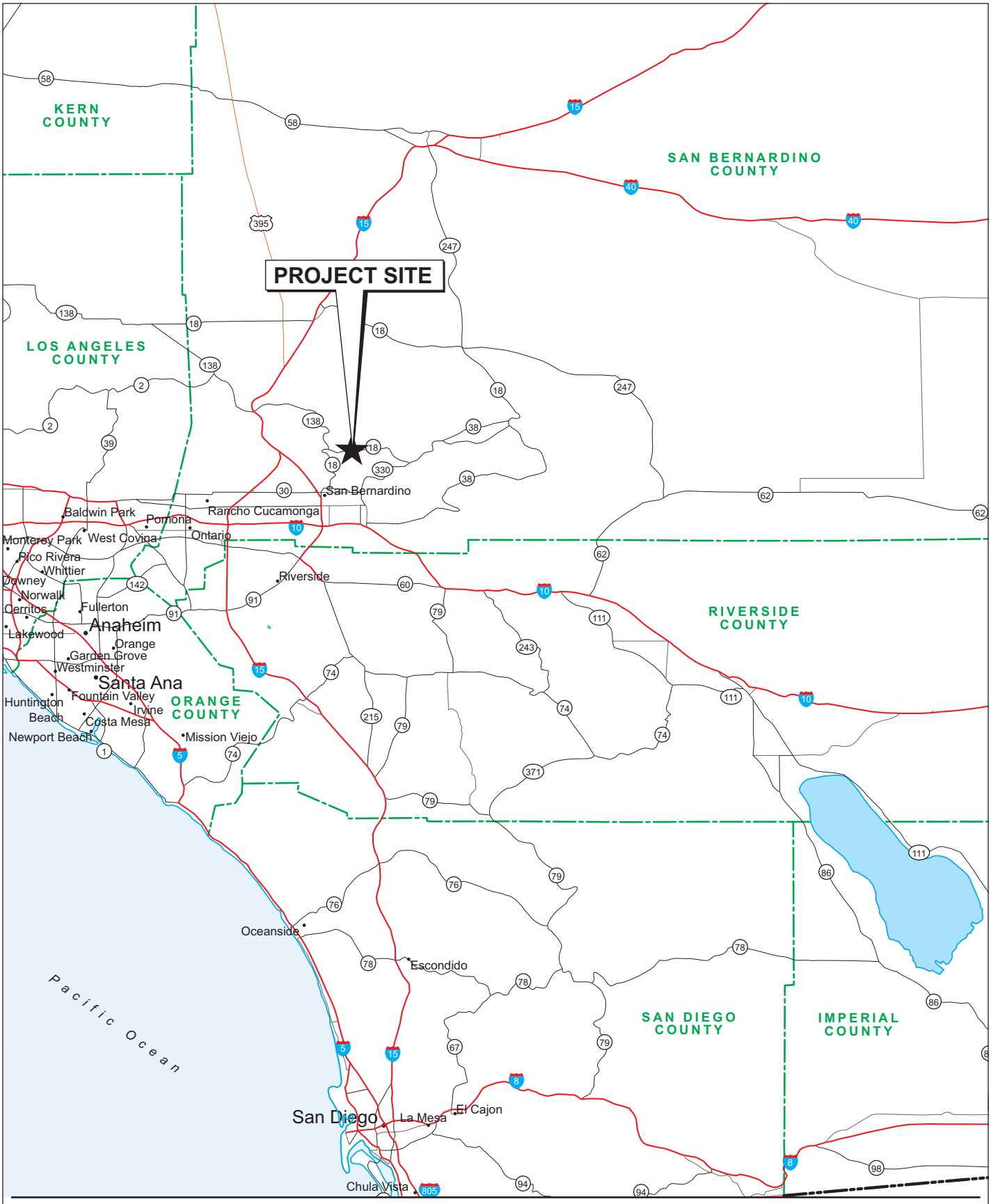
Attachments

Table 1

2007 San Bernardino Flying Squirrel Trapping Program

	4/17	4/18	4/19	4/20	7/10	7/11	Total
Number of Traps	64	110	110	110	110	110	614
Species							
Deer Mouse (*Peromyscus maniculatus*)	4	15 (1 recaptures)	19 (5 recaptures)	25 (9 recaptures)	8	7 (2 recaptures)	78
Brush mouse (*Peromyscus boyleii*)	0	4	1 (1 recaptures)	2 (1 recaptures)	3	5 (1 recaptures)	15
Merriam's chipmunk (*Neatamias merriami*)	0	0	0	0	5	4	9
California vole (*Macrotus californicus*)	0	0	0	0	0	1	1
Dusky-footed woodrat (*Neotoma fuscipes*)	0	0	0	0	1	0	1
Total	**4**	**19**	**20**	**27**	**17**	**17**	**104**
Capture Ratio %	**6**	**17**	**18**	**25**	**15**	**15**	**16.9**

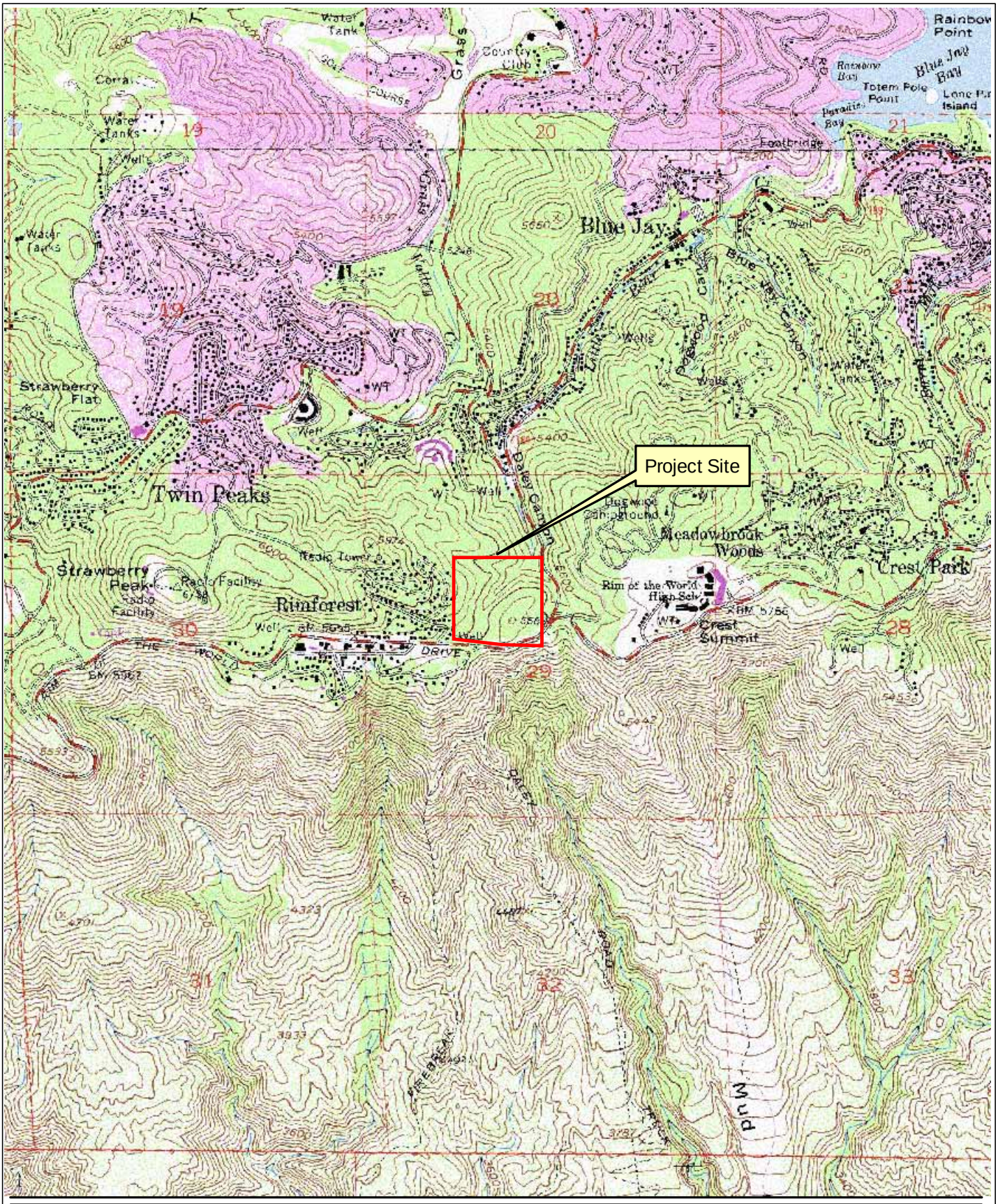
Source: PCR Services Corporation 2007



PCR

Source: PCR Services Corporation, 2007.

Figure 1
Church of the Woods Regional Map



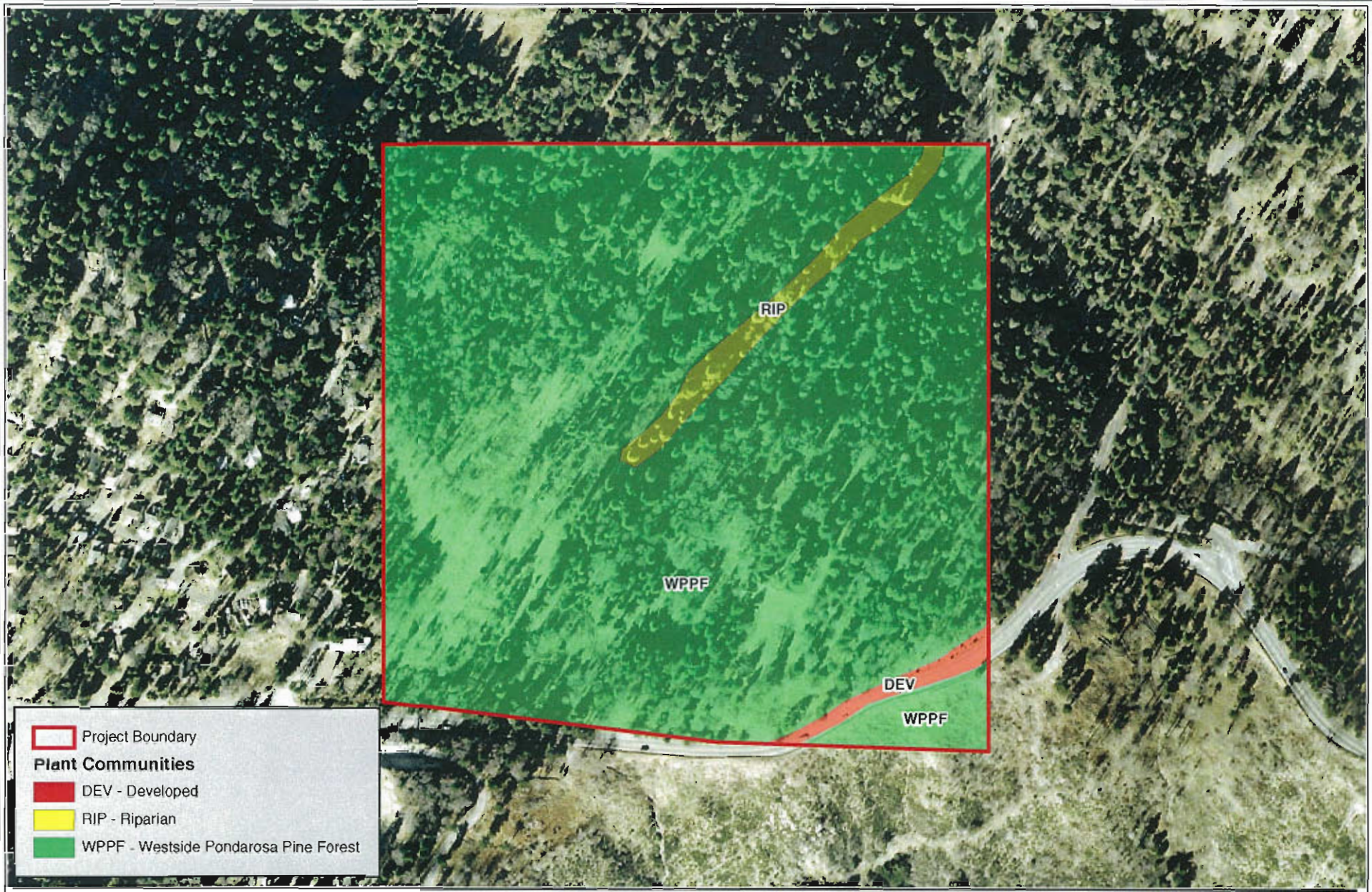
PCR

N

2,000 0 2,000 Feet

Figure 2
Church of the Woods Vicinity Map

Source: USGS Topographic Series (Harrison Mountain, CA); PCR Services Corporation, 2007.



PCR

N

300 0 300 Feet

Source: Google Earth, 2006, PCR Services Corporation, 2006.

Figure 3
Church of the Woods
Vegetation Communities

Tanner Environmental Services

California Spotted Owl Survey

July 9, 2007

tanner environmental services

PO Box 6132 • Ventura, CA 93006-6132 • 805-636-1806 • Fax 805-641-3271 • Info@TannerEnvironmental.com

July 9, 2007

Jason Berkley
PCR Services
One Venture, Suite 150
Irvine, CA 92618

Dear Mr. Berkley,

Tanner Environmental Services (TES) was contracted by your firm, PCR Services, to conduct surveys for California spotted owls on APN 336-101-006, the site of a proposed development. TES performed presence-absence and reproductive surveys for California spotted owls between March 30 and June 6, 2007. The following is a report on the results of those surveys.

APN 336-101-006 is located in the San Bernardino Mountains on the main ridgeline just south of Lake Arrowhead and immediately east of Rimforest at roughly 5600 feet elevation. The site supports medium aged, closed canopy mixed conifer forest including relict old growth trees as well as several small meadows. The dominant tree species are Jeffrey pine (*Pinus jeffreyi*), white fir (*Abies concolor*), sugar pine (*P. lambertiana*), incense cedar (*Calocedrus decurrens*), and black oak (*Quercus kelloggii*). Much of the understory has been disturbed due to timber removal operations.

California spotted owls are known to occur throughout the San Bernardino Mountains and most of the large mountain ranges in southern California (LaHaye et al. 1994). Their primary habitat is closed canopy conifer and live oak (*Q. agrifolia*) forest (Gutierrez et al. 1992 and LaHaye et al. 1997). California spotted owls occur predominately above 4000 feet elevation; however, some can be found at lower elevations in deep canyons and near the Pacific coast where similar forests are located.

A Male spotted owl was identified on the site during presence-absence surveys. At this point we discontinued presence-absence surveys and proceeded with reproductive surveys. These surveys were utilized to determine if spotted owls were present and using the project site for nesting and/or roosting. A total of four reproductive surveys were conducted.

During two of the four reproductive surveys, a male spotted owl was located and given mice following US Fish and Wildlife Service protocol. On both of these occasions, the owl flew to the south and over the ridgeline; however, on the second occasion on June 6, we were able to track the owl to a nest tree which was located roughly one third of a mile from the project site. The nest tree and the owls we located were associated with an historic spotted owl territory identified by both San Bernardino National Forest and California Department of Fish and Game.

As noted, a male California spotted owl was identified during surveys on three occasions. On each of these occasions, the owl was located in the southeast quarter of the project site; however, the owl was not found to be either roosting or nesting on the project site. In addition, there are no known historic roost or nest sites on APN 336-101-006. Based on the number of times we identified

California spotted owls during our surveys, it is clear that the project site does provide foraging habitat for this species.

If you have any further questions or concerns, please contact me directly.

Sincerely,

Richard Tanner
Principal

Literature Cited

Gutierrez, R. J., J. Verner, K. S. McKelvey, B. R. Noon, G. N. Steger, D. R. Call, W. S. LaHaye, B. B. Bingham, and J. S. Senser. 1992. Habitat relations of the California spotted owl. In: J. Verner, K. S. McKelvey, B. R. Noon, R. J. Gutierrez, G. I. Gould, and T. W. Beck (technical coordinators), The California spotted owl: a technical assessment of its current status. General Technical Report PSW-GTR-133. Albany, CA: Pacific Southwest Research Station, USDA Forest Service; 79-98.

LaHaye, W. S., R. J. Gutierrez, and H. R. Akcakaya. 1994. Spotted owl metapopulation dynamics in southern California. Journal of Animal Ecology 63:775-785.

LaHaye, W. S., R. J. Gutierrez, and D. R. Call. 1997. Nest site selection and reproductive success of California spotted owls. Wilson Bulletin 109:42-51.

John Hatcher

Updated Foresters Report

September 7, 2005

SEP 0 9 2005

John B. Hatcher

dba: Wildfire Aware
3747 Wasatch Dr.
Redding, CA 96001

530-245-9332 Home/office
951-743-5708 Cell phone
E-mail: johnbhatcher@msn.com
Reg. Prof. Forester #681

September 7, 2005

Mr. Patrick Hopkins
1814 Commercenter West, Suite A
San Bernardino, CA 92408

Dear Pat,

The Church of the Woods owns a 38-acre parcel just east of Rimforest, CA, bounded on the south by State Highway 18, and on the east by Daley Canyon Road. A Western Pine Bark Beetle epidemic was responsible for killing a high percentage of the host trees throughout the San Bernardino Mountains from Crestline to Big Bear. In this area the suitable host trees are Ponderosa and Coulter Pines.

This 38-acre parcel was included in the San Bernardino County Fire Department's program of work for 2004. This parcel was advertised and the successful bidder was Arrowhead Enterprises. They removed 2,800 dead trees in all size classes. There may have been incidental dead sugar pine, white fir, incense cedar, or black oak trees removed, but primarily ponderosa and coulter pine were removed. The County's primary objective was to lower the fire hazard, so removal or chipping was required for all dead trees. The Licensed Timber Operator (LTO) removed all sections of trees for which they had markets. Everything leftover was chipped and spread over the disturbed areas.

The USDA-Natural Resource Conservation Service (NRCS) funded this program, and they require a higher level of erosion control and prevention than does the State Forest Practice Act. They were quite willing to fund everything they required. The contract between the County and the LTO required erosion control on areas disturbed by the work under this contract. NRCS required erosion control anywhere that it was needed, irrespective of whether or not the needed work was caused by work performed under the contract. In other words, if an area needed erosion control or prevention, the contractor had to complete the work.

All work to be performed by Arrowhead Enterprises has been completed and approved by USDA-NRCS and the County Fire Department.

John B. Hatcher
Registered Professional Forester #681

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

NRCS-ADS-045
8-90

CONTRACT NO.
RF01LP

DATE OF INSPECTION
05/20/05

THIS IS TO CERTIFY THAT (Name and address of Contractor):

Arrowhead Enterprises

HAD ALL WORK UNDER THE ABOVE CONTRACT FOR THE CONSTRUCTION OF *(Job description and location)*

Large Parcel Church of the Woods - Crestline

READY FOR FINAL INSPECITON ON *(date)* _____ THAT THE WORK WAS COMPLETED IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT WITH THE FOLLOWING EXCEPTIONS.

(a) TECHNICAL: NONE

(b) OTHER: NONE

COMMENTS:

Number of parcels treated: 1 Number of acres treated: 40. Number of trees removed: 2,800

- Meets CA Forest Practice Rules standards as per Glenn Barley CDF
- Meets NRCS standards and county contract standards.
- Stump hgts! <8"
- Chip depth <4"
- Waterbars & spacing adequate

Project Cost $186,520.00

6-10

New faded and dead trees since contract completion died quick 1-2 wks new bu hgts

AND IT IS RECOMMENDED UPON COMPLETION OF THE EXCEPTIONS LISTED UNDER (a) ABOVE THAT THE WORK UNDER THIS CONTRACT BE ACCEPTED BY THE CONTRACTING OFFICER.

GOVERNMENT REPRESENTATIVE: Adam Lerner Forester

EWP SPONSOR REPRESENTATIVE: RPF #500

STATE CONSERVATION ENGINEER:

STATE ADMINISTRATIVE OFFICE:

THE ABOVE EXCEPTION(S) WERE COMPLETED ON:

(a) NAME:	TITLE:	DATE:
(b) NAME:	TITLE:	DATE:

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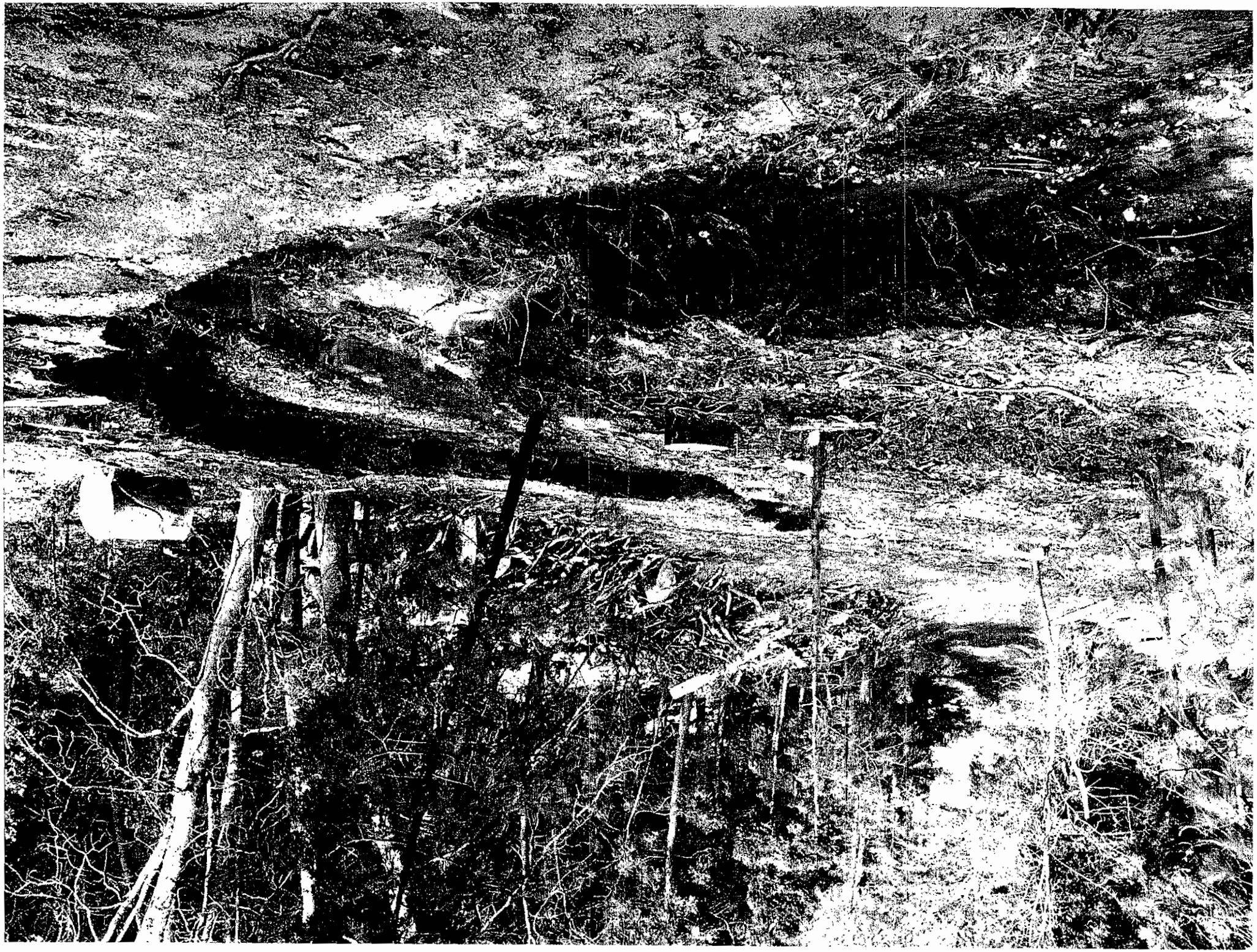

John Hatcher and James Bridges

Foresters Report for Church of the Woods

March 2003

FORESTERS REPORT

For

Church of the Woods
Lake Arrowhead Christian School

Prepared by

John Hatcher
Registered Professional Forester
Calif. Lic. #681

And

James Bridges
Registered Professional Forester
Calif. Lic. #1534

March 2003

FORESTERS REPORT

For

Church of the Woods
Lake Arrowhead Christian School

Prepared by

John Hatcher
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Calif. Lic. #681

And

James Bridges
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Calif. Lic. #1534

March 2003

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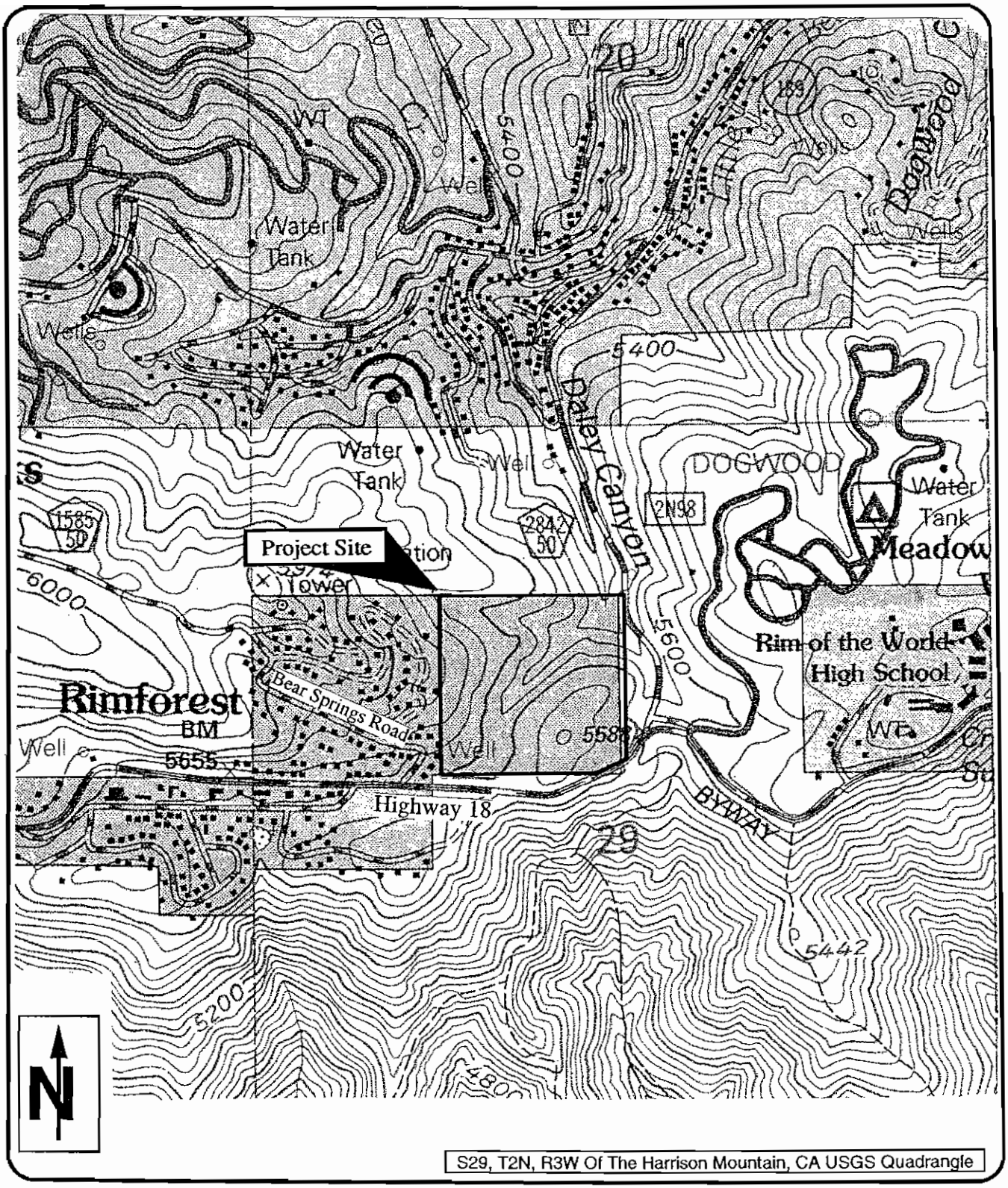


CHURCH OF THE WOODS
AND
LAKE ARROWHEAD CHRISTIAN SCHOOL
CUP and TPM 16155

CHURCH OF THE WOODS
AND
LAKE ARROWHEAD CHRISTIAN SCHOOL
CONDITIONAL USE PERMIT
SITE PLAN

Scale: 1" = 50'

NOTES:

1. RECORD OWNER: CHURCH OF THE WOODS, A CALIFORNIA CORPORATION; P. O. BOX 2000; LAKE ARROWHEAD, CA. 92352; 909-337-3455
2. PUBLIC UTILITIES ARE AS FOLLOWS:
   A) WATER: BIG BEAR WATER AND POWER; P. O. BOX 1929; BIG BEAR, CA. 92315; 909-866-5050
   B) SEWER: LAKE ARROWHEAD COMMUNITY SERVICES DIST; P. O. BOX 759; LAKE ARROWHEAD, CA 92352; 909-337-2505
   C) NATURAL GAS: SO. CAL. GAS CO.; P. O. BOX 6228; SAN BERNARDINO, CA. 909-889-9711
   D) ELECTRIC: SO. CAL. EDISON CO.; P. O. BOX 98; RIM FOREST, CA. 92378; 909-337-2584
   E) TELEPHONE: VERIZONE; 1300 CRESTON AVE.; MORTONE, CA. 92376; 909-793-7441
   F) CABLE TV: FALCON CABLE; P. O. BOX 9; RIM FOREST, CA. 92378; 909-336-2457
3. LEGAL DESCRIPTION: THE SE 1/4; NW 1/4; SECTION 29, T.2N, R.3W, SBM, COUNTY OF SAN BERNARDINO, CALIFORNIA
4. THE CURRENT AND PROPOSED GENERAL PLAN USE DISTRICT IS LA/RC.
5. ENTRY SIGNS WILL BE SUBMITTED FOR REVIEW AT A LATER DATE.
6. ALL PARKING AREAS WILL BE SURFACED WITH ASPHALT. THE MINIMUM PARKING SPACE WILL BE 8'x18' TYPICAL
7. TREES TO BE REMOVED ARE DISCUSSED IN THE FORESTERS REPORT PREPARED BY JOHN HATCHER DATED 3-25-03.

PROJECT SUMMARY:

TOTAL PROJECT

a) Building Coverage	117,200 SF	7.3%
b) Drives / Walks / Drainage	368,267 SF	22.8%
c) Ball Field and Play Yard	154,313 SF	9.6%
d) Landscape and Recreation	143,925 SF	9.0%
e) Landscape Slopes	228,841 SF	14.2%
f) Natural Area	605,414 SF	37.1%
TOTAL AREA	1,608,160 SF	100%

PROJECT SUMMARY

PARCEL 1: LAKE ARROWHEAD CHRISTIAN SCHOOL:

a) Building Coverage	53,439 SF	23.4%
b) Drives and Walks	81,037 SF	35.5%
c) Slope Area	40,451 SF	17.7%
d) Ornamental Landscape	27,482 SF	12.0%
e) Play Yard	30,831 SF	13.5%
f) Natural Area	10,633 SF	4.6%
TOTAL AREA :	228,533 SF	100%

PARCEL 2: CHURCH OF THE WOODS:

a) Building Coverage	59,295 SF	10.3%
b) Drives and Walks	276,614 SF	48.1%
c) Slope Area	71,791 SF	12.5%
d) Ornamental Landscape/Recreation	118,452 SF	20.6%
e) Natural Area	49,228 SF	8.5%
TOTAL AREA :	575,710 SF	100%

PARCEL 3: BASEBALL FIELD:

a) Drives, Walks and Drainage	25,516 SF	8.6%
b) Slopes	118,599 SF	40.2%
c) Ball Field and Adjacent Areas	118,558 SF	40.2%
d) Landscape	2,281 SF	0.8%
e) Natural Area	29,122 SF	9.9%
TOTAL AREA :	294,076 SF	100%

PARCEL 4: NATURAL OPEN SPACE 147,481 SF

PARCEL 5: NATURAL OPEN SPACE 350,500 SF

BUILDING SUMMARY

CHURCH OF THE WOODS

PHASE I	
First floor	18,305 SF
Second floor	8,579 SF
SUB TOTAL	26,884 SF
PHASE II	
First floor	1,900 SF
Second floor	700 SF
SUB TOTAL	2,600 SF
CHAPEL	
First floor	33,018 SF
Second floor	13,783 SF
SUB TOTAL	46,801 SF
MAINTENANCE BLDG.	
First floor	2,500 SF
Second floor	573 SF
SUB TOTAL	3,073 SF
WORSHIP CENTER	
PHASE III	
First Floor	18,880 SF
Second floor	4,630 SF
SUB TOTAL	18,510 SF
SEATING	
First floor	800 people
Second floor	400 people
SUB TOTAL	1,200 people
TOTAL SQUARE FOOTAGE:	87,768 SF

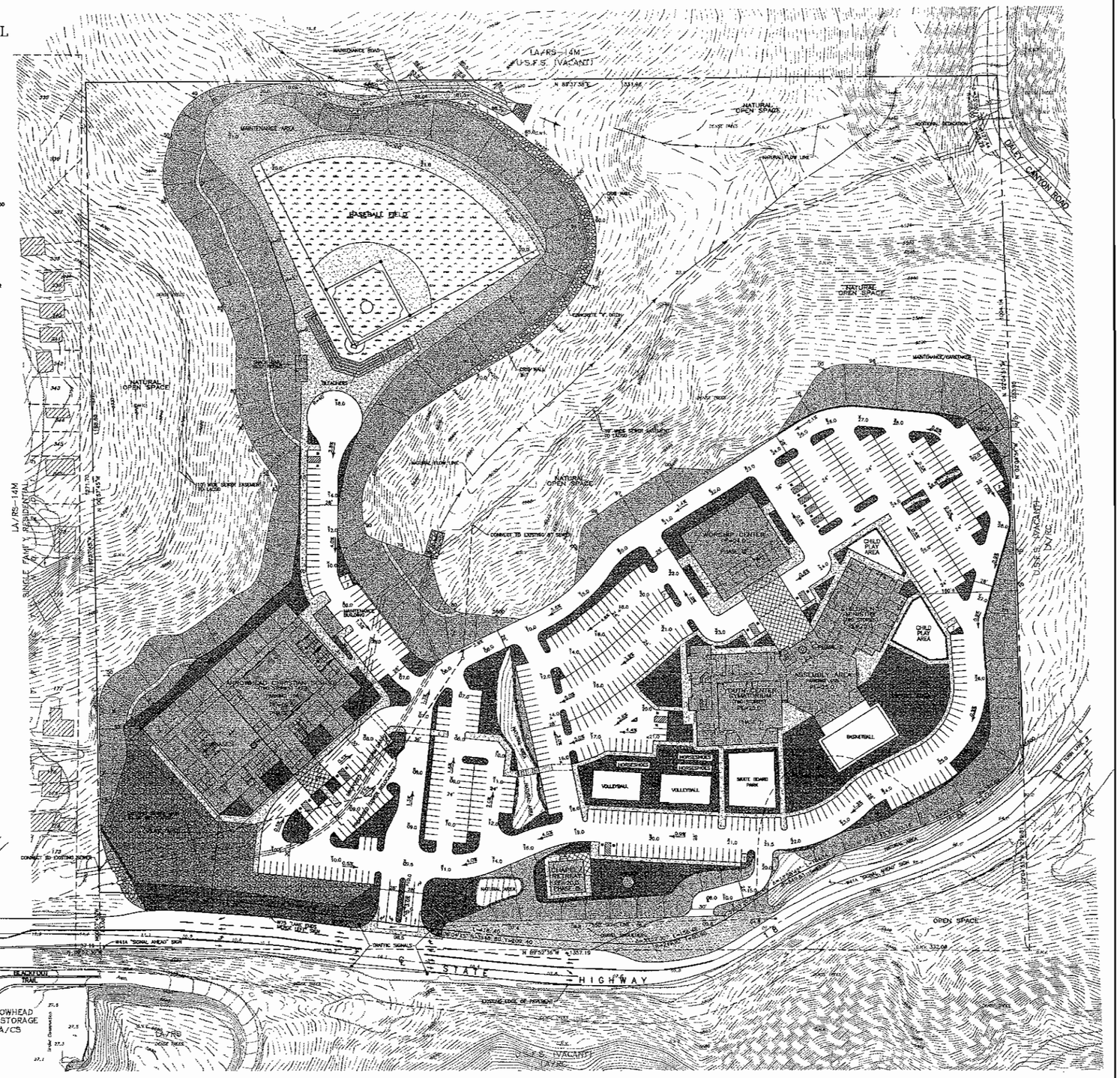
LAKE ARROWHEAD CHRISTIAN SCHOOL

PHASE I	
First Floor	21,610 SF
Second floor	9,200 SF
SUB TOTAL	30,810 SF
PHASE II	
First floor	29,030 SF
Second floor	5,600 SF
SUB TOTAL	35,230 SF
TOTAL	66,040 SF

PARKING SUMMARY

	REQUIRED	PROVIDED
LAKE ARROWHEAD CHRISTIAN SCHOOL (BUILD OUT)		
STAFF/FACULTY/EMPLOYEES (80) (1 SPACE EA.)	80	
STUDENTS 10-12 (100) (1 SPACE EA.)	100	
TOTAL	180	103*
CHURCH OF THE WOODS		
1200 SEATS (1 space for 4 seats)	300	455
TOTAL	480	561

NOTE: *Reciprocal parking easements will be established.



3-20-03

W.J. McKEEVER, INC.
CIVIL ENGINEERING
847 NORTH MAIN STREET, SUITE 8A
RIVERSIDE, CALIFORNIA 92505
PH: (909) 341-9700
FAX: (909) 341-9740

REGISTERED PROFESSIONAL ENGINEER
WILLIAM J. McKEEVER
No. 20599
Exp. 12-31-05
CIVIL
STATE OF CALIFORNIA

3/24/03

Scope of Project

Prepare a report for the 36.9-acre property that provides information that can be utilized by the San Bernardino County Planning Department and other governmental agencies to help make more informed decisions about this development proposal.

The report is made up of two parts:

1. Information on timber stand condition, timber volumes, number of trees per acre and distribution range, timber site quality and soils information.
2. Tree protection and insect prevention guidelines.

Timber Type Classification and Site Quality

The trees on the property can generally be classified as a second growth 70 to 100 year old stand resulting from near clear-cut logging in the early 1900's. The most recent logging took place in the mid 1970s and appears to have been a high-risk sanitation-salvage harvest. Based upon the Wildlife Habitat Relationships Handbook, timber stands on the property can be classified as Sierran Mixed Conifer (See classification system in Appendix). Within this classification the timber stands fall into the SMC 5S/4P category, consisting of an all age, all size structure. The small portion of the property south of Highway 18, consisting primarily of brush and small trees, is far different from the portion north of Highway 18. However, this small parcel will not be developed in this proposal, and will not be considered further in this report.

Site quality is a measure of the productive capability of the site and is based on a tree's height and age. It is normally determined by measuring trees of high quality that are in a dominant or co-dominant position in the timber stand. The timber was randomly sampled along the cruise lines to determine site quality. The Site Class rating for the property is a high Class 3. This generally indicates very good potential to grow trees.

Soil types on the property were determined from the San Bernardino National Forest Soil Survey, dated 1980. The majority of the soils belong to the Morical - Wind River

Families. These soils are typified as being deep, with an effective rooting depth of 20 to 40 inches and high moisture retention capability. Erosion hazard is rated as moderate to high, depending on the steepness of slopes. The timber productivity rating for these soils is also good.

Forest Condition

Trees on the property are generally healthy. There are trees recently killed by bark beetles. These beetles attack both Ponderosa and Sugar pines, however, only dead ponderosa pines were observed. There are about 50 insect killed trees on the property.

There were about 200 dead trees, 6 inches DBH and smaller, that died because of overcrowding. The majority of dead trees were suppressed fir and cedar saplings less than 3 inches in diameter.

Trees less than 6 inches in diameter averaged 890 per acre with a range of 100 to 4000 per acre. Two thirds of these trees are Incense Cedar and White fir seedlings and saplings. Both the density and current mortality of these small trees strongly support a recommendation for pre-commercial thinning on the portion of the property not cleared during development. This will enhance the health and vigor of the residual trees, reduce mortality and also serve to achieve the required fuel modification.

Survey Method

Timber stands were stratified by density utilizing aerial photography interpretation and ground proofing. A strip cruise, to provide inventory data, was designed to transect each stratum so that an adequate sample could be inventoried.

Inventory Design

Four cruise lines were laid out on an east – west pattern starting at 400 feet north from the SE corner of the property (See Cruise Strip Map in Appendix). Individual tree data was gathered on each strip that was 1320 feet long and 50 feet wide. This resulted in 6.06 acres that were inventoried, giving a 16% sample.

Trees diameters were measured at 4.5 feet in height (Diameter Breast High [DBH]) using a Merrit hypsometer and/or a diameter tape. Tree heights were measured with a Suunto clinometer. Tree volumes were calculated from San Bernardino National Forest local volume tables.

Inventory Results

An inventory along the 6.06 acres of cruise strips shows an average of 107 trees per acre, 6 inches in diameter and larger. There is an average volume of 25,400 board feet, per acre, of conifers and 411 cubic feet, per acre, of hardwoods 6 inches in diameter and larger. This data calculates to a total volume of 938 thousand board feet (MBF) of conifers and 15,206 cubic feet of oaks in 3969 trees on the property.

Impact of Project

The project proposal will result in clearing 23.2 acres and leaving 13.7 acres more or less natural. The construction clearing will result in the removal of 2482 trees, 6" diameter and larger, or 62% of the total timber stand. The preliminary plans call for roads to be constructed within the cleared areas. Construction of all buildings, recreational facilities, and other improvements will take place on the cleared areas.

The project proposes to leave 13.7 acres of open space in various areas of the property. These areas contain dense groups of small trees that need thinning for both the health of the timber stand and fire safety. Old logging roads and skid trails may be used to facilitate this fuel modification and thinning treatment.

Landscaping Recommendations

The understory in the area outside the cleared areas is small trees with less room to grow than is necessary for them to reach maturity. Therefore, replanting of trees on a 2 to 1 basis as per County's Plant Protection and Management Ordinance is not recommended. Cut slopes exceeding 20 feet in width may have 15 gallon size Ponderosa Pine or Giant Sequoia planted close to the toe of the slope. Fill slopes exceeding 20 feet in width may have the same trees planted near the top of the slope

. Spacing between planted trees should be no closer than 20 feet. Low volume, fire resistant shrubs and ground covers are much more desirable for planting on roadside slopes (See recommended plant lists in Appendix).

It is highly recommended that a Registered Professional Forester or ISA Certified Arborist, familiar with the San Bernardino Mountain's environmental conditions, review and approve the Landscaping Plan prior to submittal.

TREE PROTECTION GUIDELINES

1. Construct protective barriers around trees to be left on site, near the road right-of way and building envelope, to keep construction equipment from damaging them. Ref. attached Tree City USA Bulletin - How To Save Trees During Construction.

2. Limit ground disturbing construction activities to the dry summer or early fall months to reduce soil compaction.

3. Confine use of heavy equipment to roadway prisms, approved skid trail, building sites, driveway pads and parking areas rather than travel cross country.

4. No heavy equipment should be operated, parked or serviced within the dripline of remaining trees.

5. Keep concrete or asphalt pads outside the dripline of remaining trees.

6. Fill material, over 6" deep, should be kept outside the dripline of remaining trees. Where fill around trees is necessary, barrier walls with drainage systems, as per attached Tree City USA Bulletin should be constructed.

7. Foundation footings should be kept outside the dripline of remaining trees. Where this is not possible, consult with an ISA Certified Arborist or Registered Professional Forester to determine if roots may be cut, or if trees should be removed.

8. Sewer, water and other underground utility lines should be run so as to avoid roots of remaining trees. Where utility lines must be constructed within the dripline of trees, trenches should be hand dug in order to prevent unnecessary root damage and root cutting.

9. Tree roots, larger than 2" in diameter, which have been damaged during construction, should have the shattered ends exposed to an undamaged portion and squarely cut off with a hand saw. The cut ends should then be painted with a tree seal.

10. Install plastic or chemical root barriers between tree roots and foundation footings.

11. Keep grading cuts over 2" deep outside the dripline of remaining trees. Where only slight grading is necessary (2" or less and the tree is not shallow rooted), the graded surface should be mulched with peat moss, straw, or leaf mold to stimulate root production and retain moisture.

12. Do not allow concrete or masonry products to be dumped or stacked within the dripline of remaining trees. Do not allow concrete delivery trucks to be washed or cleaned on the property.

13. Any necessary pruning of residual trees should be done in accordance with the attached ISA Pruning Standards.

NOTE: Trees that cannot be protected utilizing the above guidelines should be removed. Only large specimen or unique trees, as determined by an ISA Certified Arborist or Registered Professional Forester, should be considered for more intensive and expensive preservation methods.

INSECT PREVENTION GUIDELINES

1. During tree removal operations, all pine limbs and logs should be removed from the site within 15 days to reduce the potential for bark beetle infestations in cut material. This will prevent a brood from developing that could infest neighboring pine trees. California Forest Practice Rules also allow chipping, debarking, sealing with clear plastic for 4 to 6 months, or lopping of limbs from stems greater than 3 inches diameter and scattering so that all material has maximum exposure to solar radiation.

2. Consider protective spraying of high value, individual pine trees with carbaryl insecticide prior to construction. Buffer spray solution so that a pH of 5 is achieved to provide season long protection.

3. All landscape planting and irrigation should be kept outside driplines of the remaining pine trees, so as not to interrupt the natural wet-dry cycle.

A Certified Arborist or Registered Professional Forester should inspect the site at a minimum of once a month during construction activities to insure that the above recommendations are being followed.

Disclaimer

Even though all of the above recommendations are followed, it is possible that residual trees could still be damaged or that conditions might change during construction activities, which might cause the death of individual trees. This may result in a need for further review and possible changes in recommendations. Trees may also die, particularly over-mature trees, because of reasons beyond anyone's control.

John B. Hatcher
Registered Professional Forester
Calif. License #681

Appendix

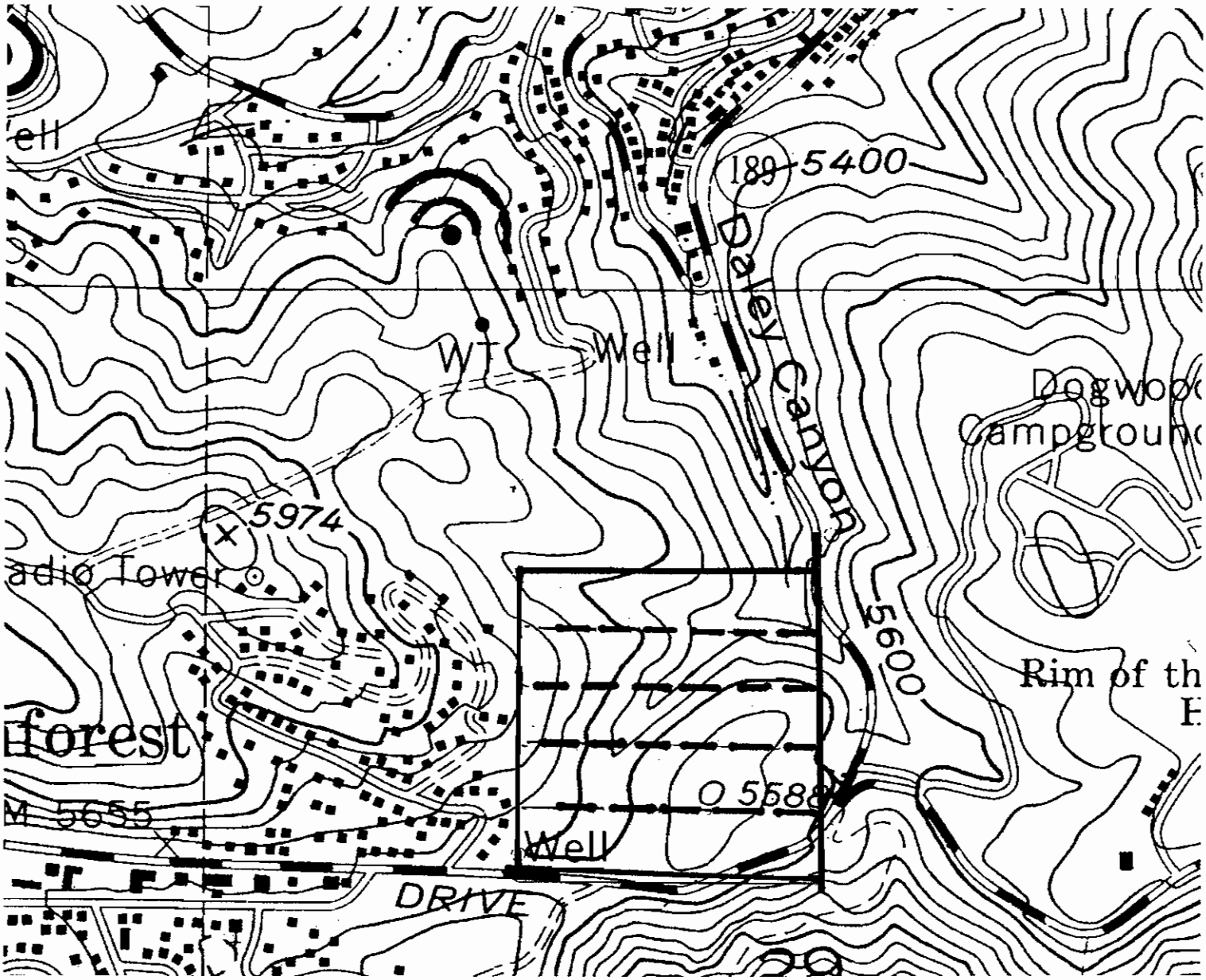
REFERENCES

1. Forestry Handbook, Reginald Forbes, The Ronald Press, 1961, Chapt. 1 - Forest Measurement

2. A Guide to Wildlife Habitats of California, Calif. Dept. of Forestry and Fire Protection, 1988

3. Soil Resource Inventory of the San Bernardino National Forest, James Retelas, USDA Forest Service, 1980

4. Arboriculture, 2nd Edition, Richard Harris, Prentice Hall, 1992



Cruise Strip Map

Church of the Woods
Lake Arrowhead Christian School

Project Boundary
Cruise Strips

March 2003

Thomas Leslie Corporation

Results of a Wetland/Jurisdictional Delineation Study for Tentative Parcel Map No. 16155

August 15, 2005

Thomas Leslie Corporation

Biological and Cultural Investigations & Monitoring

Mr. Patrick Hopkins
Church of the Woods
c/o: ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

August 15, 2005

SUBJECT: Results of a Wetland/Jurisdictional Delineation Study for Tentative Parcel Map No. 16155 (TPM 16155), a 38-Acre San Bernardino County Property

Dear Mr. Hopkins:

Thomas Leslie Corporation (TLC) is pleased to present the results of a wetland/jurisdictional Delineation performed within the boundaries of 38-acre Tentative Parcel Map No. 16155 (TPM 16155).

This delineation study report (**I**) summarizes the results of the *pre-field* and *field* portions of wetland/jurisdictional Delineation investigations, (**II**) identifies the purpose of the wetland/jurisdictional Delineation, (**III**) describes the location of TPM 16155, (**IV**) provides detailed discussions of the methodologies and (**V**) results of the wetland/jurisdictional Delineation investigations and (**VI**) makes recommendations regarding the need for (a) additional jurisdictional investigations or (b) regulatory approvals to authorize implementation of the land use plan proposed by TPM 16155. This delineation study report is divided into six corresponding sections: I, II, III, IV, V and VI.

I. SUMMARY OF THE WETLAND/JURISDICTIONAL DELINEATION

- ***No*** USGS blue-line drainages are mapped onsite (see Figure 2).
- ***No*** hydric soils and ***no*** wetlands were delineated onsite.
- A total of 0.44± acres of jurisdictional ephemeral and perennial but non-wetland waters of the state and 0.24± acres of jurisdictional waters of the US, were delineated within the boundaries of TPM 16155. Table 1 (page 2) provides a summary of the acreages of jurisdictional waters identified onsite. **NOTE**: Table 1 and the Appendix C Delineation Map legend document both ephemeral and perennial non-wetland waters occur onsite.
- As Table 1 also documents, 0.22± acres of jurisdictional waters of the state, and 0.12± acres of jurisdictional waters of the US, will be impacted during the development of TPM 16155. The impacts will occur as a result of construction of a concrete-lined trapezoidal channel at the north end of Parcel 3 and a proposed 60 inch storm drain in Parcel 1. Therefore, state and federal regulatory approvals (state 401 permit, federal 404 notifying Nation Wide 39 and state 1602 agreement) ***will be required*** to authorize development of TPM 16155.
- ***No*** additional regulatory investigations are recommended prior to preparation and submittal of applications for regulatory approvals.
- ***No*** listed threatened or endangered plant or wildlife species were identified during ***38*** focused plant and wildlife surveys performed on TPM 16155, by <u>four separate</u> biological consulting firms, in four separate years: 2005, 2003, 2002 and 2001 (TLC, 2003a-e; TLC, 2002a, b; TLC, 2001a-c; BRC, 2005; ENVIRA, 2003; NRA, 2001).

P.O. Box 2229 Temecula, CA 92593-2229 Office (951) 296-6232 Fax (951) 296-6233

Table 1: Acres of Jurisdiction within the boundaries of TPM 16155

Drainage No.	Total Length of Drainage (in feet)	California Department of Fish and Game Jurisdiction			U.S. Army Corp of Engineers Jurisdiction		
		Average Width (in feet)	Total Acres of Jurisdiction	Acres Impacted by Development	Average Width	Total Acres of Jurisdiction	Acres Impacted by Development
"A"	2,010.0 (1)	7.08	0.33	0.17	3.71	0.17	0.09
Tributary A1	370.0 (2)	5.08	0.02	0.02	2.17	0.01	0.01
"B"	795.0 (2)	3.11	0.06	0.03	1.87	0.03	0.02
"C"	300.0 (3)	4.20	0.03	0.0	4.20	0.03	0.0
	TOTALS:		**0.44**	**0.22** (4)		**0.24**	**0.12** (4)

(1) = Comprised of 1,000± ft ephemeral waters and 1,010± ft perennial non-wetland spring-fed waters.

(2) = Comprised entirely of ephemeral waters.

(3) = Upper reaches - ephemeral and dry in 2005; lower reaches at confluence with Drainage "A" had standing water.

(4) = Mitigation will be identified as a condition of approval for issuance of state and federal permits.

II. PURPOSE OF THE WETLAND/JURISDICTIONAL DELINEATION

The wetland/jurisdictional Delineation (delineation) was performed, to ascertain the presence or absence, map the location and quantify jurisdictional elements (federal and/or state waters, wetlands or riparian habitat) within the boundaries of TPM 16155.

III. LOCATION OF TPM 16155

- **Figure 1** illustrates the boundaries of the property on the 2005 *Thomas Guide* San Bernardino and Riverside Counties Street Guide and Directory on Detail map page 517, coordinates F-4 and G-4.
- **Figure 2** plots the boundaries of the property in the NW quadrant of Section 29, Township 2 North, Range 3 West; of the 1996 Harrison Mountain, California 7.5' United States Geological Survey (USGS) Topographic Quadrangle.

TPM 16155 is located in San Bernardino County, California. The Rim of the World Highway (State Highway 18; Hwy. 18) provides regional access to the property. The property can be reached by exiting Hwy. 18 at Bear Springs or Daley Canyon Roads. The property is situated northwest of the intersection of Hwy 18 and Daley Canyon Road.

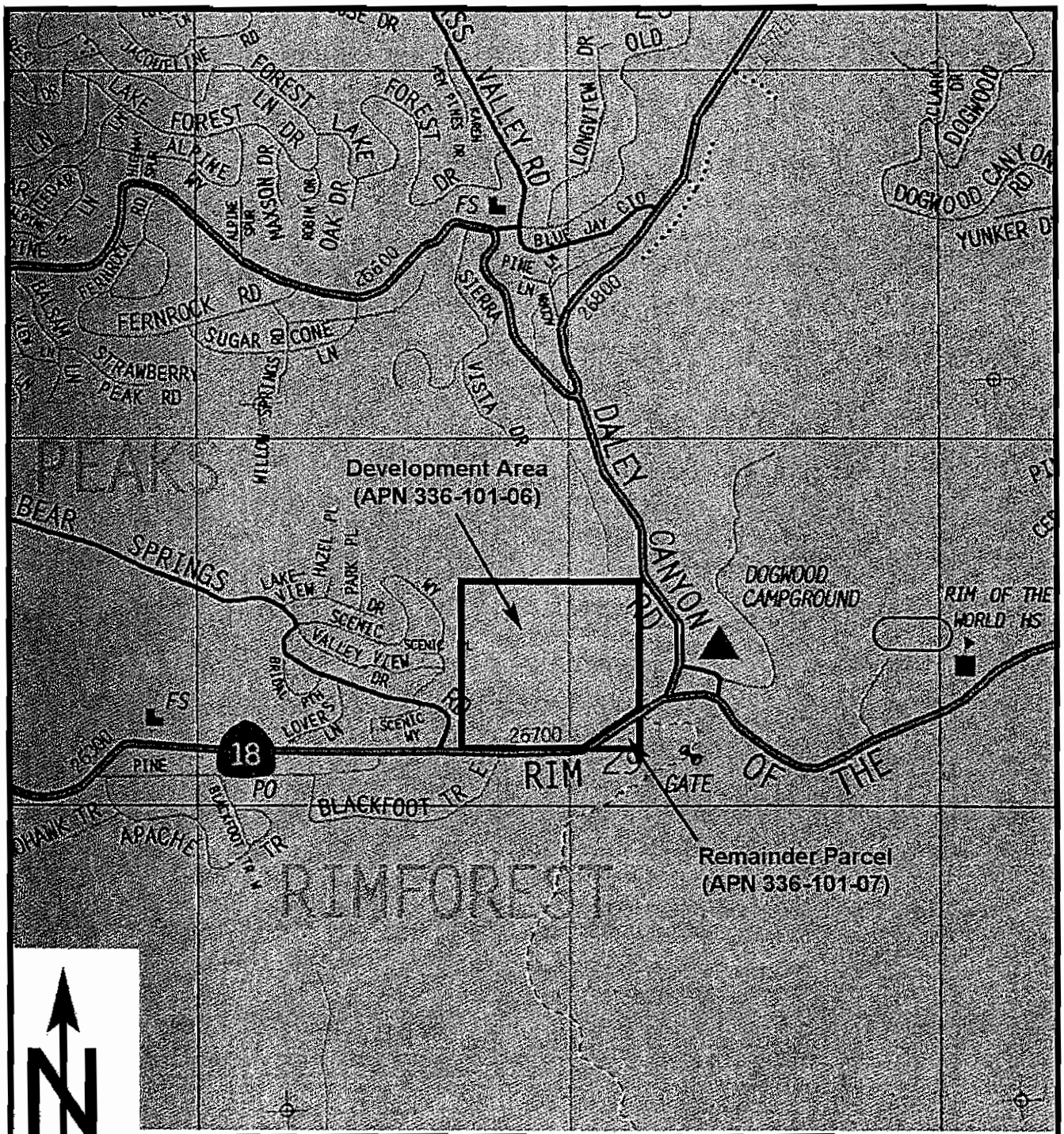
IV. METHODOLOGIES OF THE WETLAND/JURISDICTIONAL DELINEATION

A. Pre-field Portion of the Wetland/Jurisdictional Delineation

The pre-field portion of the wetland/jurisdictional Delineation included an analysis of the Harrison Mountain, California USGS quadrangle and the W. J. McKeever 1 inch = 50 foot scale tract map for TPM 16155 (WJM, 2004), to determine the presence of potentially jurisdictional elements.

B. Field Portion of the Wetland/Jurisdictional Delineation

The field portion of the wetland/jurisdictional Delineation was performed on July 17, 2005 by TLC delineators Thomas A. Leslie, M.S. and Nadya Leslie, M.S. Field data collected along the northeast portion of Drainage A and Drainage C on July 25, 2002, that was "field checked" on July 17, 2005, was also incorporated into the 2005 delineation report. The site inspection involved a comprehensive survey to (1) assess the existing site conditions and (2) determine if potential state and federal jurisdictional areas (vegetated and/or unvegetated state and federal waters, wetlands or riparian habitat) occurred onsite.



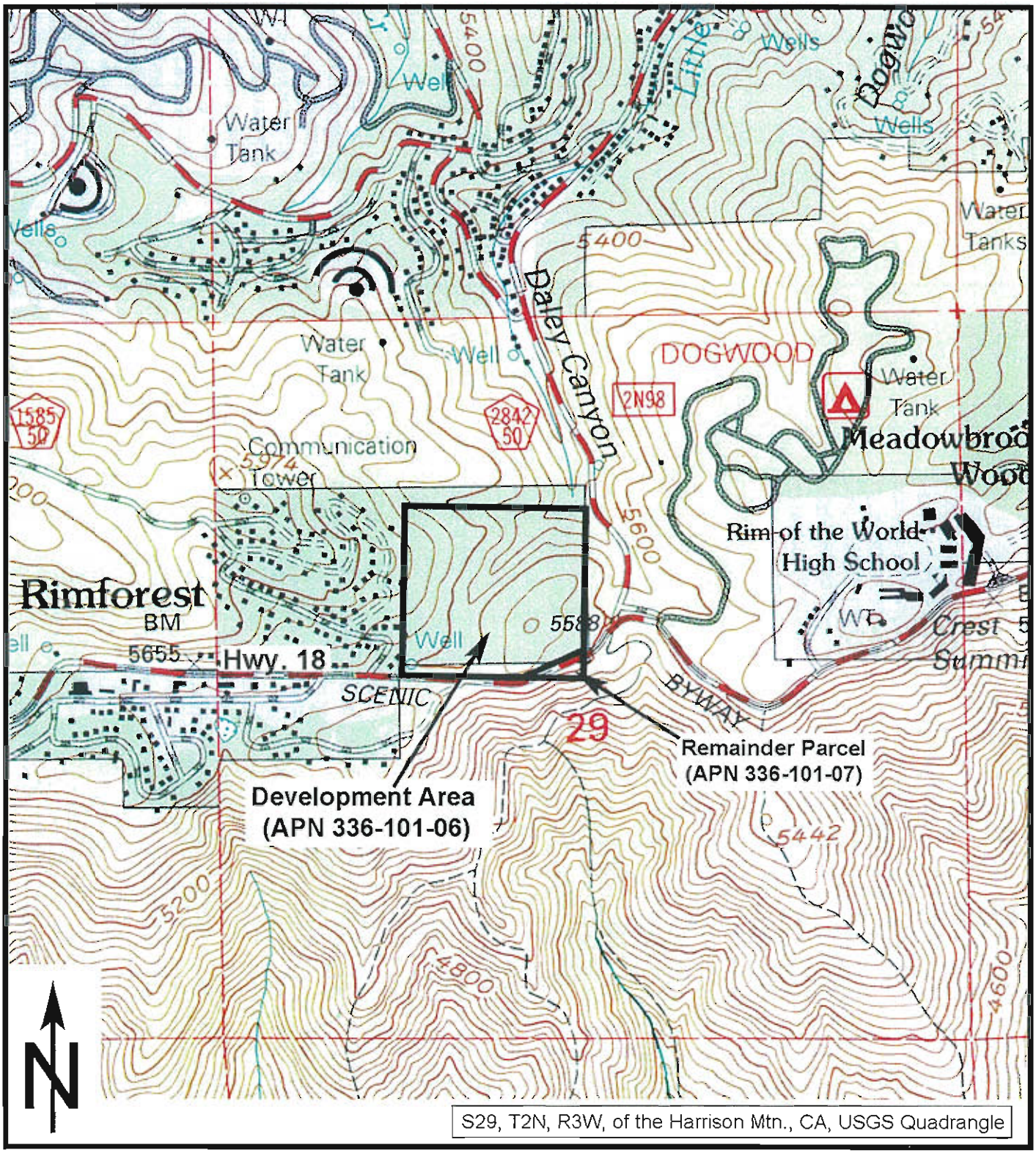
2005 *Thomas Guide* for San Bernardino & Riverside Counties, Page 517, Coordinates F-4 and G-4

Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1
Location of
Tentative Parcel Map No. 16155

Illustrated on Thomas Guide Map



Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 2

Location of Tentative Parcel Map No. 16155

Illustrated on a USGS Quadrangle Map

A *Routine Delineation* (jurisdictional wetland delineation) was selected as the appropriate method for use in making a wetland/jurisdictional Delineation for the site. The wetland/jurisdictional Delineation was conducted using methodologies described in the *1987 Corps of Engineers (Corps) Wetlands Delineation Manual* (Environmental Laboratory, 1987). This methodology employs a three-parameter approach to identify wetlands: (1) vegetative, (2) soils and (3) hydrologic conditions must each meet specific criteria for an area to meet the definition of a wetland as described in the 1987 manual.

Potentially jurisdictional elements identified within the boundaries of TPM 16155 on July 17, 2005 and July 25, 2002, were delineated following current definitions specified by Section 404 of the Federal Clean Water Act and Section 1602 of the California Fish and Game Code (CDFG, 2004).

When a potential state and/or federal jurisdictional area (vegetated and/or unvegetated state and federal waters and associated jurisdictional wetlands or riparian habitat) was encountered, its location was hand drawn in the field on the 1 inch = 50 feet scale map provided by W. J. McKeever, Inc. (WJM, 2004).

When the entirety of the tract had been inspected, each potential jurisdictional area was thoroughly examined to obtain delineation measurements and characterize existing vegetation within and along each area delineated as jurisdictional.

Hand written *Field Notes* were made to document performance of the wetland/jurisdictional Delineation performed over TPM 16155. The field notes included an inventory of the plant species identified onsite during the July 17, 2005 and July 25, 2002, field portion of the wetland/jurisdictional Delineation. The field notes were later transcribed to computer files and used to prepare the Appendix C delineation map, the Appendix D *Floral Compendium* and this wetland/jurisdictional Delineation report.

The Appendix A Photo Plate Nos. 1-4, document the conditions of the wetland/jurisdictional delineation on TPM 16155. Copies of *Delineation Data Sheets* and *Routine Wetland Delineation Data Forms*, completed to ascertain the presence or absence of wetlands onsite, are provided in Appendix B. Finally, a *Jurisdictional Delineation Map* is provided in Appendix C.

V. RESULTS OF THE WETLAND/JURISDICTIONAL DELINEATION

This section of the delineation report discusses the results of the wetland/jurisdictional Delineation, divided into ***pre-field*** and ***field*** investigations. The data collected during performance of the *pre-field* and *field* investigations was used to determine which, if any, jurisdictional elements are present onsite. Because hydric soils are present in wetlands, a *pre-field* assessment of the soils mapped onsite by *Soil Survey of San Bernardino National Forest Area, California* (USDA, 1987), was made to assist in the Delineation of the presence or absence of wetlands onsite.

A. FINDINGS OF THE PRE-FIELD PORTION OF THE WETLAND/JURISDICTIONAL DELINEATION

Prior to performing the field inspection portion of the wetland/jurisdictional Delineation the Harrison Mountain, California, USGS quadrangle (Figure 2) and 1 inch = 50 foot scale tract map for TPM 16155 (WJM, 2004), were analyzed to (a) obtain a description of the topography of the tract and (b) ascertain the presence or absence of potentially jurisdictional elements.

A-1. Onsite Topography

As shown on the 1996 Harrison Mountain, California, USGS quadrangle (Figure 2), and the W.J.McKeever 1 inch = 50 foot scale map for TPM 16155 (WJM, 2004), onsite elevation vary from a

high of 5,740± feet above mean sea level (msl) along the central portion of the western boundary of the property, to a low of 5,434± feet above msl in the vicinity of the northeastern corner of TPM 16155. This represents elevational change of 306 feet across the property.

A-2. Presence or Absence of Potentially Jurisdictional Elements

Based on analysis of the topographic contours of the USGS quad sheet, and TPM 16155, the following conclusions were made.

- *No* USGS blue-line drainages are illustrated within the boundaries of TPM 16155 (Figure 2).
- At least three drainages ("A," "B" and "C") and one tributary (A1) were preliminary identified as potentially jurisdictional topographic features, within the boundaries of TPM 16155. Each of the three potentially jurisdictional topographic features were inspected during the July 17, 2005 and July 25, 2002 field portion of wetland/jurisdictional Delineation.

A-3. Soil Types of TPM 16155

As illustrated on Figure 3, an enlarged portion of *Topographic Map # 25* of the *Soil Survey of San Bernardino National Forest Area, California* (USDA, 1987) a Morical - Wind River Families complex, 15 to 30 percent slopes, is the only soil types mapped on TTM 16155.

Landscape Position: Soils of this series consist of moderately deep to deep well drained soils of fans, hills and mountainsides between 4,000 and 6,000 feet elevation. These are formed in alluvium or slightly consolidated alluvial material derived from granitic or metamorphic rock.

Typical Vegetation: The Morical - Wind River Families complex soils are typically vegetated with Ponderosa, Jeffrey Pine, and/ or Coulter pines.

Soil Characteristics: The soils of these families complex are steep, forming slopes from 30 to 50 percent. The average annual rainfall ranges from 25 to 35 inches.

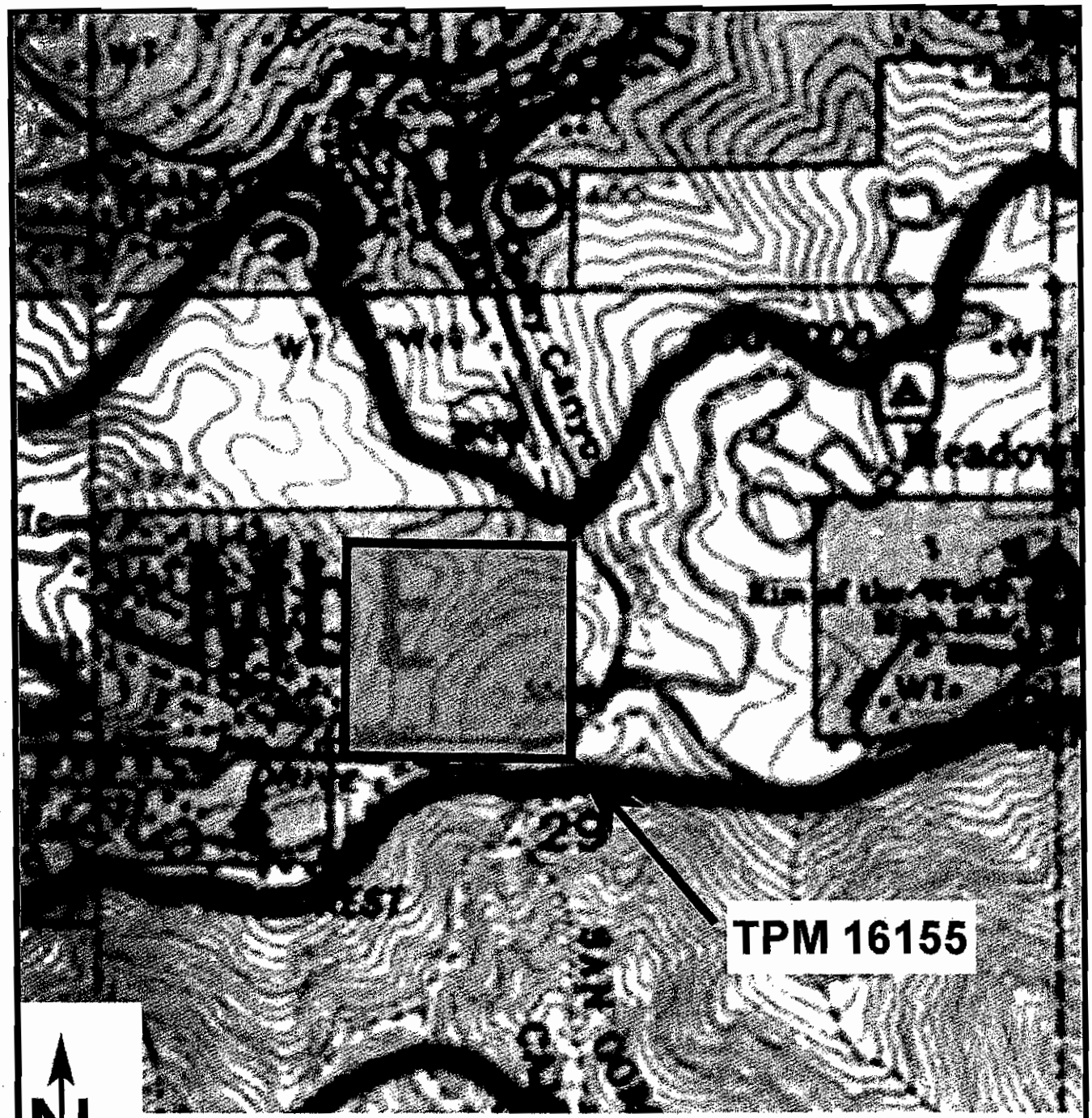
Morical – Wind River Families Complex consists of approximately 40% of Morical family soils and approximately 35 % of Wind River Family soils.

The surface layer of Morical Family soils (0 to 8 inches) is a grayish brown loam with a hard, moderate granular structure and pH = 7.0. Subsoils (8 to 50 inches) are comprised of a brownish yellow and yellowish brown clay loam, with a hard, moderate subangular blocky structure and pH = 6.5. The substratum typically consists of is a highly weathered granodiorite.

The surface layer of Wind River Family soils (0 to 19 inches) is brown sandy loam with a soft, moderate granular structure and pH = 7.0. Subsoils (19 to 34 inches) are comprised of a massive, slightly hard light yellowish-brown sandy loam and pH = 6.5. Substratum is very pale brown sandy loam; massive; slightly hard; pH = 6.7. Below the substratum is a highly weathered granite.

Hydric Rating of this Soil: According to *California Hydric Soils List* (1994) the Morical-Wind River Families complex are not hydric soils.

Finding: Hydric soils are not mapped onsite.



MbE Morical - Wind River families Complex, 15-30% slopes

Soil Survey of San Bernardino National Forest Area,California (USDA, 1987), Sheet No. 25

Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 3

Soils Map for

Tentative Parcel Map No. 16155

B. FINDINGS OF THE FIELD PORTION OF THE WETLAND/JURISDICTIONAL DELINEATION

The results of the wetland/jurisdictional delineation, including an inspection of the potentially jurisdictional topographic features identified during the *Pre-Field* investigations, are discussed in this section of the delineation report.

The potentially jurisdictional topographic features were inspected during the July 17, 2005 and July 25, 2002 field portion of the wetland/jurisdiction Delineation to ascertain the presence or absence of jurisdictional elements.

As previously discussed in the METHODOLOGIES section of this report, the 1987 Corps wetland delineation manual employs a three-parameter approach to identify wetlands: (1) vegetative, (2) soils and (3) hydrologic conditions must each match specific criteria for an area to meet the definition of a wetlands as described in the 1987 manual (Environmental Laboratory, 1987). More specifically, an area can only be delineated as a jurisdictional wetland if it contains ***all*** three criteria specified for an area to meet the definition of a wetlands as described in the 1987 manual (Environmental Laboratory, 1987). If any one of these three criteria is missing, no federally jurisdictional wetland is delineated onsite.

- The **vegetative** cover of the area must be *dominated* (more than 50%) by plant species having a wetland indicator status of obligate [OBL], facultative wet [FACW] or facultative [FAC] (Reed, 1988).

- The **soils** of the area must be classified by the *California Hydric Soils List* (SCS, 1994) as a hydric soil, or the soil must exhibit hydric soil features when inspected in the field.

- Sufficient wetland **hydrology** must be present to create conditions leading to the development of hydric soils and support hydric vegetation characteristic of wetlands.

B-1. Vegetative Conditions of TPM 16155

- An analysis of Appendix D Floral Compendium shows that plant species that are OBL, FACW or FAC (excluding FAC-) do ***not*** dominate onsite. Instead, the majority (83%) of the plant species, and biomass growing on TPM 16155 is upland species, lacking wetland indicator status dominates all vegetative strata: tree, shrub and herbaceous/grass understory. Therefore, one of the three criteria required to delineate an area as a wetland is *missing* from TPM 16155. **NOTE**: Although, some willows were identified along the northerly portion of Drainage "A," they were growing in an area that will not be impacted by development and they did not dominate the vegetational cover where they occur.

- As Appendix D Floral Compendium documents, although one OBL, five FACW and ten FAC plants species were identified onsite, they do ***not*** dominate the vegetation cover associated with any onsite drainage and are missing entirely from Drainage "B" and the first 1,000± feet of Drainage "A". Finally, they do ***not*** comprise more than 50% of the onsite vegetational cover where they do occur: Drainage "C" and the last 1,010± feet of Drainage "A."

Vegetation Identified Onsite During 2005 and 2002 Field Surveys

During the field surveys performed on July 17, 2005 and July 25, 2002, it was determined that the majority of TPM 16155 is vegetated with Westside Ponderosa Pine Forest. This habitat type covers approximately 95% of 38± acre property. The common tree species of this forest include Ponderosa Pine (*Pinus ponderosa*), Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*) and Black Oak (*Quercus kelloggii*). Shrub layer is represented by Mountain Pink Currant (*Ribes nevadense*), Mountain Dogwood (*Cornus nuttallii*), Deer Brush (*Ceanothus integerrimus*) and California Coffeeberry (*Rhamnus californica*). Scattered Western Bracken (*Pteridium aquilinum* var. *pubescens*) occurs in the herb layer.

A limited amount of Arroyo Willow (*Salix lasiolepis*), supported by perennial spring water flows, occur onsite along the northeasterly1,010± feet of Drainage "A" northeast of delineation measurement #8 (DM-8) to the northeast tract boundary. The majority of the shrub layer along the northeastern portion of Drainage "A" is dominated by Mountain Dogwood (*Cornus nuttallii*), an upland species lacking wetland indicator status (Reed, 1988).

Finally, Ruderal/Disturbed plants were growing onsite along the dirt roads, and logging skid trails that criss-crossed TPM 16155 on July 17, 2005. The Ruderal/Disturbed areas were comprised of a sparse scatter of annual, locally common non-native grasses and forbs, and hardy native species growing like weeds. The plant species commonly occurring within the Ruderal/Disturbed areas of the property included non-native upland weeds such as Common Ragweed (*Ambrosia artemisiifolia*), Prickly Lettuce (*Lactuca serriola*), Black Bindweed (*Polygonum convolvulus*), Cheat Grass (*Bromus tectorum*), Ripgut Grass (*Bromus diandrus*) and native White Yarrow (*Achillea millefolium*), Tarplant (*Hemizonia paniculata*), Morning Glory (*Calystegia occidentalis*) and California Goldenrod (*Solidago californica*).

B-2 Soil Conditions

- ***No*** wetland (hydric) soil indicators were identified onsite.
- The Morical – Wind River Families Complex soils mapped onsite are ***not*** identified by the SCS as hydric (SCS, 1994).
- Wetland delineation soil test pits were ***not*** excavated since wetland soil indicators were ***not*** present onsite and plant species that are OBL, FACW or FAC do ***not*** dominate onsite.
- Since wetland soil indicators are ***not*** present onsite, a 2nd one of the three criteria required to delineate an area as a wetland, was missing along the drainages of TPM 16155.

B-3. Hydrologic Conditions

- ***No*** wetland hydrology was observed along drainage B and the first 1,000 feet of Drainage A.
- Flowing water, derived from a spring immediately northeast of DM-8, was present along the northeastern 1,010± feet of Drainage "A" between measurement DM-8 and the north parcel boundary and Drainage "C."

B-4. Field Check of Potentially Jurisdictional Features Identified During the *Pre-Field* Investigations

B-4.1. Drainage "A"

- The northeasterly directed Drainage "A" starts in the vicinity of the southwestern corner of TPM 16155 and flows northeasterly 2,010± feet across the tract to the northeastern corner of the parcel (see Appendix C delineation map).

- Drainage "A" is not mapped as blue-line stream course on Harrison Mountain, USGS, topographic quadrangle.

- The southwesterly 1,053± linear feet of Drainage "A" will be impacted by development. That is, 0.19± acres of non-wetland waters of the state and 0.09± acres of the non-wetland waters of the US will be impacted by development. As illustrated on TPM 16155, the remaining northeasterly 957± feet of Drainage "A" is situated in Natural Open Space Parcel 5 and will not be impacted by the proposed land use plan (WJM, 2004).

B-4.2. Tributary A1 (T-A1)

- The northeasterly directed Tributary A1 starts at dirt access road (logging "skid trail") and "runs" 200± feet northeasterly where it converges with Drainage "A" (see Appendix C delineation map).

- Tributary A1 is not mapped as blue-line stream course on Harrison Mountain, USGS, topographic quadrangle.

- The entire 200± linear feet of Tributary A1 will be impacted by development. That is, 0.02± acres of non-wetland waters of the state, and 0.01± acres of the non-wetland waters of the US will be impacted by development.

- Water only flows along this ephemeral drainage as a result of ice melt or during storms.

B-4.3. Drainage "B"

- The southwesterly directed Drainage "B" crosses onto TPM 16155 at northern boundary, approximately 380± feet east from the northwestern parcel corner and extends 795± feet southeasterly where it converges with Drainage "A" (see Appendix C delineation map).

- Drainage "B" is not mapped as blue-line stream course on Harrison Mountain, USGS, topographic quadrangle.

- Drainage "B" was dry on July 17, 2005. Water only flows along this ephemeral drainage as a result of ice melt or during storms.

- 375± linear feet of Drainage "B" will be impacted by development. That is, 0.03± acres of non-wetland waters of the state and 0.01± acres of the non-wetland waters of the US will be impacted by development. As illustrated on TPM 16155, the remaining southeasterly 420± feet of Drainage "B" is situated in Natural Open Space Parcel 5 and will not be impacted by the proposed land use plan (WJM, 2004).

B-4.4. Drainage "C"

- The northwesterly direct Drainage "C" crosses onto TPM 16155 at eastern boundary, approximately 230± feet south from the northeastern parcel corner and flows northwesterly where it converges with Drainage "A" just north of the northern boundary (see Appendix C delineation map).
- 300± feet of Drainage "C" is situated within the boundaries of the property.
- Drainage "C" is not mapped as blue-line stream course on Harrison Mountain, USGS, topographic quadrangle.
- As illustrated on TPM 16155, Drainage "C" will ***not*** be impacted by development of TPM 16155. The entirety of Drainage "C" is situated in Natural Open Space Parcel 5 (WJM, 2004).

VI. NEED FOR ADDITIONAL BIOLOGICAL INVESTIGATIONS OR REGULATORY APPROVALS

A. Need For Additional Biological Investigations

- ***No*** additional jurisdictional investigations are recommended.

B. Need For Regulatory Approvals

- 0.22± acres of jurisdictional waters of the state, and 0.12± acres of jurisdictional waters of the US, will be impacted during the development of TPM 16155.
- Therefore, state and federal regulatory approvals (401, 404 and 1602) ***will be required*** to authorize development of TPM 16155.

Please call me if you have any questions regarding this delineation report or require additional information.

Respectfully Submitted,

THOMAS LESLIE CORPORATION

Thomas A. Leslie, President/B.S./M.S. Biologist
TAL/nvl

REFERENCES

BioResource Consultants (BRC), July 17, 2005, California Spotted Owl Surveys on APN 336-101-006, San Bernardino County, California.

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Reed, P., U.S. Department of the Interior, Fish and Wildlife Service, 1988, National List of Plant Species That Occur in Wetlands: California (Region 0).

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Thomas Leslie Corporation (TLC), October 7, 2003a, 2003 Results of an Andrew's Marble Butterfly Habitat Assessment.

Thomas Leslie Corporation (TLC), October 7, 2003b, Results of a 2003 Mountain Yellow-legged Frog Habitat Assessment.

Thomas Leslie Corporation (TLC), October 7, 2003c, Results of 2003 California Spotted Owl Protocol Surveys.

Thomas Leslie Corporation (TLC), October 7, 2003d, Results of Focused 2003 Botanical Surveys Performed on Tentative Parcel Map No. 16155.

Thomas Leslie Corporation (TLC), October 8, 2003e, Opinion Regarding Absence of Southern Rubber Boa from TPM 16155.

Thomas Leslie Corporation (TLC), January 10, 2002a, Results of a Mountain Yellow-legged Frog Habitat Assessment.

Thomas Leslie Corporation (TLC), June 10, 2002b, Results of Focused Southern Rubber Boa Surveys.

Thomas Leslie Corporation (TLC), September 19, 2001a, Results of A Biological Constraints Analysis of APN 336-101-006 and APN 336-101-007.

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United States Department of Agriculture; Soil Conservation Service, July 1994, SOI - California Hydric Soils List.

United States Department of the Interior Geological Survey (USGS), 1996 State of California Department of Water Resources, Harrison Mountain, California, 7.5 Minute Series (Quadrangle topographic).

W. J. McKeever, Inc., September 9, 2005, 1 Inch = 50 Feet Map: Church of the Woods, Tentative Parcel Map No. 16155.

APPENDIX A

PHOTO PLATE NOS. 1-4

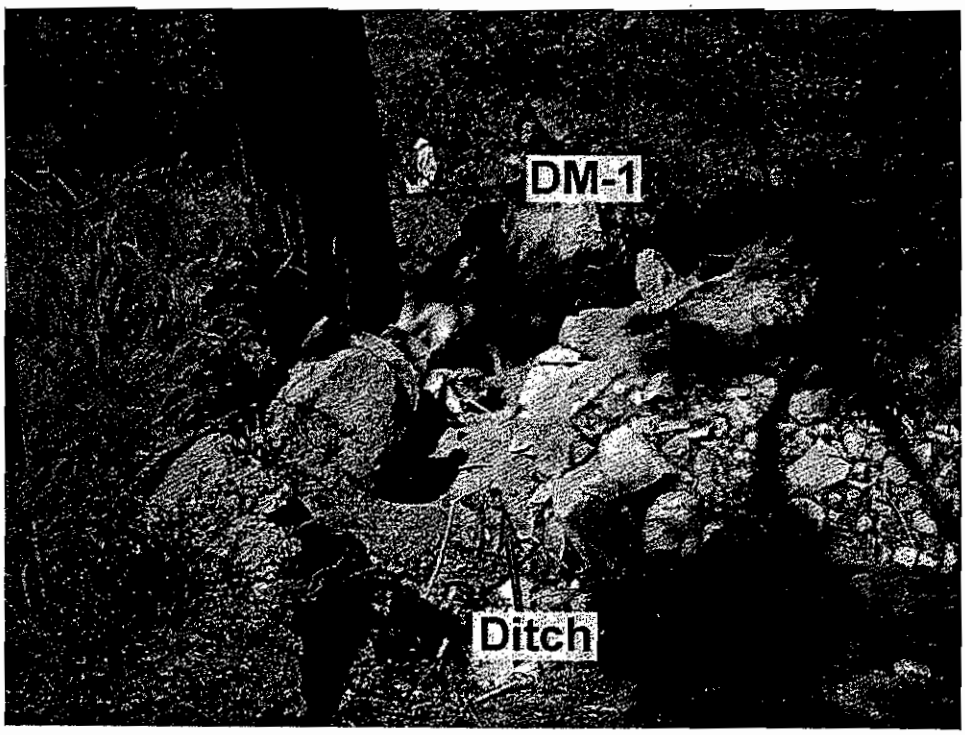
FOR

TENTATIVE PARCEL MAP NO. 16155

SAN BERNARDINO COUNTY, CALIFORNIA

PHOTO PLATE NO. 1

1a. East view, along the southern boundary of TPM 16155, from near the southwestern parcel corner and Highway 18. An asphalt and rip-raped ditch, collects ephemeral ice melt and storm water run-off flows from Highway 18, conveys it northeasterly onto TPM 16155 where it converges with the westerly onsite portion of Drainage "A" (photo date - *07/17/05*).



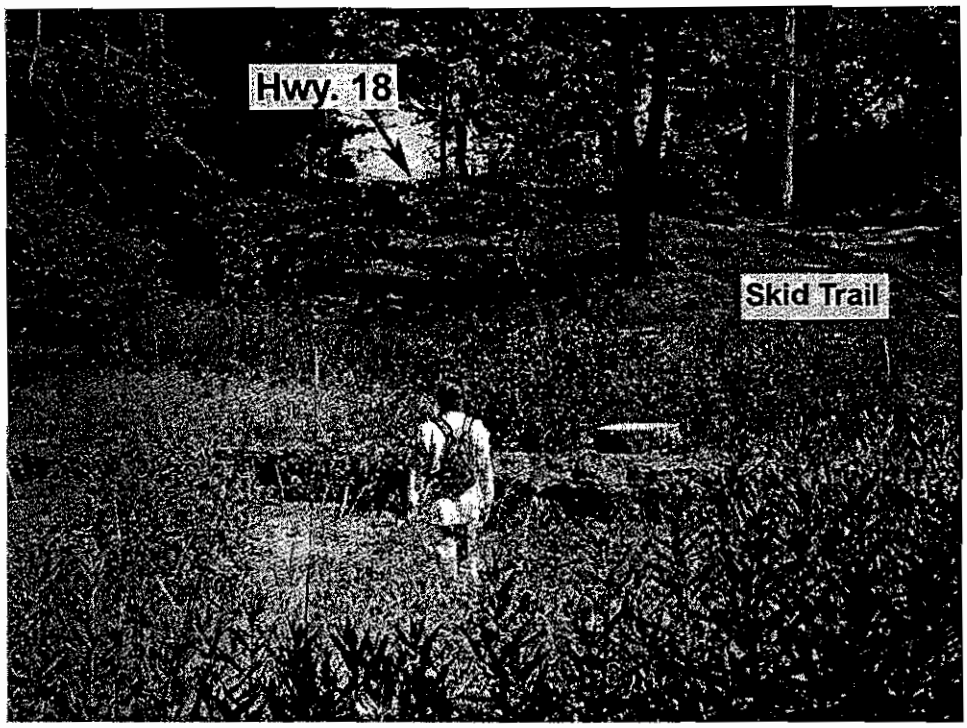
1b. North view down the ditch discussed in 1a above (photo date - *07/17/05*).

PHOTO PLATE NO. 2

2a. Northeasterly view where delineation measurement #1 (DM-1) was made. The ditch seen in 1a and 1b was dry on July 17, 2005. Upland plant species, lacking wetland indicator status (Reed, 1988) dominated along the ditch. That is, ***no*** hydric vegetation occurred any where in the vicinity of DM-1. The biomass of the plant cover adjacent to the ditch was dominated by upland non-native Hare Barley [*Hordeum murinum* ssp. *leporinum*] (photo date - *07/17/05*).

2b. Close-up view, of delineation measurement #3 (DM-3). DM-3 was made onsite Drainage "A." Routine Wetland Delineation sample point #1 (RWD-1), located in Appendix B of this delineation report, documents that upland plant species, lacking wetland indicator status, dominated at this portion of Drainage "A." Since this sample point lacked wetland hydrology, and hydric vegetation did not predominate, no soil test pit was excavated and hydric soils were delineated as absent (photo date - *07/17/05*).

PHOTO PLATE NO. 3-1



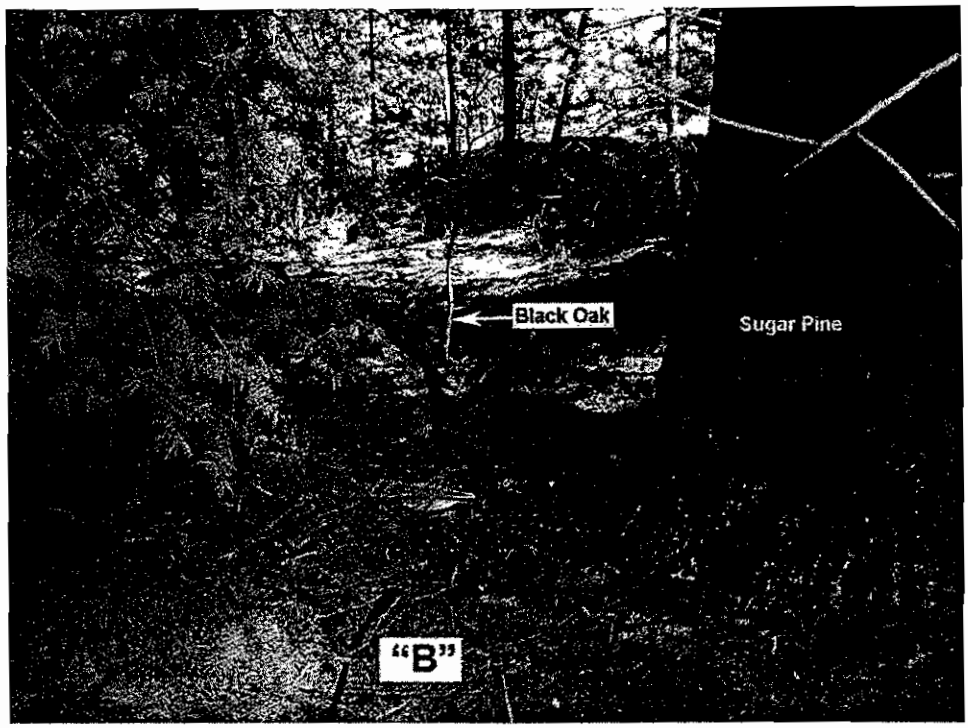
3a. Southerly view toward Highway 18, where delineation measurement #4 (DM-4) was made. Drainage "A" was 12.8 feet wide at DM-4. The dashed line at the right of this photograph show the location of a logging "skid trail" used to remove trees previously cut down onsite (photo date - *07/17/05*).

3b. Northeasterly view at DM-4. As this photograph documents, Drainage "A" was dry on July 17, 2005 and upland annual grass and herb species, lacking wetland indicator status dominated at DM-4. The dominant upland species included Pigweed (*Chenopodium album*), Ripgut Grass (*Bromus diandrus*) and Common Knotweed (*Polygonum arenastrum*). Although, Mugwort (*Artemisia douglasiana*) was present at this spot, it did not predominate. Therefore, *no* wetland was delineated at DM-4 and hydric soils were delineated as absent (photo date - *07/17/05*).

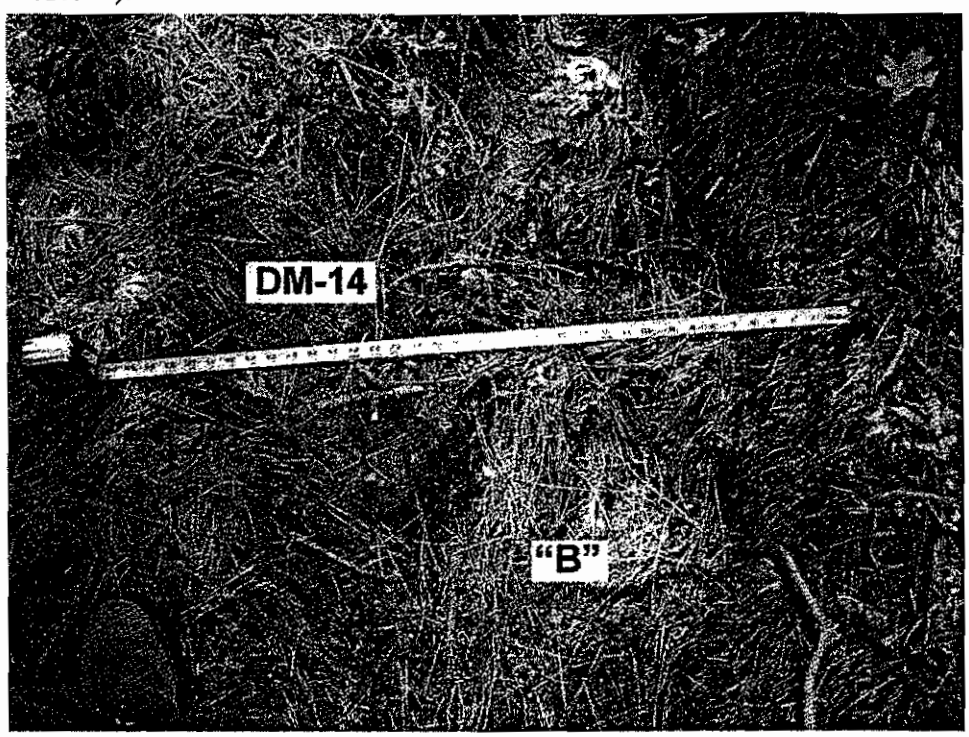
PHOTO PLATE NO. 3-2

3c. Close-up view, of delineation measurement #8 (DM-8). The concrete slab visible in this photograph is part of a "man-hole cover," of an existing sewer line that crosses TPM 16155. The location of the entire sewer line is illustrated on Appendix C map. The first 1,000± feet of Drainage "A" was dry and ephemeral up to this point. Northeast beyond DM-8, As Figure 2 shows, Drainage "A" was perennial stream course. Drainage "A" is ***not*** identified as a blue-line stream course on the Harrison Mountain, Calif. USGS topographic quadrangle (photo date - *07/17/05*).

PHOTO PLATE NO. 4-1



4a. Southeasterly view, down Drainage "B," toward the point where Drainage "B" crosses the northern boundary of TPM 161555. 795± feet southeasterly from this point, Drainage "B" converges with Drainage "A" (photo date - *07/17/05*).



4b. Close-up view of the bed and banks of Drainage "B", a narrow non-blue-line stream course that ephemerally conveys ice melt and storm flows into the wider perennial Drainage "A." Photos 4a and 4b both document the absence of wetland plant species and dominance of upland forest plants lacking wetland indicator status (photo date - *07/17/05*).

PHOTO PLATE NO. 4-2

4c. Northerly view, of the point where the dry/ephemeral Drainage "B" (dashed line) converged with the perennial spring flows of Drainage "A" on July 17, 2005 (photo date - *07/17/05*).

4d. Close-up view of the point where the ephemeral Drainage B (dashed line) converged with the perennial flows of Drainage "A" (dotted line) on July 17, 2005. Although, spring fed perennial flows occur within the last 1,010± feet of Drainage "A," ***no*** wetlands were delineated anywhere along Drainage "A" (a) due to the absence of hydric soils and (b) because hydric vegetation does not dominate along the stream. Instead, upland perennial shrub and tree species predominated along the onsite length of Drainage "A" on July 17, 2005 (photo date - *07/17/05*).

APPENDIX B

DELINEATION DATA SHEETS AND ROUTINE WETLAND DELINEATION DATA FORMS

FOR

TENTATIVE PARCEL MAP NO. 16155

SAN BERNARDINO COUNTY, CALIFORNIA

DELINEATION DATA SHEET

JOB NAME: Church of the Woods **2nd OBSERVER:** Nadya Leslie

OBSERVER: Tom Leslie **3rd OBSERVER:**

DATE: July 17, 2005

LOCATION: San Bernardino County, NE of the intersection of Hwy. 18 and Bear Springs Rd.

GENERAL HABITAT DESCRIPTION (include the names of three dominants): Westside Ponderosa Pine Forest

Obs. No.	Distance Measured	Drainage Width In Feet/Inches		Drainage Designation: DRAINAGE "A" NOTES
		DFG	COE	
1	40.0	6.3	5.0	DM-1. North of the Centerline of Highway 18. No running water.
2	200.0	10.0	2.9	DM-2. Routine Wetland Determination form RWD-1 completed at this point.
3	400.0	5.3	2.2	DM-3. By mature Cedar tree.
4	530.0	12.8	7.9	DM-4. Skid Trail road crossing.
5	700.0	8.2	1.6	DM-5.
6	720.0	---	---	Confluence with side drainage.
7	800.0	10.4	5.0	DM-6.
8	945.0	8.8	3.5	DM-7.
9	1,000.0	2.7	2.7	DM-8. Crossing the sewer line. Running water. Routine Wetland Determination form RWD-2 completed at this point.
10	1,500.0	3.0	3.0	DM-9. Routine Wetland Determination form RWD-3 completed at this point
11	1,630.0	3.3	3.3	DM-10.
	Average Width:	7.08	3.71	

DELINEATION DATA SHEET

JOB NAME: Church of the Woods **2nd OBSERVER:** Nadya Leslie

OBSERVER: Tom Leslie **3rd OBSERVER:**

DATE: July 17, 2005

LOCATION: San Bernardino County, NE of the intersection of Hwy. 18 and Bear Springs Rd.

GENERAL HABITAT DESCRIPTION (include the names of three dominants): Westside Ponderosa Pine Forest

Obs. No.	Distance Measured	Drainage Width In Feet/Inches		Drainage Designation: Tributary A1 NOTES
		DFG	COE	
1	50.0	8.9	2.8	DM-11. 50 feet southwest from the confluence with main drainage.
2	100.0	3.6	0.9	DM-12.
3	200.0	2.8	2.8	DM-13. Obliterated at dirt tree skid trail.
	Average Width:	5.08	2.17	

DELINEATION DATA SHEET

JOB NAME: Church of the Woods **2nd OBSERVER:** Nadya Leslie

OBSERVER: Tom Leslie **3rd OBSERVER:**

DATE: July 17, 2005

LOCATION: San Bernardino County, NE of the intersection of Hwy. 18 and Bear Springs Rd.

GENERAL HABITAT DESCRIPTION (include the names of three dominants): Westside Ponderosa Pine Forest

Obs. No.	Distance Measured	Drainage Width In Feet/Inches		Drainage Designation: DRAINAGE "B" NOTES
		DFG	COE	
1	0.0	2.3	1.8	DM-14.
2	200.0	6.5	4.0	DM-15. Routine Wetland Determination form RWD-4 completed at this point
3	355.0	---	---	Center line of skid trail.
4	400.0	2.8	1.0	DM-16.
5	600.0	3.7	1.2	DM-17.
6	645.0	2.3	2.3	DM-18.
7	720.0	1.0	1.0	DM-19.
8	795.0	---	---	Confluence with Drainage "A."
	Average Width:	3.11	1.87	

DELINEATION DATA SHEET

JOB NAME: Church of the Woods **2nd OBSERVER:** Nadya Leslie

OBSERVER: Tom Leslie **3rd OBSERVER:**

DATE: July 17, 2005

LOCATION: San Bernardino County, NE of the intersection of Hwy. 18 and Bear Springs Rd.

GENERAL HABITAT DESCRIPTION (include the names of three dominants): Westside Ponderosa Pine Forest

Obs. No.	Distance Measured	Drainage Width In Feet/Inches		Drainage Designation: DRAINAGE "C" NOTES
		DFG	COE	
1	0.0	---	---	Start of Drainage "C" on TPM 16155.
2	170.0	4.2	4.2	DM-20.
3	300.0	---	---	Drainage "C" converges with Drainage "A" off-site just N of the N boundary of TPM
	Average Width:	4.20	4.20	

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetland Delineation Manual)

Project/Site: Church of the Woods **Applicant/Owner:** ICON, Inc. **Investigator(s):** Tom Leslie, Nadya Leslie			**Date:** July 17, 2005 **County:** San Bernardino **State:** California
Do Normal Circumstances exist on the site?	**Yes**	No	**Community ID:**
Are Atypical Methods warranted? (explain on reverse)	Yes	**No**	**Transect ID: RWD-1**
Is the area a Problem Area? (explain on reverse)	Yes	**No**	**Plot ID:** 200' northeast from the CL of Hwy. 18 (see App.C map)

VEGETATION (Ranked in descending order of abundance)

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Hordeum murinum*	H	NI	9.		
2. *Polygonum arenastrum*	H	---	10.		
3. *Tanacetum parthenium*	H	---	11.		
4. *Lotus purshianus*	H	---	12.		
5. *Chenopodium album*	H	FAC	13.		
6. *Lolium perenne*	H	FAC	14.		
7. *Rubus ursinus*	S	FACW	15.		
8. *Bromus diandrus*	H	---	16.		

Percent of Dominant Species that are OBL, FACW or FAC (Excluding FAC-): **less than 25%**

Remarks: Hydric vegetation does ***not*** predominate at this site.

HYDROLOGY

___ Recorded Data (describe in Remarks)

___ Stream Lake or Tide Gage
___ Aerial Photographs
___ Other

_X_ No Recorded Data Available

Field Observations:
Depth of Surface Water: N/A (in.)
Depth to Free Water in Pit: N/A (in.)
Depth to Saturated Soil: N/A (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (explain in Remarks)

Remarks: Hydrology was not observed at this site on July 17, 2005.

SOILS

Map Unit Name
(Series and Phase): Morical & Wind River Family Drainage Class: well drained
Field Observations
Taxonomy (Subgroup): mesic Mollic Haploxeralfs & Ultic Haploxerolls Confirm Mapped Type? **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle (Abundance/Contrast)	Texture, Concretions, Structure, etc.
					sandy, gravelly

Hydric Soil Indicators:

- _____ Histosol
- _____ Histic Epipedon
- _____ Sulfidic Odor
- _____ Aquic Moisture Regime
- _____ Reducing Conditions
- _____ Gleyed or Low-Chrome Colors
- _____ Concretions
- _____ High Organic Content in Surface Layer in Sandy Soils
- _____ Organic Streaking in Sandy Soils
- _____ Listed on Local Hydric Soils List
- _____ Listed on National Hydric Soils List
- _____ Other (Explain in Remarks)

Remarks: Hydric soils were not observed at this site. No soil test pit excavated since hydric vegetation did not predominate and the drainage was dry (ephemeral) at this sample point.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes **No** (Circle) Wetland Hydrology Present? Yes **No** Hydric Soils Present? Yes **No**	Is this Sampling Point Within a Wetland? Yes **No** (Circle)

Remarks: Wetlands are not delineated at this site due to the absence of hydric vegetation, wetland hydrology and hydric soils.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetland Delineation Manual)

Project/Site: Church of the Woods **Applicant/Owner:** ICON, Inc. **Investigator(s):** Tom Leslie, Nadya Leslie			**Date:** July 17, 2005 **County:** San Bernardino **State:** California
Do Normal Circumstances exist on the site?	**Yes**	No	**Community ID:**
Are Atypical Methods warranted? (explain on reverse)	Yes	**No**	**Transect ID: RWD-2**
Is the area a Problem Area? (explain on reverse)	Yes	**No**	**Plot ID:** 1,000' northeast from the CL of Hwy. 18 (see App.C map)

VEGETATION (Ranked in descending order of abundance)

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Cornus nuttallii*	S	- - -	9.		
2. *Tanacetum parthenium*	H	- - -	10.		
3. *Cerastium glomeratum*	H	- - -	11.		
4. *Clarkia rhomboidea*	H	- - -	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (Excluding FAC-): **0%**

Remarks:

HYDROLOGY

___ Recorded Data (describe in Remarks)

___ Stream Lake or Tide Gage
___ Aerial Photographs
___ Other

_X_ No Recorded Data Available

Field Observations:
Depth of Surface Water: __N/A_____ (in.)
Depth to Free Water in Pit: __N/A___ (in.)
Depth to Saturated Soil: __N/A____ (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (explain in Remarks)

Remarks: Running water on July 17, 2005.

SOILS

Map Unit Name
(Series and Phase): Morical & Wind River Family Drainage Class: well drained
Field Observations
Taxonomy (Subgroup): mesic Mollic Haploxeralfs & Ultic Haploxerolls Confirm Mapped Type? **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle (Abundance/Contrast)	Texture, Concretions, Structure, etc.
					sandy, gravelly

Hydric Soil Indicators:

- _____ Histosol
- _____ Histic Epipedon
- _____ Sulfidic Odor
- _____ Aquic Moisture Regime
- _____ Reducing Conditions
- _____ Gleyed or Low-Chrome Colors
- _____ Concretions
- _____ High Organic Content in Surface Layer in Sandy Soils
- _____ Organic Streaking in Sandy Soils
- _____ Listed on Local Hydric Soils List
- _____ Listed on National Hydric Soils List
- _____ Other (Explain in Remarks)

Remarks: Hydric soils were not observed at this site. No soil test pit excavated since hydric vegetation did not predominate at this sample point.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes **No** (Circle) Wetland Hydrology Present? **Yes** No Hydric Soils Present? Yes **No**	Is this Sampling Point Within a Wetland? Yes **No** (Circle)

Remarks: Wetlands are not delineated at this site due to the absence of hydric vegetation and hydric soils.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetland Delineation Manual)

Project/Site: Church of the Woods			**Date:** July 17, 2005
Applicant/Owner: ICON, Inc.			**County:** San Bernardino
Investigator(s): Tom Leslie, Nadya Leslie			**State:** California
Do Normal Circumstances exist on the site?	**Yes**	No	**Community ID:**
Are Atypical Methods warranted? (explain on reverse)	Yes	**No**	**Transect ID: RWD-3**
Is the area a Problem Area? (explain on reverse)	Yes	**No**	**Plot ID:** 1,500' northeast from the CL of Hwy. 18 (see App.C map)

VEGETATION (Ranked in descending order of abundance)

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Quercus kelloggii*	T	---	9.		
2. *Pteridium aquilinum*	H	---	10.		
3. *Ribes nevadense*	S	---	11.		
4. *Cornus nuttallii*	S	---	12.		
5. *Abies concolor*	T	---	13.		
5. *Calocedrus decurrens*	T	---	14.		
7. *Rubus ursinus*	S	**FACW**	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (Excluding FAC-): **less than 5%**

Remarks:

HYDROLOGY

___ Recorded Data (describe in Remarks)

___ Stream Lake or Tide Gage
___ Aerial Photographs
___ Other

_X_ No Recorded Data Available

Field Observations:
Depth of Surface Water: __N/A____ (in.)
Depth to Free Water in Pit: __N/A___ (in.)
Depth to Saturated Soil: __N/A____ (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (explain in Remarks)

Remarks: Running water on July 25, 2002.

SOILS

Map Unit Name
(Series and Phase): Morical & Wind River Family Drainage Class: well drained
Field Observations
Taxonomy (Subgroup): mesic Mollic Haploxeralfs & Ultic Haploxerolls Confirm Mapped Type? **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle (Abundance/Contrast)	Texture, Concretions, Structure, etc.
					sandy, gravelly

Hydric Soil Indicators:

- _____ Histosol
- _____ Histic Epipedon
- _____ Sulfidic Odor
- _____ Aquic Moisture Regime
- _____ Reducing Conditions
- _____ Gleyed or Low-Chrome Colors
- _____ Concretions
- _____ High Organic Content in Surface Layer in Sandy Soils
- _____ Organic Streaking in Sandy Soils
- _____ Listed on Local Hydric Soils List
- _____ Listed on National Hydric Soils List
- _____ Other (Explain in Remarks)

Remarks: Hydric soils were not observed at this site. No soil test pit excavated since hydric vegetation did not predominate at this sample point.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes **No** (Circle)
Wetland Hydrology Present? **Yes** No
Hydric Soils Present? Yes **No**

Is this Sampling Point Within a Wetland? Yes **No** (Circle)

Remarks: Wetlands are not delineated at this site due to the absence of hydric vegetation and hydric soils.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetland Delineation Manual)

Project/Site: Church of the Woods			**Date:** July 17, 2005
Applicant/Owner: ICON, Inc.			**County:** San Bernardino
Investigator(s): Tom Leslie, Nadya Leslie			**State:** California
Do Normal Circumstances exist on the site?	**Yes**	No	**Community ID:**
Are Atypical Methods warranted? (explain on reverse)	Yes	**No**	**Transect ID: RWD-4**
Is the area a Problem Area? (explain on reverse)	Yes	**No**	**Plot ID:** 200' east along drainage "B."

VEGETATION (Ranked in descending order of abundance)

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Ribes nevadense*	S	- - -	9.		
2. *Quercus kelloggii*	T	- - -	10.		
3. *Pteridium aquilinum*	H	- - -	11.		
4. *Calocedrus decurrens*	T	- - -	12.		
5. *Osmorhiza chilensis*	H	**FAC***	13.		
6. *Clarkia rhomboidea*	H	- - -	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (Excluding FAC-): **less than 5%**

Remarks:

HYDROLOGY

___ Recorded Data (describe in Remarks)

___ Stream Lake or Tide Gage
___ Aerial Photographs
___ Other

_X_ No Recorded Data Available

Field Observations:
Depth of Surface Water: __N/A_____ (in.)
Depth to Free Water in Pit: __N/A___ (in.)
Depth to Saturated Soil: __N/A____ (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
___ Drift Lines
___ Sediment Deposits
___ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (explain in Remarks)

Remarks: No wetland hydrology observed at this site.

SOILS

Map Unit Name
(Series and Phase): Morical & Wind River Family Drainage Class: well drained
Field Observations
Taxonomy (Subgroup): mesic Mollic Haploxeralfs & Ultic Haploxerolls Confirm Mapped Type? **Yes** No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle (Abundance/Contrast)	Texture, Concretions, Structure, etc.
					sandy, gravelly

Hydric Soil Indicators:

- _____ Histosol
- _____ Histic Epipedon
- _____ Sulfidic Odor
- _____ Aquic Moisture Regime
- _____ Reducing Conditions
- _____ Gleyed or Low-Chrome Colors
- _____ Concretions
- _____ High Organic Content in Surface Layer in Sandy Soils
- _____ Organic Streaking in Sandy Soils
- _____ Listed on Local Hydric Soils List
- _____ Listed on National Hydric Soils List
- _____ Other (Explain in Remarks)

Remarks: Hydric soils were not observed at this site. No soil test pit excavated since hydric vegetation did not predominate and the drainage was dry (ephemeral) at this sample point.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes **No** (Circle) Wetland Hydrology Present? Yes **No** Hydric Soils Present? Yes **No**	Is this Sampling Point Within a Wetland? Yes **No** (Circle)

Remarks: Wetlands are not delineated at this site due to the absence of hydric vegetation, wetland hydrology and hydric soils.

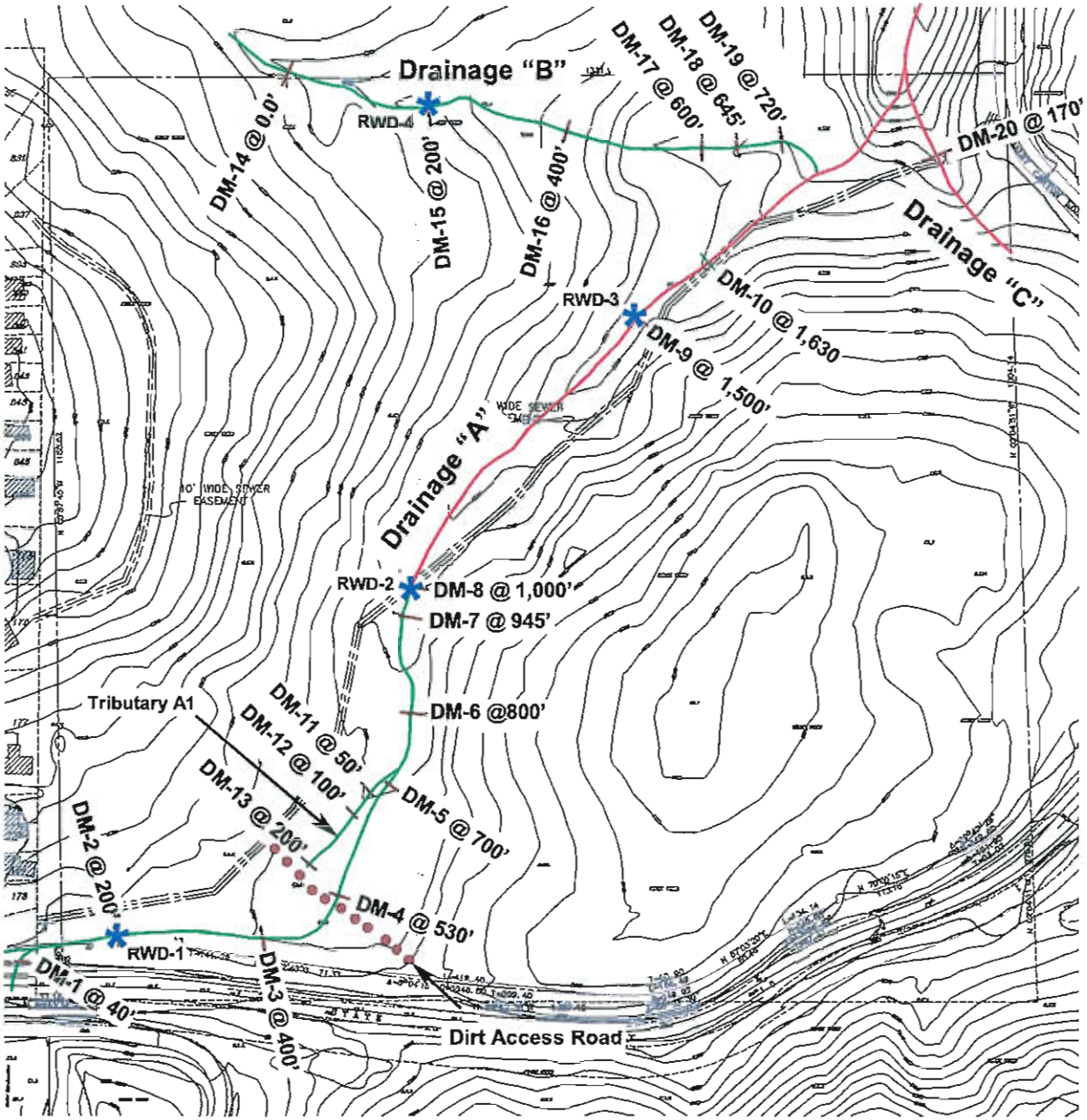
APPENDIX C

2005

WETLAND/JURISDICTIONAL DELINEATION MAP

FOR
TENTATIVE PARCEL
MAP NO. 16155

SAN BERNARDINO COUNTY, CALIFORNIA



Measurement, in feet		CDFG	ACOE
Drainage "A"			
Ephemeral Waters:			
DM-1	40 ft NE of the CL of Hwy. 18	6.3	5.0
DM-2	200 ft NE of the CL of Hwy. 18	10.0	2.9
DM-3	400 ft NE of the CL of Hwy. 18	5.3	2.2
DM-4	530 ft NE of the CL of Hwy. 18	12.8	7.9
DM-5	700 ft NE of the CL of Hwy. 18	8.2	1.6
DM-6	800 ft NE of the CL of Hwy. 18	10.4	5.0
DM-7	945 ft NE of the CL of Hwy. 18	8.8	3.5
Perennial Waters:			
DM-8	1,000 ft NE of the CL of Hwy. 18	2.7	2.7
DM-9	1,500 ft NE of the CL of Hwy. 18	3.0	3.0
DM-10	1,630 ft NE of the CL of Hwy. 18	3.3	3.3
Tributary A1			
Ephemeral Waters:			
DM-11	50 ft SW from confluence with "A"	8.9	2.8
DM-12	100 ft SW from confluence with "A"	3.6	0.9
DM-13	200 ft SW from confluence with "A"	2.8	2.8
Drainage "B"			
Ephemeral Waters:			
DM-14	At the N property boundary	2.3	1.8
DM-15	200 ft E down the drainage	6.5	4.0
DM-16	400 ft E down the drainage	2.8	1.0
DM-17	600 ft E down the drainage	3.7	1.2
DM-18	645 ft E down the drainage	2.3	2.3
DM-19	720 ft E down the drainage	1.0	1.0
Drainage "C"			
Perennial and Ephemeral Waters:			
DM-20	170 ft NW from E property boundary	4.2	4.2

* RWD -1 through 4 = Sites where Routine Wetland Determination Data Forms were filled out

Dirt Access Road = Logging "Skid Trail"

APPENDIX D

2005

FLORAL COMPENDIUM

(Also Includes All Species Identified Onsite by TLC Biologists in 2001, 2002 and 2003)

FOR
TENTATIVE PARCEL
MAP NO. 16155

SAN BERNARDINO COUNTY, CALIFORNIA

Non-Native (20)	SCIENTIFIC NAMES	COMMON NAMES (92)	Region "O" Wetland Indicator Status
	DIVISION PTERIDOPHYTA		
	FAMILY DENNSTAEDTIACEAE	**BRACKEN FAMILY**	
	Pteridium aquilinum var. pubescens	Western Bracken	- - -
	DIVISION CONIFEROPHYTA		
	FAMILY CUPRESSACEAE	**CYPRESS FAMILY**	
	Calocedrus decurrens	Incense Cedar	- - -
	FAMILY PINACEAE	**PINE FAMILY**	
	Abies concolor	White Fir	- - -
	Pinus coulteri	Coulter Pine	- - -
	Pinus jeffreyi	Jeffrey Pine	- - -
	Pinus lambertiana	Sugar Pine	- - -
	Pinus ponderosa	Ponderosa Pine	- - -
	DIVISION ANTHOPHYTA	**FLOWERING PLANTS**	
	Class Dicotyledones (Dicots)	**Cotyledons (Seed Leaves) 2**	
	FAMILY APIACEAE	**CARROT FAMILY**	
	Osmorhiza chilensis	Sweet Celery	**FAC***
	Sanicula graveolens	Montane Yellow-flowered Sanicle	- - -
	FAMILY APOCYNACEAE	**DOGBANE FAMILY**	
X	*Vinca major*	Greater Periwinkle	- - -
	FAMILY ASTERACEAE	**SUNFLOWER FAMILY**	
	Achillea millefolium	White Yarrow	**FACU**
	Ambrosia acanthicarpa	Annual Bur-sage	- - -
X	*Ambrosia artemisiifolia*	Common Ragweed	**FACU**
	Artemisia douglasiana	Mugwort	**FACW**
	Artemisia dracunculus	Tarragon	- - -
	Erigeron divergens	Common Fleabane Daisy	- - -
	Eriophyllum lanatum	Montane Wooly Daisy	- - -
	Gnaphalium canescens ssp. beneolens	Fragrant Everlasting	- - -
	Hemizonia paniculata	Tarplant	**FACU***
	Hieracium albiflorum	Alpine Hawkweed	- - -
X	*Lactuca serriola*	Prickly Lettuce	**FAC**
	Madia elegans	Common Madia	- - -
	Malacothrix saxatilis	Cliff-Aster	- - -
	Solidago californica	California Goldenrod	- - -
X	*Tanacetum parthenium*	Feverfew	- - -
X	*Taraxacum officinale*	Dandelion	**FACU**

Non-Native (20)	SCIENTIFIC NAMES	COMMON NAMES (92)	Region "O" Wetland Indicator Status
	FAMILY BRASSICACEAE	**MUSTARD FAMILY**	
	Erysimum capitatum	Western Wallflower	- - -
	Lepidium virginicum	Poor-man's Peppergrass	**FACU**
X	*Lunaria annua*	Dollar Plant	- - -
X	*Sisymbrium altissimum*	Tumble or Jim Hill Mustard	**FACU**
	FAMILY CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**	
	Sambucus mexicana	Blue Elderberry	**FAC**
	FAMILY CARYOPHYLLACEAE	**PINK FAMILY**	
X	*Cerastium glomeratum*	Mouse-ear Chickweed	- - -
	Silene lemmonii	Catchfly	- - -
X	*Stellaria media*	Common Chickweed	**FACU**
	FAMILY CHENOPODIACEAE	**GOOSEFOOT FAMILY**	
X	*Chenopodium album*	Pigweed	**FAC**
	FAMILY CONVOLVULACEAE	**MORNING GLORY FAMILY**	
	Calystegia occidentals ssp. fulcrata	Sonora Morning Glory	- - -
	FAMILY CORNACEAE	**DOGWOOD FAMILY**	
	Cornus nuttallii	Mountain Dogwood	- - -
	FAMILY ERICACEAE	**HEATH FAMILY**	
	Arctostaphylos sp.	Manzanita	- - -
	Pterospora andromedea	Pinedrops	- - -
	Sarcodes sanguinea	Snow Plant	- - -
	FAMILY FABACEAE	**LEGUME FAMILY**	
	Lotus crassifolius	Large-flowered Lotus	- - -
	Lotus purshianus	Spanish Clover	- - -
	Lupinus latifolius	Flat-leaved Lupine	- - -
	Lupinus luteolus	Butter Lupine	- - -
	Lupinus microcarpus	Chick Lupine	- - -
	Vicia americana	American Vetch	**NI**
	FAMILY FAGACEAE	**OAK FAMILY**	
	Quercus chrysolepis	Canyon Oak	- - -
	Quercus kelloggii	California Black Oak	- - -
	FAMILY HYDROPHYLLACEAE	**WATERLEAF FAMILY**	
	Phacelia imbricata	Phacelia	- - -
	Nemophila menziesii spp. *menziesii*	Baby Blue Eyes	- - -

Non-Native (20)	SCIENTIFIC NAMES	COMMON NAMES (92)	Region "O" Wetland Indicator Status
	FAMILY GROSSULARIACEAE	**GOOSEBERRY FAMILY**	
	Ribes cereum	Squaw currant	**NI**
	Ribes nevadense	Mountain Pink Currant	- - -
	FAMILY LAURACEAE	**LAUREL FAMILY**	
	Umbellularia californica	California Bay	**FAC**
	FAMILY ONAGRACEAE	**EVENING PRIMROSE FAMILY**	
	Circaea alpina ssp. *pacifica*	Enchanter's Nightshade	**FACW**
	Clarkia rhomboidea	Rhomboid Clarkia	- - -
	Epilobium brachycarpum	Panicled Willow-Herb	- - -
	Epilobium canum	California Fuchsia	- - -
	FAMILY POLEMONIACEAE	**PHLOX FAMILY**	
	Polemonium occidentale	Jacob's Ladder (only few plants in 2001; none in later years)	**OBL**
	FAMILY POLYGONACEAE	**BUCKWHEAT FAMILY**	
	Eriogonum fasciculatum	California Buckwheat	- - -
	Eriogonum saxatile	Montane Buckwheat	- - -
X	*Polygonum arenastrum*	Common Knotweed	- - -
X	*Polygonum convolvulus*	Black Bindweed	**NI**
	FAMILY PORTULACACEAE	**PURSLANE FAMILY**	
	Claytonia perfoliata	Miner's Lettuce	**FAC**
	FAMILY RHAMNACEAE	**BUCKTHORN FAMILY**	
	Ceanothus integerrimus	Deer Brush	- - -
	Rhamnus californica	California Coffeeberry	- - -
	FAMILY ROSACEAE	**ROSE FAMILY**	
	Fragaria vesca	Wood Strawberry	- - -
	Potentilla glandulosa	Sticky Cinquefoil	**FAC**
	Rubus parviflorus	Thimbleberry	**FAC**
	Rubus ursinus	California Blackberry	**FACW**
	FAMILY RUBIACEAE	**MADDER FAMILY**	
X	*Galium aparine*	Goose Grass	**FACU**
	FAMILY SALICACEAE	**WILLOW FAMILY**	
	Salix lasiolepis	Arroyo Willow	**FACW**
	FAMILY SCROPHULARIACEAE	**FIGWORT FAMILY**	
	Castilleja applegatei	Montane Indian Paintbrush	- - -
	Penstemon centranthifolius	Scarlet Bugler	- - -
	Penstemon spectabilis	Chaparral Beard-tongue	- - -

Non-Native (20)	SCIENTIFIC NAMES	COMMON NAMES (92)	Region "O" Wetland Indicator Status
	FAMILY SOLANACEAE	**NIGHTSHADE FAMILY**	
	Solanum xanti	Purple Nightshade	- - -
	FAMILY URTICACEAE	**NETTLE FAMILY**	
	Urtica dioica	Hoary Nettle	**FACW**
	FAMILY VISCACEAE	**MISTLETOE FAMILY**	
	Phoradendron macrophyllum	Big-leaf Mistletoe	- - -
	Class Monocotyledones	**Monocots**	
	FAMILY CYPERACEAE	**SEDGE FAMILY**	
	Carex subfusca	Rusty Sedge	**FAC-**
	FAMILY IRIDACEAE	**IRIS FAMILY**	
	Iris hartwegii ssp. australis	Hartweg's Iris	- - -
	FAMILY LILIACEAE	**LILY FAMILY**	
	Bloomeria crocea	Common Goldenstar	- - -
	Dichelostemma capitatum	Blue Dicks	- - -
	FAMILY ORCHIDACEAE	**ORCHID FAMILY**	
	Piperia cooperi	Slenderspire Piperia	- - -
	FAMILY POACEAE	**GRASS FAMILY**	
	Bromus carinatus	California Brome	- - -
	Bromus ciliatus	Fringed Brome	**FAC**
X	*Bromus diandrus*	Ripgut Grass	- - -
X	*Bromus tectorum*	Cheat Grass	- - -
	Elymus glaucus	Blue Wildrye	**FACU**
X	*Elytrigia intermedia*	Intermediate Wheatgrass	- - -
X	*Hordeum murinum ssp. leporinum*	Hare Barley	**NI**
X	*Lolium perenne*	Perennial Ryegrass	**FAC**
X	*Phalaris minor*	Littleseed Canary Grass	- - -
X	*Vulpia myuros*	Foxtail Fescue	**FACU**

Wetland Indicator Status:

The following symbols are used to indicate the wetland indicator status of plant species identified onsite, if any.

OBL Obligate: under natural conditions, occurs almost always (estimated probability > 99%) in wetlands.

FACW Facultative Wetland: usually occurs in wetlands (estimated probability 67-99%), but occasionally found in non-wetlands.

FAC Facultative: equally likely to occur (estimated probability 34-66%) in wetlands or non-wetlands.

FACU Facultative Upland: usually occur in non-wetlands but occasionally (estimated probability 1-33%) found in wetlands.

UPL Obligate Upland: occur in wetlands in another region, but occur almost always (estimated probability > 99%) under natural conditions in non-wetlands in the region specified.

NI or --- No Indicator Status: was recorded for those species for which sufficient information was not available to determine an indicator status or that were not considered by the Regional Panel.

An Asterisk (*) following a regional Indicator identifies tentative assignment based on limited information from which to determine the indicator status

BioResource Consultants

California Spotted Owl Survey on APN 336-101-006

July 22, 2005

BioResource Consultants

P.O. Box 1539 402 W. Ojai Ave., Suite 201 Ojai, CA 93024-1539 805.636.1806 Richard@BioRC.com

July 22, 2005

Tom Leslie
Thomas Leslie Corporation
PO Box 2229
Temecula, CA 92593

Subject: California Spotted Owl Surveys on APN 336-101-006, San Bernardino County, California

Dear Mr. Leslie,

At your request I conducted reproductive surveys on the subject site, following USFWS Spotted Owl Survey Protocol, in an attempt to determine if the California Spotted Owl utilized the site for roosting and/or nesting. The surveys were conducted during the mornings of 24 June, 1 July, 8 July and 15 July, 2005 between the hours of 4:30 and 6:00am under clear to slightly overcast skies with no precipitation.

APN 336-101-006 is located in the San Bernardino Mountains on the main ridgeline just south of Lake Arrowhead and immediately east of Rimforest at roughly 5600 feet elevation. The site supports medium aged, closed canopy mixed conifer forest including relict old growth trees as well as several small meadows. The dominant tree species are Jeffrey pine (*Pinus jeffreyi*), white fir (*Abies concolor*), sugar pine (*P. lambertiana*), incense cedar (*Calocedrus decurrens*), and black oak (*Quercus kelloggii*).

California Spotted Owls are known to occur throughout the San Bernardino Mountains as well as a majority of the large mountain ranges in southern California (LaHaye et al. 1994). Their primary habitat is closed canopy conifer and live oak (*Q. agrifolia*) forest (Gutierrez et al. 1992 and LaHaye et al. 1997).

Results:
No Spotted Owls were located during the site visits. In addition, there are no known historic roost or nest sites located on APN 336-101-006.

Sincerely,

Richard Tanner
Wildlife Biologist

Literature Cited

Gutierrez, R. J., J. Verner, K. S. McKelvey, B. R. Noon, G. N. Steger, D. R. Call, W. S. LaHaye, B. B. Bingham, and J. S. Senser. 1992. Habitat relations of the California spotted owl. In: J. Verner, K. S. McKelvey, B. R. Noon, R. J. Gutierrez, G. I. Gould, and T. W. Beck (technical coordinators), The California spotted owl: a technical assessment of its current status. General Technical Report PSW-GTR-133. Albany, CA: Pacific Southwest Research Station, USDA Forest Service; 79-98.

LaHaye, W. S., R. J. Gutierrez, and H. R. Akcakaya. 1994. Spotted owl metapopulation dynamics in southern California. Journal of Animal Ecology 63:775-785.

LaHaye, W. S., R. J. Gutierrez, and D. R. Call. 1997. Nest site selection and reproductive success of California spotted owls. Wilson Bulletin 109:42-51.

Thomas Leslie Corporation

Opinion Regarding Absence of Southern Rubber Boa from TPM 16155

October 8, 2003

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

October 8, 2003

SUBJECT: Opinion Regarding Absence of Southern Rubber Boa from TPM 16155

Dear Mr. Hopkins:

On June 10, 2002, Thomas Leslie Corporation (TLC) sent a report to the California Department of Fish and Game entitled *Results of Focused Southern Rubber Boa Surveys*. As documented on pages 9 and 11 of TLC's report, the Southern Rubber Boa (*Charina bottae umbratica*; SRB) surveys "were conducted over the entirety of" Tentative Parcel Map No.16155 (TPM 16155) in April 2002. As Figure 1 illustrates, TPM 16155, a 38± acre property, is situated northwest of the intersection of The Rim of the World Highway (Hwy. 18) and Daley Canyon Road in San Bernardino County, California.

Conclusions of the 2002 SRB Report: The 2002 SRB report made the following conclusions:

- No SRB were discovered within the boundaries of the property during comprehensive surveys conducted between April 7 and 27, 2002.
- Due to the careful thorough nature of the SRB surveys, and experience with locating SRB in 2002, it is our opinion that if present onsite SRB would have been identified.

The CDFG's *Draft* SRB survey protocols call for performance of three consecutive years of SRB surveys. Furthermore, the surveys can only be performed by a biologist with an MOU from the CDFG.

SRB Survey Requirements: As described above, the 1st SRB protocol survey for Tentative Parcel Map No. 16155 was performed in April 2002. Therefore, the 2nd protocol survey should be conducted in 2003. If the 2nd SRB survey was performed in 2003, the 3rd survey could be completed in spring 2004. Unfortunately, no MOU's have been issued to anyone in California. Although TLC requested "*a Memorandum of Understanding (MOU) Authorizing the "Taking" of State Listed Reptile Species*" from the CDFG on February 24, 2003, according to CDFG staff, no MOU's have been issued to anyone in California. Consequently, the 2nd year SRB protocol survey could not be performed on TPM 16155.

Results of Sixteen 2003 Biological Field Surveys: In 2003 sixteen biological field surveys (2 diurnal and 14 nocturnal) were performed on TPM 16155 by four biologists with three different biological consulting firms.

- ***No*** SRB were identified onsite during the sixteen field surveys performed onsite in 2003.

Therefore, based on the results of the sixteen 2003 biological field surveys, it is TLC's opinion that SRB continue to be absent from TPM 16155 in 2003.

Please call me if you have any questions regarding this letter or require additional information.

Respectfully Submitted
THOMAS LESLIE CORPORATION

T. Leslie

Thomas A. Leslie, President/BS-MS Biologist
TAL/nvl// PH-100803-SRB Opinion Ltr. Habitat Assessment

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233

Thomas Leslie Corporation

Results of Focused 2003 Botanical Surveys Performed on Tentative Parcel Map No. 16155

October 7, 2003

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

October 7, 2003

SUBJECT: Results of Focused 2003 Botanical Surveys Performed on Tentative Parcel Map No.16155

Dear Mr. Hopkins:

Thomas Leslie Corporation is pleased to present the results of focused 2003 botanical surveys performed on June 21 and July 9, 2003 within the boundaries of Tentative Parcel Map No.16155 (TPM 16155). Although, the 38± acre property is comprised of two Assessors' Parcel Numbers (APN), 336-101-06 and 336-101-07, only APN 336-101-06 is being developed, APN 336-101-07 will be a remainder parcel.

A. FINDINGS SUMMARY: ***No*** listed, or unlisted but sensitive plant species have been identified onsite during 25 field surveys performed on TPM 16155 over a three year period: 2003, 2002 and 2001.

B. LOCATION OF TPM 16155: As Figure 1 illustrates, TPM 16155 is situated northwest of the intersection of The Rim of the World Highway (State Highway 18; Hwy. 18) and Daley Canyon Road in San Bernardino County, California.

C. PURPOSE OF THE FOCUSED 2003 BOTANICAL SURVEYS: The surveys were performed to ascertain the presence or absence of listed, or unlisted but sensitive, plant species on the project site. A complete inventory of the plant species identified onsite is provided in the Appendix A *Floral Compendium.* The plant species inventory includes those species identified on TPM 16155 during eight 2003, nine 2002 and eight 2001 general and focused biological investigations (25 total) performed onsite by the following biological consulting firms:

2003 - eight surveys:

- June 21 and July 9, 2003 by TLC
- June 30, July 1, 2, 3, 4 and 5 by Envira.

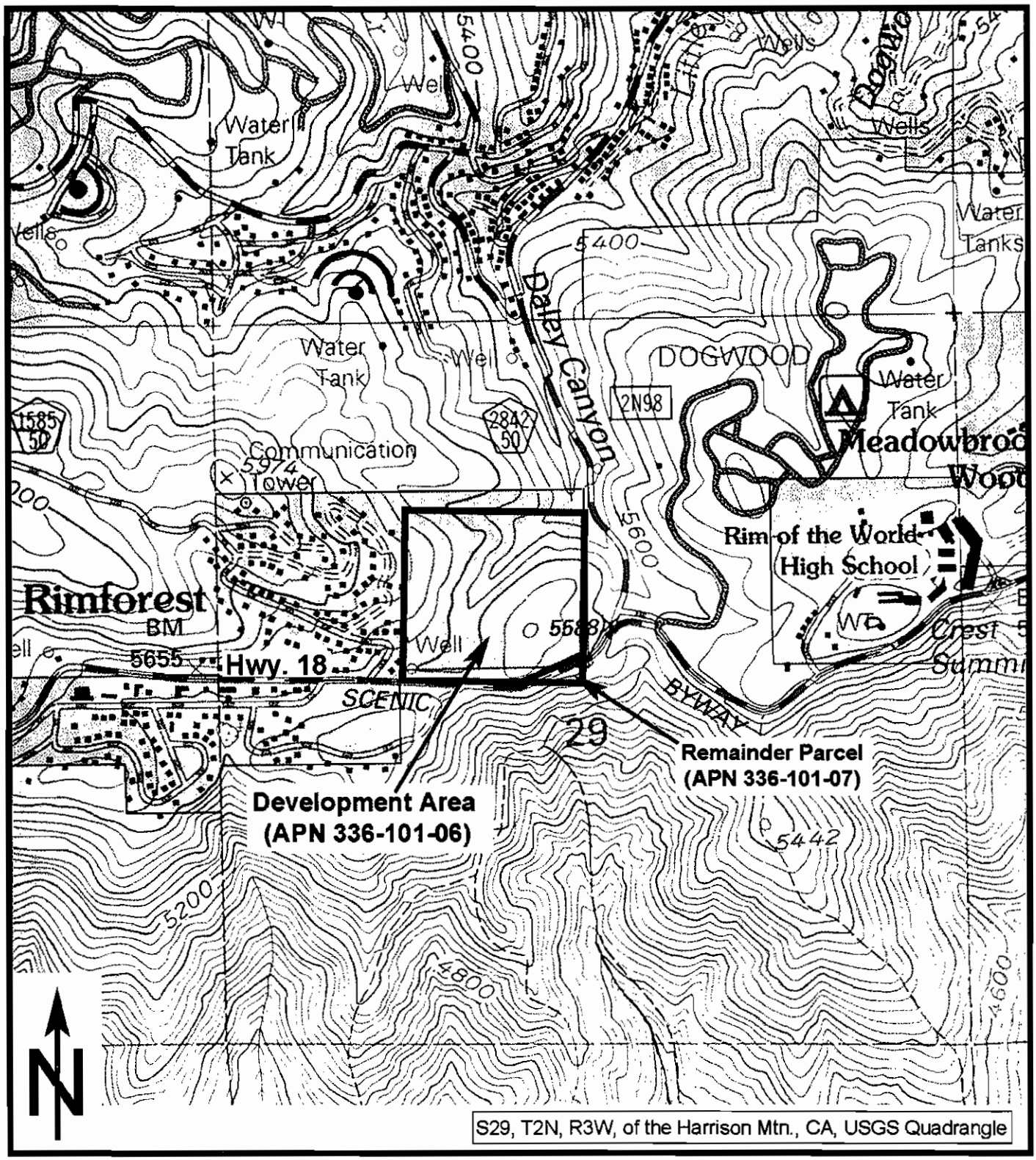
2002 - nine surveys:

- April 7, 11, 14, 17, 20 and 27, 2003 by TLC and Bill LaHaye
- April 13, June 22 and July 25, 2003 by TLC.

2001 - eight surveys:

- August 26, 2001 by TLC
- September 6, 2001 by Bill LaHaye
- October 1, 2, 3, 4, 5, and 6, 2001 by NRA.

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233



Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1

Location of
Tentative Parcel Map No. 16155
on a USGS Quadrangle Map

D. HABITAT TYPE VEGETATING TPM 16155: As documented by TLC's September 19, 2001, *biological constraints analysis* report (TLC, 2001a), the project site is vegetated with Holland's (1986) closed canopied Westside Ponderosa Pine Forest. The pine forest habitat covers "close to 100 percent of the site" (NRA, 2001). The *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property - Westside Ponderosa Pine Forest. Onsite, this forest habitat covers approximately 95%, of the 38±-acre property.

E. RESULTS OF THE FOCUSED 2003 BOTANICAL SURVEYS

- ***No*** listed endangered or threatened plant species, unlisted but sensitive plant species or plant species candidate for listing, were identified within the boundaries of TPM 16155 during eight focused 2003 botanical surveys performed onsite in June, and July 2003 by TLC and Envira (2003) biologists.

- ***None*** were identified onsite during nine focused botanical surveys performed in April, June and July 2002 by TLC and Mr. Bill LaHaye.

- ***None*** were identified onsite during eight focused botanical surveys performed in August, September and October 2001 by TLC and NRA biologists and Mr. Bill LaHaye (TLC, 2001; NRA, 2001; LaHaye, 2001).

Please call me if you have any questions or require additional information regarding this letter report.

Respectfully Submitted,
THOMAS LESLIE CORPORATION

T. Leslie

Thomas A. Leslie, President/BS-MS Biologist
TAL/nvl

REFERENCES

ENVIRA, August 25, 2003, White-eared Pocket Mouse Trapping Survey, Church of the Woods, Rim Forest, California.

LaHaye, W., October 30, 2001, Andrew's Marble Butterfly Investigations Performed on San Bernardino County APN 336-101-06, San Bernardino County, California.

Natural Resources Assessment, Inc. (NRA), December 11, 2001, White-eared Pocket Mouse Trapping Survey, Church of the Woods, Rim Forest, California.

San Bernardino County (SBC) Valley Region Vegetation by Holland Classification, February 13, 2001, 1 inch = 10,200 feet scale map.

Thomas Leslie Corporation (TLC), September 19, 2001, Results of a Biological Constraints Analysis of APN 336-101-006 and APN 336-101-007.

APPENDIX A

2003
FLORAL COMPENDIUM

FOR

Tentative Parcel Map No. 16155

**(Assessors' Parcel Numbers 336-101-06 & 336-101-07;
a.k.a. The Church of the Woods Project)**

SAN BERNARDINO COUNTY, CALIFORNIA

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
	KINGDOM FUNGI	**MUSHROOMS (1)**		
	FAMILY LYCOPERDACEAE			
	Lycoperdum pyriforme	Pear-Shaped Puffball	N/A	N/A
	KINGDOM LICHENS	**LICHENS (1)**		
	Letharia vulpina	Wolf Lichen	N/A	N/A
	KINGDOM PLANTAE	**HIGHER VASCULAR PLANTS (83)**		
	DIVISION PTERIDOPHYTA	**FERNS**		
	FAMILY DENNSTAEDTIACEAE	**BRACKEN FAMILY**		
	Pteridium aquilinum var. pubescens	Western Bracken	N/A	N/A
	DIVISION CONIFEROPHYTA	**CONIFERS**		
	FAMILY CUPRESSACEAE	**CYPRESS FAMILY**		
	Calocedrus decurrens	Incense Cedar	N/A	N/A
	FAMILY PINACEAE	**PINE FAMILY**		
	Abies concolor	White Fir	N/A	N/A
	Pinus coulteri	Coulter Pine	N/A	N/A
	Pinus jeffreyi	Jeffrey Pine	N/A	N/A
	Pinus lambertiana	Sugar Pine	N/A	N/A
	Pinus ponderosa	Ponderosa Pine	N/A	N/A
	DIVISION ANTHOPHYTA	**FLOWERING PLANTS**		
	Class Dicotyledones (Dicots)	**Cotyledons** (Seed Leaves) 2		
	FAMILY APIACEAE	**CARROT FAMILY**		
	Osmorhiza chilensis	Sweet Celery	- - -	April-July
	Sanicula graveolens	Montane Yellow-flowered Sanicle	- - -	April-June
	FAMILY APOCYNACEAE	**DOGBANE FAMILY**		
X	*Vinca major*	Greater Periwinkle	- - -	March-July
	FAMILY ASTERACEAE	**SUNFLOWER FAMILY**		
	Achillea millefolium	White Yarrow	- - -	June-September

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
X	*Ambrosia artemisiifolia*	Common Ragweed	- - -	August-November
	Artemisia douglasiana	Mugwort	- - -	June-October
	Artemisia dracunculus	Tarragon	- - -	August-October
	Erigeron divergens	Common Fleabane Daisy	F	March-November
	Eriophyllum lanatum	Montane Wooly Daisy	- - -	June-July
	Gnaphalium canescens	Fragrant Everlasting	- - -	July-October
	Hemizonia paniculata	Tarplant	- - -	May-November
	Hieracium albiflorum	Alpine Hawkweed	F	June-August
X	*Lactuca serriola*	Prickly Lettuce	- - -	May-September
	Madia elegans	Common Madia	F	June-August
	Malacothrix saxatilis	Cliff-Aster	- - -	March-September
	Solidago californica	California Goldenrod	- - -	July-October
X	*Tanacetum parthenium*	Feverfew	- - -	June-September
X	*Taraxacum officinale*	Dandelion	- - -	January-December
	FAMILY BRASSICACEAE	**MUSTARD FAMILY**		
	Erysimum capitatum	Western Wallflower	F	March-July
	Lepidium sp.	Peppergrass	- - -	N/A
X	*Lunaria annua*	Dollar Plant	- - -	April-May
X	*Sisymbrium altissimum*	Tumble Mustard	F	April-July
	FAMILY CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**		
	Sambucus mexicana	Blue Elderberry	F	March-September
	FAMILY CARYOPHYLLACEAE	**PINK FAMILY**		
	Silene lemmonii	Catchfly	F	June-August
	FAMILY CONVOLVULACEAE	**MORNING GLORY FAMILY**		
	Calystegia occidentals ssp. fulcrata	Sonora Morning Glory	F	May-August
	FAMILY CORNACEAE	**DOGWOOD FAMILY**		
	Cornus nuttallii	Mountain Dogwood	F	April-July

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
	FAMILY ERICACEAE	**HEATH FAMILY**		
	Arctostaphylos sp.	Manzanita	- - -	January-March
	Pterospora andromedea	Pinedrops	- - -	June-August
	Sarcodes sanquinea	Snow Plant	F	May-July
	FAMILY FABACEAE	**LEGUME FAMILY**		
	Lotus crassifolius	Large-flowered Lotus	- - -	May-August
	Lupinus latifolius	Flat-leaved Lupine	- - -	April-July
	Lupinus luteolus	Butter Lupine	- - -	May-August
	Lupinus microcarpus	Chick Lupine	- - -	April-May
	Vicia americana	American Vetch	- - -	April-June
	FAMILY FAGACEAE	**OAK FAMILY**		
	Quercus chrysolepis	Canyon Oak	- - -	April-May
	Quercus kelloggii	California Black Oak	- - -	April-May
	FAMILY HYDROPHYLLACEAE	**WATERLEAF FAMILY**		
	Phacelia sp.	Phacelia	- - -	March-May
	Nemophila menziesii spp. *menziesii*	Baby Blue Eyes	F	April-May
	FAMILY GROSSULARIACEAE	**GOOSEBERRY FAMILY**		
	Ribes cereum	Squaw currant	- - -	June-July
	Ribes nevadense	Mountain Pink Currant	- - -	April-June
	FAMILY LAURACEAE	**LAUREL FAMILY**		
	Umbellularia californica	California Bay	- - -	December-May
	FAMILY ONAGRACEAE	**EVENING PRIMROSE FAMILY**		
	Circaea alpina ssp. *pacifica*	Enchanter's Nightshade	F	June-August
	Clarkia rhomboidea	Rhomboid Clarkia	F	May-July
	Epilobium brachycarpum	Panicled Willow-Herb	- - -	June-September
	Epilobium canum	California Fuchsia	- - -	August-October
	FAMILY POLEMONIACEAE	**PHLOX FAMILY**		
	Polemonium occidentale	Jacob's Ladder	- - -	June-August

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
	FAMILY POLYGONACEAE	**BUCKWHEAT FAMILY**		
	Eriogonum fasciculatum	California Buckwheat	- - -	March-October
	Eriogonum saxatile	Montane Buckwheat	- - -	May-July
X	*Polygonum convolvulus*	Black Bindweed	- - -	May-September
	FAMILY PORTULACACEAE	**PURSLANE FAMILY**		
	Claytonia perfoliata	Miner's lettuce	F	February-May
	FAMILY RHAMNACEAE	**BUCKTHORN FAMILY**		
	Ceanothus integerrimus	Deer Brush	- - -	May-June
	Rhamnus californica	California Coffeeberry	- - -	May-July
	FAMILY ROSACEAE	**ROSE FAMILY**		
	Fragaria vesca	Wood Strawberry	F	March-July
	Potentilla glandulosa	Sticky Cinquefoil	F	May-June
	Rubus parviflorus	Thimbleberry	F	March-August
	FAMILY RUBIACEAE	**MADDER FAMILY**		
X	*Galium aparine*	Goose Grass	- - -	March-July
	FAMILY SALICACEAE	**WILLOW FAMILY**		
	Salix lasiolepis	Arroyo Willow	- - -	February-April
	FAMILY SCROPHULARIACEAE	**FIGWORT FAMILY**		
	Castilleja applegatei	Montane Indian Paintbrush	- - -	May-July
	Penstemon centranthifolius	Scarlet Bugler	- - -	April-July
	Penstemon spectabilis	Chaparral Beard-tongue	- - -	April-June
	FAMILY SOLANACEAE	**NIGHTSHADE FAMILY**		
	Solanum xanti	Purple Nightshade	F	February-July
	FAMILY URTICACEAE	**NETTLE FAMILY**		
	Urtica dioica	Hoary Nettle	- - -	June-September

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
	FAMILY VISCACEAE	**MISTLETOE FAMILY**		
	Phoradendron macrophyllum	Big-leaf Mistletoe	- - -	October-March
	Class Monocotyledones	**Monocots**		
	FAMILY CYPERACEAE	**SEDGE FAMILY**		
	Carex sp.	Sedge	- - -	Summer
	FAMILY IRIDACEAE	**IRIS FAMILY**		
	Iris hartwegii ssp. australis	Hartweg's Iris	F	May-June
	FAMILY LILIACEAE	**LILY FAMILY**		
	Bloomeria crocea	Common Goldenstar	F	April-June
	Dichelostemma capitatum	Blue Dicks	F	February-May
	FAMILY ORCHIDACEAE	**ORCHID FAMILY**		
	Piperia cooperi	Slenderspire Piperia	F	March-July
	FAMILY POACEAE	**GRASS FAMILY**		
	Bromus carinatus	California Brome	- - -	April-August
	Bromus ciliatus	Fringed Brome	F	July-August
X	*Bromus diandrus*	Ripgut Grass	- - -	April-June
X	*Bromus tectorum*	Cheat Grass	- - -	May-June
	Elymus sp.	Elymus	F	June-August
X	*Elytrigia intermedia*	Intermediate Wheatgrass	F	April-August
X	*Hordeum murinum*	Hare Barley	- - -	April-July
X	*Phalaris minor*	Littleseed Canary Grass	- - -	April-July
X	*Vulpia myuros*	Foxtail Fescue	F	April-June

Thomas Leslie Corporation

2003 Results of an Andrew's Marble Butterfly Habitat Assessment

October 7, 2003

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
Church of the Woods, c/o: ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

October 7, 2003

SUBJECT: 2003 Results of an Andrew's Marble Butterfly Habitat Assessment

Dear Mr. Hopkins:

Thomas Leslie Corporation is pleased to present the 2003 results of an Andrew's Marble Butterfly (*Euchloe hyantis andrewsii*; AMB) habitat assessment. The habitat assessment was conducted within the boundaries of Tentative Parcel Map No.16155 (TPM 16155). TPM 16155, a 38± acre property, is situated northwest of the intersection of The Rim of the World Highway (State Highway 18; Hwy. 18) and Daley Canyon Road in San Bernardino County, California. Although the property is comprised of two Assessors' Parcel Numbers (APN), 336-101-06 and 336-101-07, only APN 336-101-06 is being developed; APN 336-101-07 will be a remainder parcel. The need to perform the AMB habitat assessment was identified in TLC's, September 19, 2001, biological constraints analysis (TLC, 2001a).

2001 AMB Habitat Assessments: The 2003 AMB Habitat Assessment is the *third* habitat assessment performed onsite. The first was performed on August 26, 2001 (TLC, 2001b). The second was performed on September 6, 2001 (La Haye, 2001).

2003 AMB Habitat Assessment: The findings of the 2003, third AMB habitat assessment, divided into *Pre-Field Survey* and onsite protocol *Field Surveys*, are summarized in this letter report.

I. LOCATION OF PROJECT SITE

Hwy. 18 provides regional access to the property. The property can be reached by exiting Hwy. 18 at Bear Springs or Daley Canyon Roads.

- **Figure 1** illustrates the boundaries of the property on the 2004 *Thomas Guide* San Bernardino and Riverside Counties Street Guide and Directory on Detail map page 517; map coordinates F-4 and G-4.
- **Figure 2** plots the boundaries of the property in the NW quadrant of Section 29, Township 2 North, Range 3 West; of the 1996 Harrison Mtn., CA, 7.5' United States Geological Survey (USGS) Topographic Quadrangle.

II. PURPOSE OF THE AMB HABITAT ASSESSMENT

The AMB habitat assessment was performed to accomplish the following.

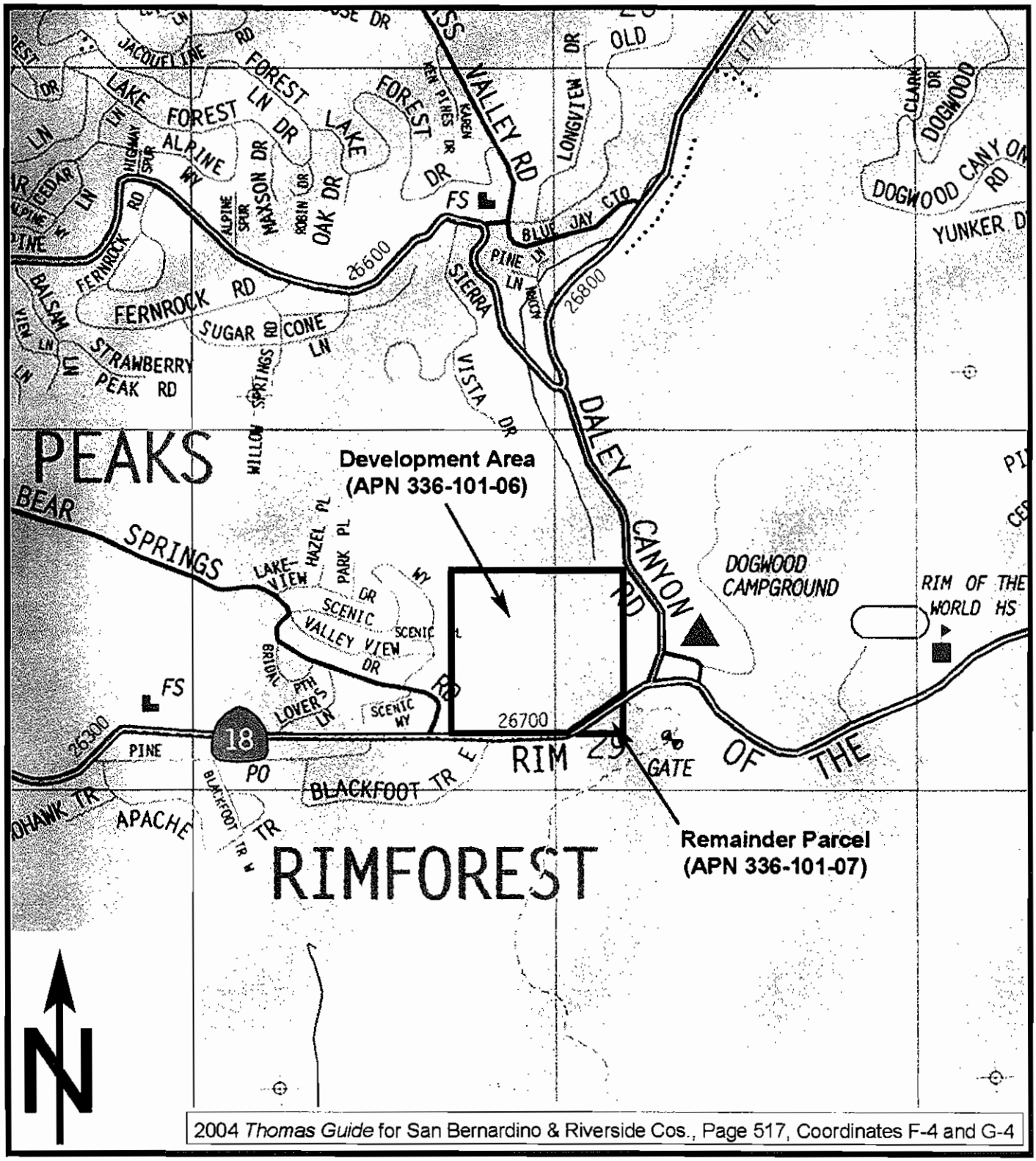
A. Ascertain the presence/absence of plant habitat potentially capable of supporting AMB within the boundaries of the property.

B. Search the property for the plant species identified in the literature as potential AMB host plants (Rock Cress, Laguna Mountains Jewel-flower, Slender-petaled Thelypodium and Parish's Rock-cress).

C. Ascertain the presence/absence onsite of potentially suitable abiotic, physical habitat elements required by the AMB including ridgelines and minor summits, sunny flats and open slopes, trails, fields of wildflowers and other similar areas.

D. Determine the need to perform additional AMB investigations.

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233



2004 *Thomas Guide* for San Bernardino & Riverside Cos., Page 517, Coordinates F-4 and G-4

Thomas Leslie Corporation

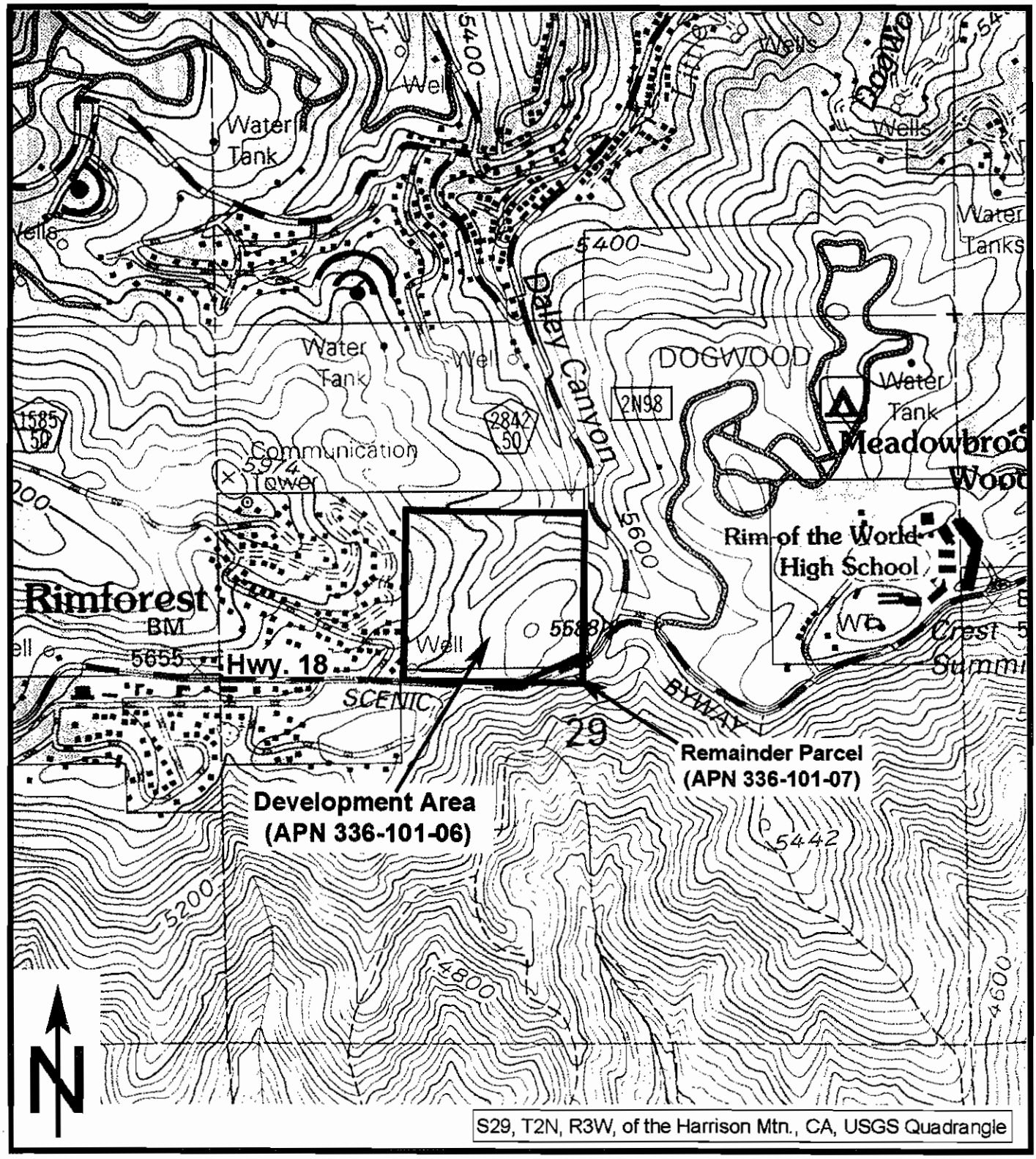
BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1

Location of

Tentative Parcel Map No. 16155

on Thomas Guide Map



Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 2

Location of
Tentative Parcel Map No. 16155
on a USGS Quadrangle Map

III. PROPOSED PROJECT

As illustrated on W.J. McKeever, Inc., May 7, 2003, 1 inch = 50 feet scale *Church of the Woods and Lake Arrowhead Christian School, Tentative Parcel Map No. 16155*, and *Conditional Use Permit Site Plan* map, the project proposed involves construction of a church (worship center, chapel retreat, natural park, children's ministry, youth center "gymnatorium") and associated sports facilities (volleyball, skateboard park, basketball, child play area), private Christian school, storage and residence buildings, a baseball field and associated onsite paved driveways, walkways, roadways, parking and ornamental landscaping.

IV. GENERAL STATUS OF THE AMB

A. Listing Status

The AMB is a state and federally ***unlisted*** insect. However, according to Mr. Steve Loe, a San Bernardino National Forest biologist, this butterfly is a locally sensitive species (Loe, Pers. Comm., 2001).

B. Description

This species has very light yellow-green marbling and lacks pearly luster on the ventral surface of the hind wings.

C. Habitat and Host Plants

The AMB is restricted to the San Bernardino Mountains above approximately 5,000 feet elevation above mean sea level [msl] (Garth and Tilden 1986, Stephenson and Calcarone, 1999). It primary inhabits sunny flats, open slopes, trails, fields of wildflowers and other similar areas within pine and mixed-conifer forests. Like many higher elevation butterfly species, AMB adults "hilltop", and repeatedly fly up and over ridgelines and minor summits.

D. Adult Survey Season:

AMB adults fly late May to early July (Garth and Tilden 1986; Emmel and Emmel, 1973). Therefore, if necessary focused adult AMB surveys should be conducted at this time of the year. According to Emmel and Emmel (1973) and Stephenson and Calcarone (1999), only two host plants are known for this species: Laguna Mountains Jewel-flower (*Streptanthus bernardinus*; flowers June-July) and Rock Cress (*Arabis holboellii* var. *pinetorum*; flowers May-July). However, another reference source states that "the food plants for this butterfly are Slender-petaled Thelypodium (*Thelypodium stenopetalum*; flowers June-July), Parish's Rock-Cress (*Arabis parishii*; flowers April-May) and other native mustards" (Krantz, 1990).

E. Presence Onsite of Host Plants During 2003 and 2001 AMB Habitat Assessments:

E-1. 2003 AMB habitat Assessment: This is the <u>*third*</u> AMB Habitat Assessment performed onsite. ***No*** potential host plant species were identified during eight field surveys performed onsite in June and July 2003 on the dates listed below.

1. **June 21 and July 9, 2003** by Thomas Leslie and Nadya Leslie.
2. **June 30, July 1, 2, 3, 4 and 5, 2003**, by Mr. Philippe Vergne (Envira, 2003).

NOTE: The absence of potential host plant species is documented on two separate plant species inventories prepared by biologists with the firms of TLC and Envira.

E-2. 2001 AMB Habitat Assessments: ***No*** potential host plant species were identified onsite in 2001 during the eight field surveys performed onsite on the following dates:

- August 26, 2001 by Thomas Leslie and Nadya Leslie (TLC, 2001b).
- September 6, 2001 by Mr. Bill La Haye (La Haye, 2001).
- October 1, 2, 3, 4, 5 and 6, 2001, by Natural Resources Assessment, Inc. (NRA Inc., 2001).

V. PROJECT SITE EXISTING VEGETATIONAL COVER DESCRIPTION

As documented by TLC's September 19, 2001, *biological constraints analysis* report (TLC, 2001a), the project site is vegetated with Holland's (1986) closed canopied Westside Ponderosa Pine Forest. The pine forest habitat covers "close to 100 percent of the site" (NRA, 2001).

The *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property - Westside Ponderosa Pine Forest (Figure 3). Onsite, this forest habitat covers approximately 95%, of the 38±-acre property. The predominant plant species of the onsite forest tree canopy, shrub layer, herbaceous understory, and a few small shady isolated onsite meadows, are briefly described below.

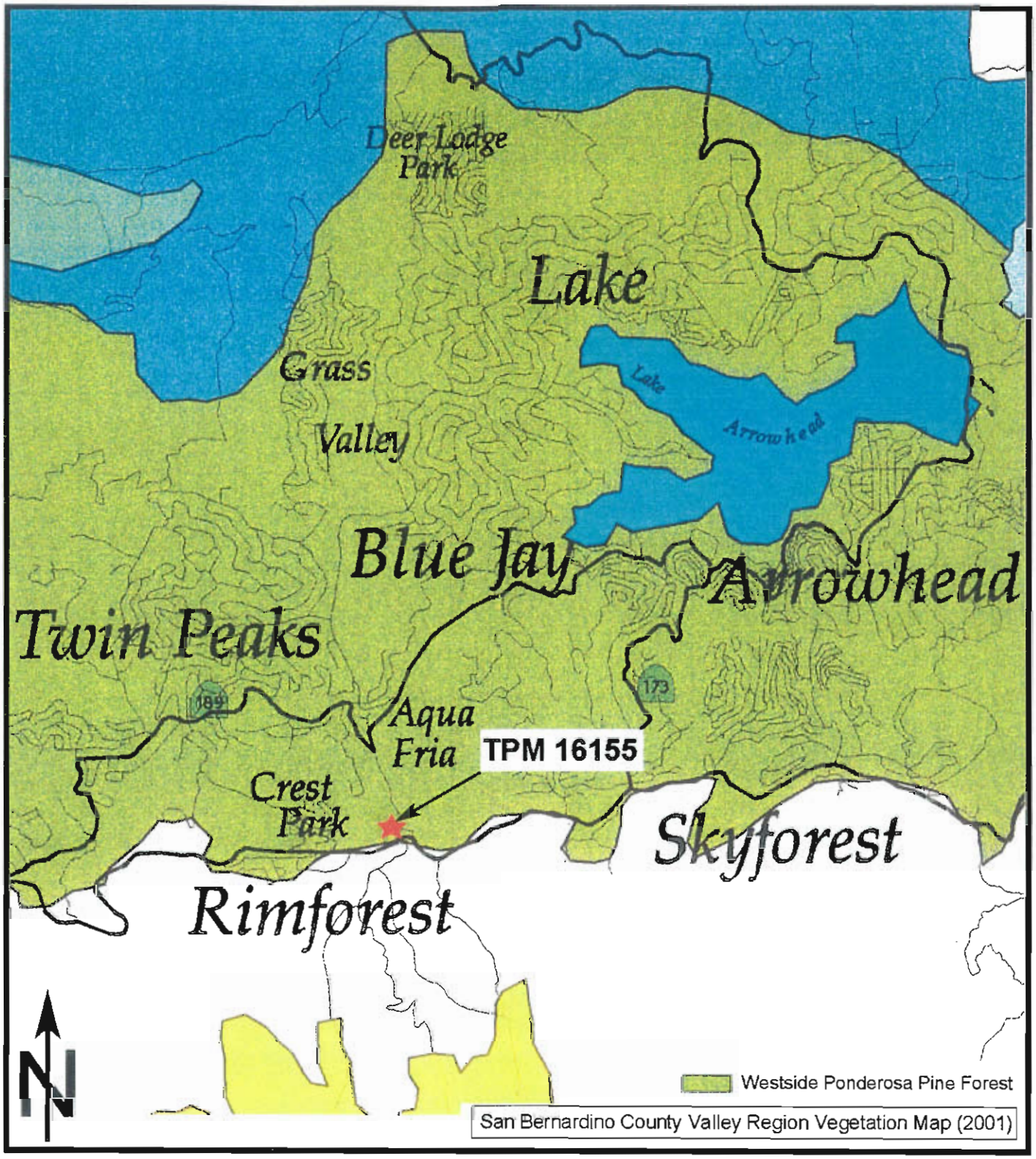
A complete inventory of the plant species identified onsite is provided in the Appendix A *Floral Compendium*. The plant species inventory also includes those species identified onsite during eight 2003 and eight 2001 biological investigations (sixteen total) performed onsite.

A. **Tree Canopy**: The common species of the onsite tree canopy include Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*) and Black Oak (*Quercus kelloggii*).

B. **Shrub Layer**: The shrub layer, of the onsite forest, is primarily composed of Mountain Pink Currant (*Ribes nevadense*) and Mountain Dogwood (*Cornus nuttallii*). A variety of other less predominant shrubs and trees, such as Deer Brush (*Ceanothus integerrimus*) and California Coffeeberry (*Rhamnus californica*) are also scattered beneath the canopies of the forest trees of the property.

C. **Herbaceous Understory**: Due to the dense nature, of the closed canopied Westside Ponderosa Pine Forest, the herbaceous understory is primarily absent. The sparse scatter of herbaceous plants observed growing, on the ground beneath the tree and shrub canopies, were non-native herbs and grasses.

D. **Small Onsite Meadows**: The few, small meadows of the site are moderately to densely vegetated with a mix of grasses and herbs. The Western Bracken (*Pteridium aquilinum* var. *pubescens*) is the most prominent meadow species.



Thomas Leslie Corporation *BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING*	**Figure 3** **Vegetation Map for** **Tentative Parcel Map No. 16155**

VI. RESULTS OF 2003 AMB INVESTIGATIONS

This section discusses the results of *Pre-Field Survey* and *Field Survey* investigations including results of literature review, results of contacts with San Bernardino National Forest Service staff and AMB habitat assessment *Pre-Field Survey* and *Field Surveys*.

A. 2003 *PRE*-FIELD SURVEY INVESTIGATION RESULTS

The *Pre-Field Survey* analysis primarily included the following.

- Contact with the San Bernardino National Forest Service in 2003 and 2001 to notify him that the ***third*** AMB habitat assessment and surveys for AMB individuals would be performed in June and July 2003 to confirm the continued absence of potential AMB host plants and adult AMB individuals onsite.
- Review of a current CDFG Natural Diversity Data Base (CNDDB) record search reports, and quadrangle velum overlay maps for the 1996 Harrison Mtn., CA and 1996 Lake Arrowhead, CA, US Geological Survey (USGS) 7.5 Minute Topographic Quadrangles (USGS, 1996a, b), determine if any state records for the AMB occurs on the church property (CDFG, 2003a, b, c, d).

A-1. Contact With the San Bernardino National Forest (SBNF) Service Biologist

- **2001 Contact**: Mr. Steve Loe, San Bernardino National Forest Service Biologist, was contacted by telephone in 2001, in attempt to obtain information regarding the need to perform the AMB habitat assessment. Mr. Loe stated that AMB habitat assessment must be performed to ascertain the presence or absence of potentially suitable AMB habitat within the boundaries of the property. Therefore, the first and second AMB habitat assessments were performed in 2001.
- **2003 Contact**: Mr. Loe was contacted on July 14, 2003, to notify him that the ***third*** AMB habitat assessment was being performed on the property in 2003.

A-2. State Records Search Results for the AMB

- ***No*** CNDDB occurrence records for AMB are recorded within the entire Harrison Mtn. or Lake Arrowhead quadrangles (CDFG, 2003a, b, c, and d). However, a 1998 biological assessment prepared for Tract 15612, a property located northwesterly of TTM 16185 in the vicinity of Grass Valley Road, recorded several sightings of this butterfly (TDA, 1998). Therefore, the nearest location of AMB known to TLC is approximately 1.0 mile northwesterly of the property.

B. 2003 AMB HABITAT ASSESSMENT *FIELD* SURVEYS RESULTS

Focused AMB field surveys were performed on the property on June 21 and July 9, 2003 to confirm the continued absence of potential AMB host plants and adult AMB individuals onsite.

B-1. Results of the 2003 Search for Potential AMB Host Plants and Individuals

- ***No*** potential AMB host plants, or adult AMB individuals were observed onsite in June or July 2003.
- Plant species inventories, provided in TLC's 2003 Appendix A *Floral Compendium* and Envira's 2003 *Appendix A Plant Species Observed*, document the *continued* absence of potential AMB host plants (Envira, 2003).
- ***None*** of the plant species identified as potential AMB host plants (Rock Cress, Laguna Mountains Jewel-flower, Slender-petaled Thelypodium and Parish's Rock-cress) were identified onsite during the June and July 2003 AMB habitat assessment field surveys. This confirms the *continued* absence of AMB host plants from the property:

  "***None*** were located" onsite by Mr. La Haye in September 2001 (La Haye, 2001). According to Mr. La Haye "if the (AMB) host plants occur on this site at all, they are uncommon."

B-2. Presence/Absence of Suitable Abiotic, Physical Habitat Required AMB Elements

- In general, due to the "closed-canopied nature of the forest" covering the property, the abiotic, physical habitat elements required, by the AMB, such as: sunny flats and open slopes, fields of wildflowers and other similar areas, are absent onsite. Therefore, "it unlikely that Andrew's marble butterfly occur on this site" (La Haye, 2001).

VII. The Need for Additional AMB Investigations

No additional focused AMB field surveys or investigations are recommended on APN 336-101-06 (Church of the Woods) for the two reasons listed below.

- AMB were ***not*** located onsite during sixteen field surveys performed during two different years: 2003 and 2001 by four different biologists with three different consulting firms: TLC, NRC, Envira and William S. La Haye.

- Due to the absence of potential AMB host plants, and the general lack of abiotic, physical habitat elements on the property required by the AMB, "no additional field surveys or investigations are recommended (on APN 336-101-06) for this species" (La Haye, 2001).

Please call me if you have any questions or require additional information regarding this letter report.

Respectfully Submitted,
THOMAS LESLIE CORPORATION

T. Leslie

Thomas A. Leslie
President/BS-MS Biologist

TAL/nvl

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Thomas Leslie Corporation (TLC), December 26, 2001b, Results of an Andrew's Marble Butterfly Habitat Assessment.

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United States Department of the Interior Geological Survey (USGS), 1996a, State of California Department of Water Resources, Harrison Mountain, California, 7.5 Minute Series (Quadrangle Topographic), Scale 1:24000.

United States Department of the Interior Geological Survey (USGS), 1996b, State of California Department of Water Resources, Lake Arrowhead, California, 7.5 Minute Series (Quadrangle Topographic), Scale 1:24000.

W. J. McKeever, Inc., May 7, 2003a, 1 Inch = 50 Feet Map: *Church of the Woods and Lake Arrowhead Christian School, Tentative Parcel Map No. 16155.*

W. J. McKeever, Inc., May 7, 2003b, 1 Inch = 50 Feet Map: *Church of the Woods and Lake Arrowhead Christian School, Conditional Use Permit Site Plan.*

APPENDIX A

2003
FLORAL COMPENDIUM

FOR

Tentative Parcel Map No. 16155

**(Assessors' Parcel Numbers 336-101-06 & 336-101-07;
a.k.a. The Church of the Woods Project)**

SAN BERNARDINO COUNTY, CALIFORNIA

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
	KINGDOM FUNGI	**MUSHROOMS (1)**		
	FAMILY LYCOPERDACEAE			
	Lycoperdum pyriforme	Pear-Shaped Puffball	N/A	N/A
	KINGDOM LICHENS	**LICHENS (1)**		
	Letharia vulpina	Wolf Lichen	N/A	N/A
	KINGDOM PLANTAE	**HIGHER VASCULAR PLANTS (83)**		
	DIVISION PTERIDOPHYTA	**FERNS**		
	FAMILY DENNSTAEDTIACEAE	**BRACKEN FAMILY**		
	Pteridium aquilinum var. pubescens	Western Bracken	N/A	N/A
	DIVISION CONIFEROPHYTA	**CONIFERS**		
	FAMILY CUPRESSACEAE	**CYPRESS FAMILY**		
	Calocedrus decurrens	Incense Cedar	N/A	N/A
	FAMILY PINACEAE	**PINE FAMILY**		
	Abies concolor	White Fir	N/A	N/A
	Pinus coulteri	Coulter Pine	N/A	N/A
	Pinus jeffreyi	Jeffrey Pine	N/A	N/A
	Pinus lambertiana	Sugar Pine	N/A	N/A
	Pinus ponderosa	Ponderosa Pine	N/A	N/A
	DIVISION ANTHOPHYTA	**FLOWERING PLANTS**		
	Class Dicotyledones (Dicots)	**Cotyledons** (Seed Leaves) 2		
	FAMILY APIACEAE	**CARROT FAMILY**		
	Osmorhiza chilensis	Sweet Celery	- - -	April-July
	Sanicula graveolens	Montane Yellow-flowered Sanicle	- - -	April-June
	FAMILY APOCYNACEAE	**DOGBANE FAMILY**		
X	*Vinca major*	Greater Periwinkle	- - -	March-July
	FAMILY ASTERACEAE	**SUNFLOWER FAMILY**		
	Achillea millefolium	White Yarrow	- - -	June-September

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
X	*Ambrosia artemisiifolia*	Common Ragweed	- - -	August-November
	Artemisia douglasiana	Mugwort	- - -	June-October
	Artemisia dracunculus	Tarragon	- - -	August-October
	Erigeron divergens	Common Fleabane Daisy	F	March-November
	Eriophyllum lanatum	Montane Wooly Daisy	- - -	June-July
	Gnaphalium canescens	Fragrant Everlasting	- - -	July-October
	Hemizonia paniculata	Tarplant	- - -	May-November
	Hieracium albiflorum	Alpine Hawkweed	F	June-August
X	*Lactuca serriola*	Prickly Lettuce	- - -	May-September
	Madia elegans	Common Madia	F	June-August
	Malacothrix saxatilis	Cliff-Aster	- - -	March-September
	Solidago californica	California Goldenrod	- - -	July-October
X	*Tanacetum parthenium*	Feverfew	- - -	June-September
X	*Taraxacum officinale*	Dandelion	- - -	January-December
	FAMILY BRASSICACEAE	**MUSTARD FAMILY**		
	Erysimum capitatum	Western Wallflower	F	March-July
	Lepidium sp.	Peppergrass	- - -	N/A
X	*Lunaria annua*	Dollar Plant	- - -	April-May
X	*Sisymbrium altissimum*	Tumble Mustard	F	April-July
	FAMILY CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**		
	Sambucus mexicana	Blue Elderberry	F	March-September
	FAMILY CARYOPHYLLACEAE	**PINK FAMILY**		
	Silene lemmonii	Catchfly	F	June-August
	FAMILY CONVOLVULACEAE	**MORNING GLORY FAMILY**		
	Calystegia occidentals ssp. fulcrata	Sonora Morning Glory	F	May-August
	FAMILY CORNACEAE	**DOGWOOD FAMILY**		
	Cornus nuttallii	Mountain Dogwood	F	April-July

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
	FAMILY ERICACEAE	**HEATH FAMILY**		
	Arctostaphylos sp.	Manzanita	- - -	January-March
	Pterospora andromedea	Pinedrops	- - -	June-August
	Sarcodes sanquinea	Snow Plant	F	May-July
	FAMILY FABACEAE	**LEGUME FAMILY**		
	Lotus crassifolius	Large-flowered Lotus	- - -	May-August
	Lupinus latifolius	Flat-leaved Lupine	- - -	April-July
	Lupinus luteolus	Butter Lupine	- - -	May-August
	Lupinus microcarpus	Chick Lupine	- - -	April-May
	Vicia americana	American Vetch	- - -	April-June
	FAMILY FAGACEAE	**OAK FAMILY**		
	Quercus chrysolepis	Canyon Oak	- - -	April-May
	Quercus kelloggii	California Black Oak	- - -	April-May
	FAMILY HYDROPHYLLACEAE	**WATERLEAF FAMILY**		
	Phacelia sp.	Phacelia	- - -	March-May
	Nemophila menziesii spp. *menziesii*	Baby Blue Eyes	F	April-May
	FAMILY GROSSULARIACEAE	**GOOSEBERRY FAMILY**		
	Ribes cereum	Squaw currant	- - -	Junc-July
	Ribes nevadense	Mountain Pink Currant	- - -	April-June
	FAMILY LAURACEAE	**LAUREL FAMILY**		
	Umbellularia californica	California Bay	- - -	December-May
	FAMILY ONAGRACEAE	**EVENING PRIMROSE FAMILY**		
	Circaea alpina ssp. *pacifica*	Enchanter's Nightshade	F	June-August
	Clarkia rhomboidea	Rhomboid Clarkia	F	May-July
	Epilobium brachycarpum	Panicled Willow-Herb	- - -	Junc-September
	Epilobium canum	California Fuchsia	- - -	August-October
	FAMILY POLEMONIACEAE	**PHLOX FAMILY**		
	Polemonium occidentale	Jacob's Ladder	- - -	June-August

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
	FAMILY POLYGONACEAE	**BUCKWHEAT FAMILY**		
	Eriogonum fasciculatum	California Buckwheat	- - -	March-October
	Eriogonum saxatile	Montane Buckwheat	- - -	May-July
X	*Polygonum convolvulus*	Black Bindweed	- - -	May-September
	FAMILY PORTULACACEAE	**PURSLANE FAMILY**		
	Claytonia perfoliata	Miner's lettuce	F	February-May
	FAMILY RHAMNACEAE	**BUCKTHORN FAMILY**		
	Ceanothus integerrimus	Deer Brush	- - -	May-June
	Rhamnus californica	California Coffeeberry	- - -	May-July
	FAMILY ROSACEAE	**ROSE FAMILY**		
	Fragaria vesca	Wood Strawberry	F	March-July
	Potentilla glandulosa	Sticky Cinquefoil	F	May-June
	Rubus parviflorus	Thimbleberry	F	March-August
	FAMILY RUBIACEAE	**MADDER FAMILY**		
X	*Galium aparine*	Goose Grass	- - -	March-July
	FAMILY SALICACEAE	**WILLOW FAMILY**		
	Salix lasiolepis	Arroyo Willow	- - -	February-April
	FAMILY SCROPHULARIACEAE	**FIGWORT FAMILY**		
	Castilleja applegatei	Montane Indian Paintbrush	- - -	May-July
	Penstemon centranthifolius	Scarlet Bugler	- - -	April-July
	Penstemon spectabilis	Chaparral Beard-tongue	- - -	April-June
	FAMILY SOLANACEAE	**NIGHTSHADE FAMILY**		
	Solanum xanti	Purple Nightshade	F	February-July
	FAMILY URTICACEAE	**NETTLE FAMILY**		
	Urtica dioica	Hoary Nettle	- - -	June-September

Non-Native 15/86 = 17.4%	SCIENTIFIC NAMES	COMMON NAMES (86)	Flowering (F) on June 21 and July 9, 2003	Flowering Period
	FAMILY VISCACEAE	**MISTLETOE FAMILY**		
	Phoradendron macrophyllum	Big-leaf Mistletoe	- - -	October-March
	Class Monocotyledones	**Monocots**		
	FAMILY CYPERACEAE	**SEDGE FAMILY**		
	Carex sp.	Sedge	- - -	Summer
	FAMILY IRIDACEAE	**IRIS FAMILY**		
	Iris hartwegii ssp. australis	Hartweg's Iris	F	May-June
	FAMILY LILIACEAE	**LILY FAMILY**		
	Bloomeria crocea	Common Goldenstar	F	April-June
	Dichelostemma capitatum	Blue Dicks	F	February-May
	FAMILY ORCHIDACEAE	**ORCHID FAMILY**		
	Piperia cooperi	Slenderspire Piperia	F	March-July
	FAMILY POACEAE	**GRASS FAMILY**		
	Bromus carinatus	California Brome	- - -	April-August
	Bromus ciliatus	Fringed Brome	F	July-August
X	*Bromus diandrus*	Ripgut Grass	- - -	April-June
X	*Bromus tectorum*	Cheat Grass	- - -	May-June
	Elymus sp.	Elymus	F	June-August
X	*Elytrigia intermedia*	Intermediate Wheatgrass	F	April-August
X	*Hordeum murinum*	Hare Barley	- - -	April-July
X	*Phalaris minor*	Littleseed Canary Grass	- - -	April-July
X	*Vulpia myuros*	Foxtail Fescue	F	April-June

Thomas Leslie Corporation

Results of 2003 California Spotted Owl Protocol Surveys

October 7, 2003

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

October 7, 2003

SUBJECT: Results of 2003 California Spotted Owl Protocol Surveys

Dear Mr. Hopkins:

Thomas Leslie Corporation is pleased to present the results, of a eight protocol presence/absence surveys, performed for the California Spotted Owl (*Strix occidentalis occidentalis*). The protocol surveys were conducted within the boundaries of Tentative Parcel Map No.16155 (project site). Although the property is comprised of two Assessors' Parcel Numbers (APN), 336-101-06 and 336-101-07, only APN 336-101-06 is being developed; APN 336-101-07 will be an undeveloped remainder parcel. The need to perform the protocol California Spotted Owl surveys was identified in TLC's, September 19, 2001, biological constraints analysis (TLC, 2001). The findings of the California Spotted Owl protocol surveys, divided into *Pre-Field Survey* and onsite protocol *Field Surveys*, are provided in this letter report.

I. SUMMARY OF MYLF HABITAT ASSESSMENT

- ***No*** Spotted Owls were seen on, or responded from within the boundaries of the property, during performance of the eight protocol surveys between April 4 and August 1, 2003.
- The 2003 California Spotted Owl protocol survey is the *second* one performed onsite.
- ***No*** Spotted Owls were seen on, or responded from within the property, during performance of protocol surveys in 2001.

II. LOCATION OF PROJECT SITE

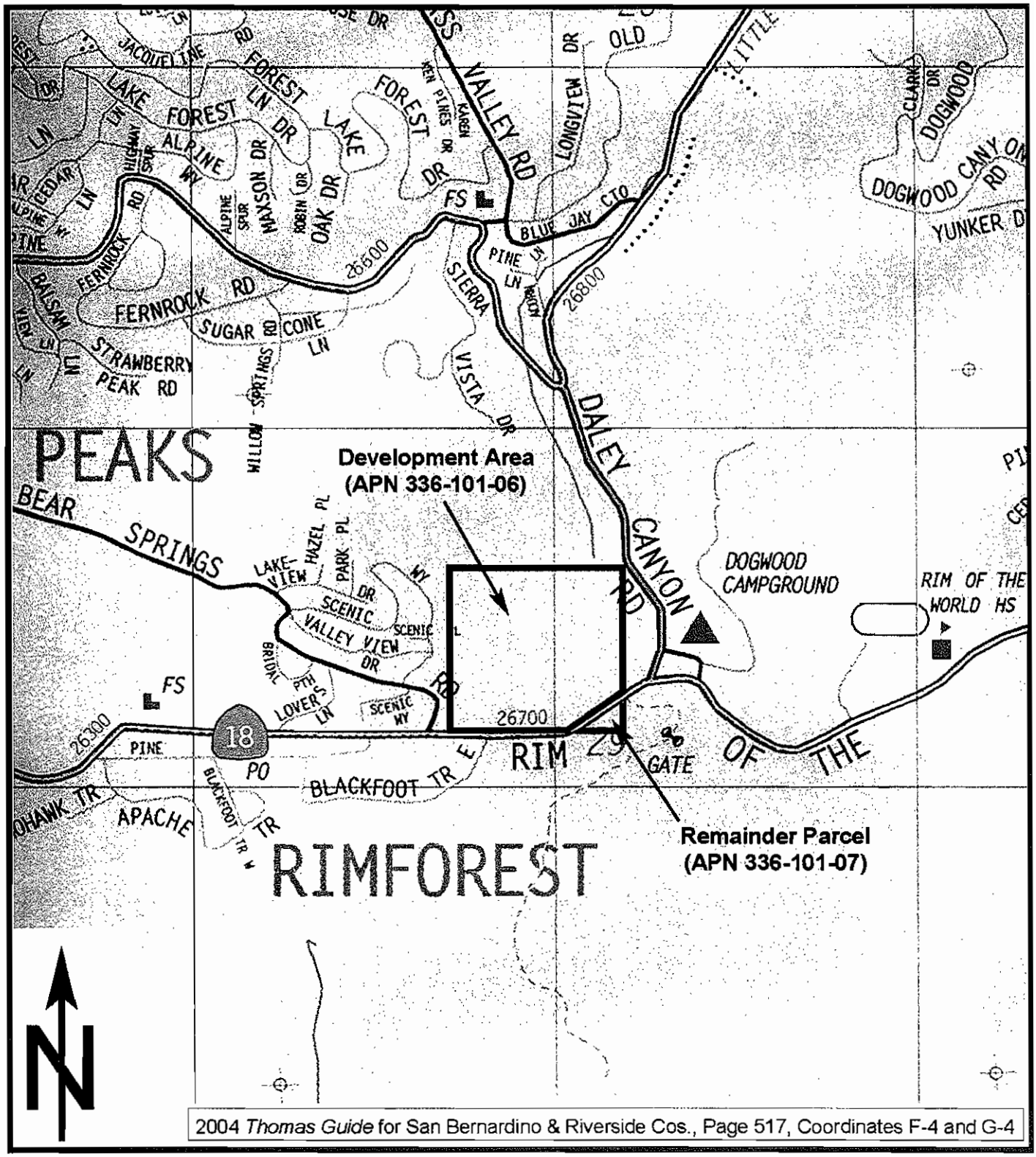
The project site is a 38± acre property located in San Bernardino County, California. The Rim of the World Highway (State Highway 18; Hwy 18) provides regional access to the project site. The property can be reached by exiting Hwy 18 at Bear Springs or Daley Canyon Roads. More specifically, the property is situated northwest of the intersection of Hwy. 18 and Daley Canyon Road.

- **Figure 1** illustrates the boundaries of the property on the 2004 *Thomas Guide* San Bernardino and Riverside Counties Street Guide and Directory on Detail map page 517; map coordinates F-4 and G-4.
- **Figure 2** plots the boundaries of the property in the NW quadrant of Section 29, Township 2 North, Range 3 West; of the 1996 Harrison Mtn., CA, 7.5' United States Geological Survey (USGS) Topographic Quadrangle.

III. PURPOSE OF THE PROTOCOL SURVEYS

The protocol surveys were performed to ascertain the presence/absence of the California Spotted Owl within the boundaries of the project site and make recommendations regarding the need to perform additional California Spotted Owl investigations.

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233

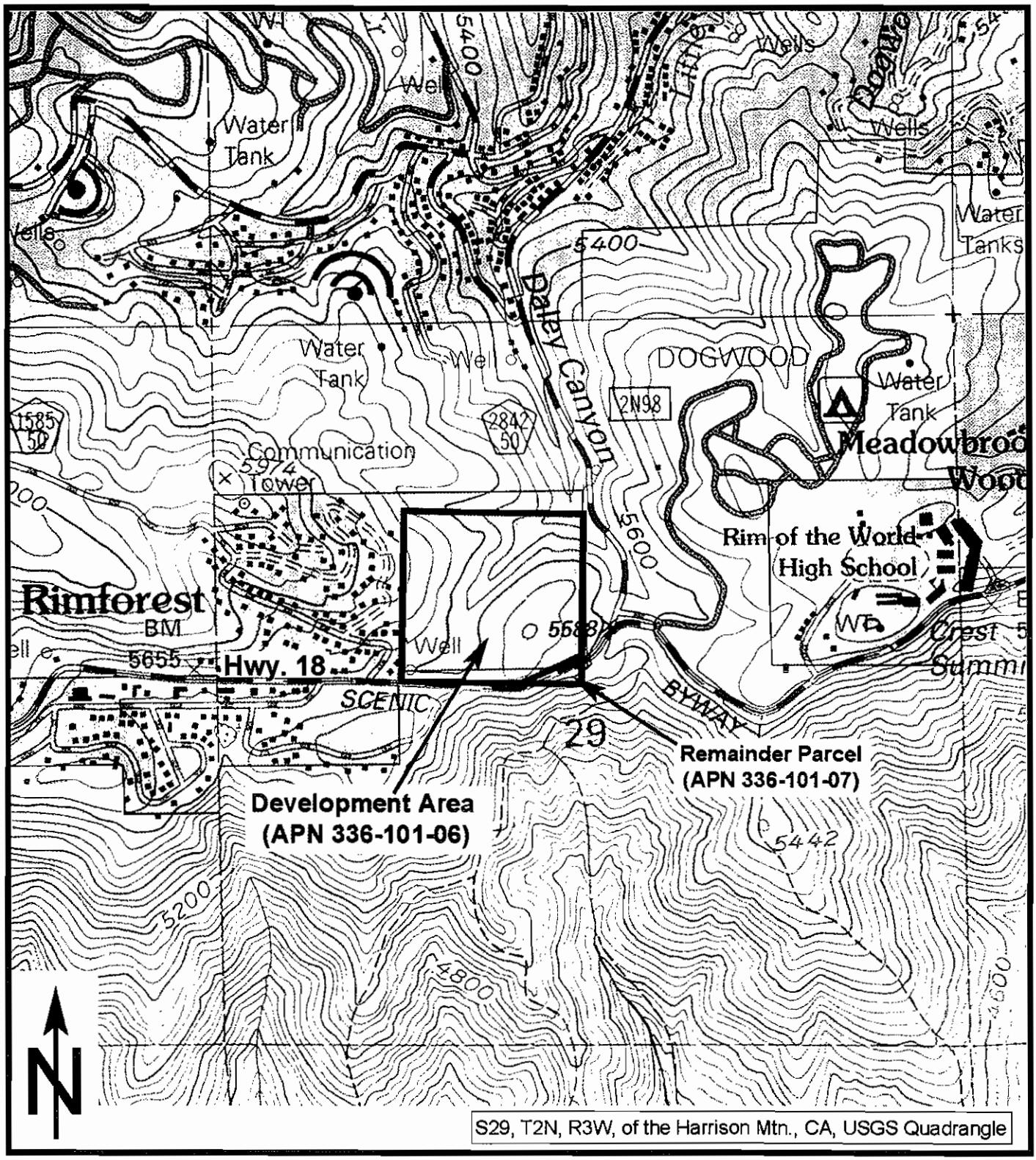


2004 *Thomas Guide* for San Bernardino & Riverside Cos., Page 517, Coordinates F-4 and G-4

Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1
Location of
Tentative Parcel Map No. 16155
on Thomas Guide Map



Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 2

Location of
Tentative Parcel Map No. 16155
on a USGS Quadrangle Map

IV. PROPOSED PROJECT

As illustrated on W.J. McKeever, Inc., May 7, 2003, 1 inch = 50 feet scale *Church of the Woods and Lake Arrowhead Christian School, Tentative Parcel Map No. 16155*, and *Conditional Use Permit Site Plan* map, the project proposed involves construction of a church (worship center, chapel retreat, natural park, children's ministry, youth center "gymnatorium") and associated sports facilities (volleyball, skateboard park, basketball, child play area), private Christian school, storage and residence buildings, a baseball field and associated onsite paved driveways, walkways, roadways, parking and ornamental landscaping.

V. GENERAL STATUS OF THE CALIFORNIA SPOTTED OWL

A. Listing Status: The California Spotted Owl is a state and federally *unlisted* southern subspecies of the Northern Spotted Owl. However, it is identified by the California Department of Fish and Game (CDFG) as Species of Special Concern (CSC). In addition, the California Spotted Owl is a San Bernardino National Forest sensitive species.

B. Description: The California Spotted Owl is a medium-sized owl whose brown plumage is contrasted with many white spots arranged in crosswise rows. This owl's head is rounded. It has dark eyes and lacks ear tufts.

C. Habitat: California Spotted Owls are known to occur in the majority of the larger mountain ranges in southern California (LaHaye *et al.*, 1994). More specifically, this owl inhabits dense coniferous woodland on steep shady slopes. It nests in **cavities of cliffs or trees**.

The primary habitat types occupied by California Spotted Owl are closed canopied live oak and closed canopied conifer forests (Gutiérrez *et al.*, 1992, LaHaye *et al.*, 1997). These forests primarily occur above approximately 4,000 feet elevation. However, some Spotted Owl occurrences are known at lower elevations in deep canyons and near the coast where similar forests are found. California Spotted Owls are known to occur in the majority of the larger mountain ranges in southern California.

VI. PROJECT SITE HABITAT DESCRIPTION

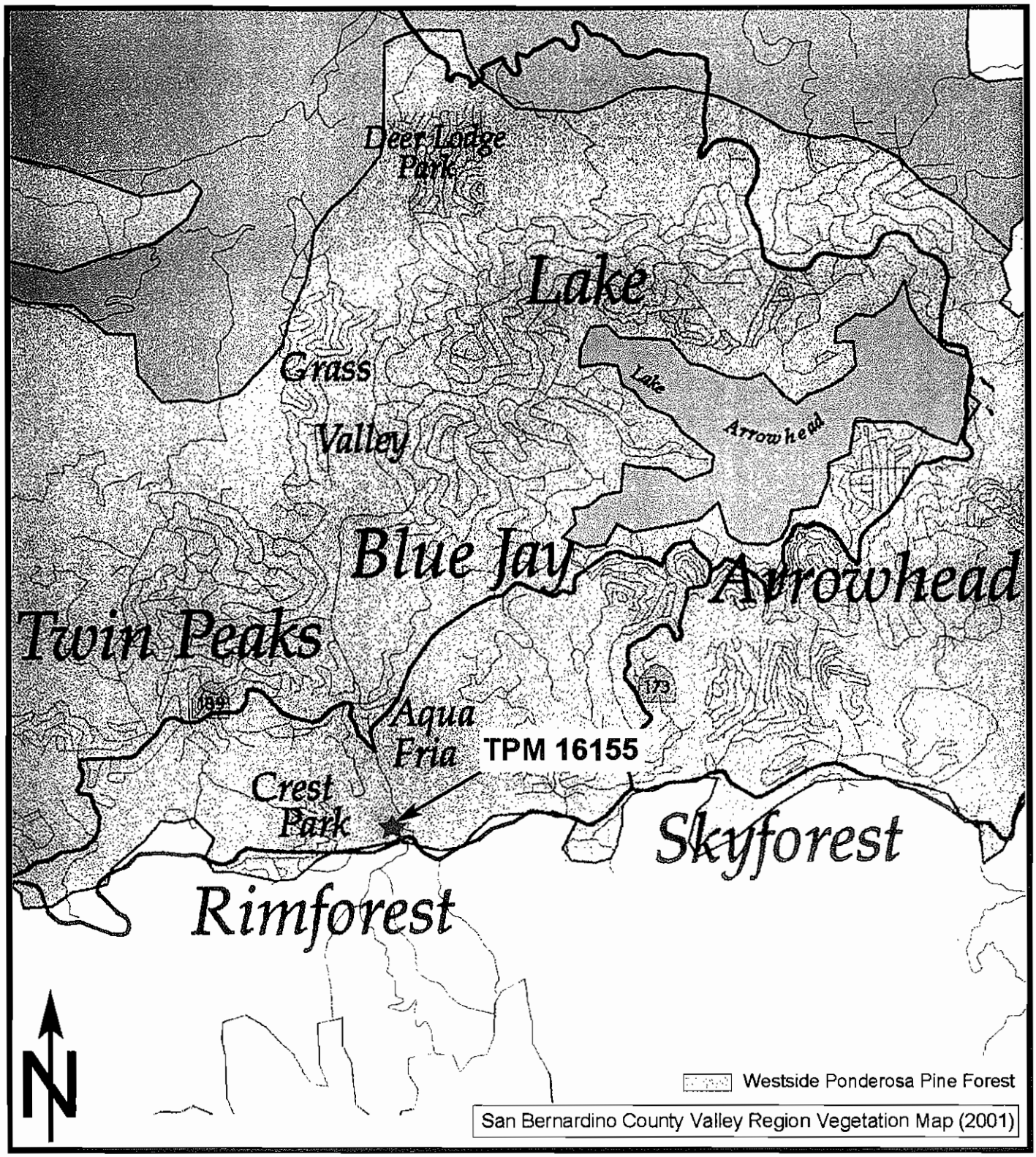
As documented by TLC's September 19, 2001, *biological constraints analysis* report (TLC, 2001), the property is vegetated with Holland's (1986) closed canopied Westside Ponderosa Pine Forest. The pine forest habitat covers "close to 100 percent of the site" (NRA, 2001). The *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property - Westside Ponderosa Pine Forest (Figure 3). Onsite, this forest habitat covers approximately 95%, of the 38±-acre property. The predominant plant species of the onsite forest tree canopy, shrub layer, herbaceous understory, and a few, small shady isolated onsite meadows, are briefly described below. The predominant plant species of the onsite forest tree canopy, shrub layer, herbaceous understory, and a few, small isolated onsite meadows, are briefly described below.

- **Tree Canopy**: The common tree species of the onsite tree canopy include Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*) and Black Oak (*Quercus kelloggii*).

- **Shrub Layer**: The shrub layer, of the onsite forest, is primarily composed of Mountain Pink Currant (*Ribes nevadense*) and Mountain Dogwood (*Cornus nuttallii*). A variety of other less predominant shrubs and trees, such as Deer Brush (*Ceanothus integerrimus*) and California Coffeeberry (*Rhamnus californica*) are also scattered beneath the canopies of the forest trees of the project site.

- **Herbaceous Understory**: Due to the dense nature, of the closed canopied Westside Ponderosa Pine Forest, the herbaceous understory is primarily absent. The sparse scatter of herbaceous plants growing, on the ground beneath the tree and shrub canopies, were non-native herbs and grasses.

- **Small Onsite Meadows**: The few, small meadows of the site are sparsely to moderately vegetated with a mix of grasses and herbs. The Western Bracken (*Pteridium aquilinum* var. *pubescens*) is the most prominent meadow species.



Thomas Leslie Corporation *BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING*	**Figure 3** **Vegetation Map for** **Tentative Parcel Map No. 16155**

VII. RESULTS

This section discusses the results of *Pre-Field Survey* and *Field Survey* investigations including results of literature review, results of contacts with Resources Agencies and protocol presence/absence California Spotted Owl surveys.

A. PRE-FIELD SURVEY INVESTIGATIONS

The results of the *Pre-Field Survey* analysis are summarized below.

The *Pre-Field Survey* analysis primarily included the following work tasks.

- Contact with the San Bernardino National Forest Service to ascertain the need to perform protocol presence or absence surveys for the California Spotted Owl.
- Review of a current California Department of Fish and Game (CDFG) Natural Diversity Data Base (CNDDB) records search report and velum overlay map, for the 1996 Harrison Mtn., CA, US Geological Survey (USGS) topographic quadrangle (CDFG, 2001a, b) to determine if any state records for the California Spotted Owl are recorded within the boundaries of the property.

A-1. Contact With the San Bernardino National Forest Service Biologist

Mr. Steve Loe, San Bernardino National Forest Service Biologist, was contacted on July 14, 2003, to notify him that the ***second*** Spotted Owl habitat assessment was being performed on the property in 2003.

Mr. Loe previously provided faxed copies of the Forest Service's 1993 *California Spotted Owl Sierran Province Interim Guidelines Environmental Assessment* (USDA, 1993) and 1992 *The California Spotted Owl: A Technical Assessment of its Current Status* (USDA, 1992). The California Spotted Owl *Interim Guidelines* provides an explanation of Changes to the CEQA Process regarding to the management options for the California Spotted Owl. This information obtained from Mr. Loe was used to schedule field surveys and to prepare this report of findings.

A-2. State Records Search Results For The California Spotted Owl

A current CDFG Natural Diversity Data Base (CNDDB) record search report, and quadrangle velum overlay map for the 1996 Harrison Mtn., CA, US Geological Survey (USGS) 7.5 Minute Topographic Quadrangle (CDFG, 2001d), was analyzed. The results of the records search and velum map analysis were used to determine (a) if any state records California Spotted Owl occurrence records are located within the boundaries of the Church of the Woods property (CDFG, 2003a, b).

A-3. State Records Search Results

- ***No*** California Spotted Owl are recorded by the CNDDB within the boundaries of the project site (CDFG, 2003a, b).
- ***No*** listed threatened or endangered species, or species candidate for listing, or any other unlisted but sensitive species were identified within the boundaries of the project site by CNDDB records (CDFG, 2003a, b).
- According to Mr. LaHaye, "there are no known current or historic spotted owl nests or roosts located on APN 336-101-006."

B. RESULTS OF THE 2003 *FIELD SURVEY* INVESTIGATIONS

The results of the *Pre-Field Survey* analysis are summarized below.

B-1. Purpose of the *Field Surveys*

The *Field Survey* investigations were primarily performed to accomplish the following work tasks.

- Through performance of eight protocol nocturnal surveys, to ascertain the presence or absence of California Spotted Owl within the boundaries of the project site.
- Determine the need to perform additional California Spotted Owl investigations.

B-2. 2003 Protocol California Spotted Owl Survey Personnel

At the direction of TLC, eight protocol California Spotted Owl presence/absence surveys were performed within the boundaries of the project site on 4 and 27 April; 27 June; 3,11,18, and 24 July; and 1 August 2003. As recommended by Mr. Steve Loe, a San Bernardino National Forest Service biologist, the protocol California Spotted Owl surveys were performed by TLC associate biologist Mr. William S. La Haye. The protocol California Spotted Owl presence/absence surveys were performed, by Mr. La Haye at the time of year when California Spotted Owl would have been both present and identifiable (CDFG, 2000), if this owl had been present onsite.

B-3. Protocol Spotted Owl Survey Results

- ***No*** Spotted Owls were seen on, or responded from within the boundaries of the property, during performance of the eight protocol surveys between April 4 and August 1, 2003.

B-4. The Need for Additional California Spotted Owl Investigations

The results of protocol surveys are valid for one year from the last survey date. Therefore, if the property remains undeveloped on August 1, 2004, "follow-up" protocol surveys would be necessary to confirm the continued absence of the California Spotted Owl on

Please call me if you have any questions or require additional information regarding this letter report.

Respectfully Submitted,

THOMAS LESLIE CORPORATION

T. Leslie

Thomas A. Leslie, President/BS-MS Biologist

TAL/nvl

REFERENCES

California Department of Fish and Game (CDFG), July 15, 2003a, Natural Diversity Data Base (NDDB) *Rare Find Records Search Report* for the 1996, United States Department of the Interior Geological Survey's (USGS) Harrison Mtn., CA, 7.5 Minute Series Topographic Quadrangle Sheet, Scale 1:24000.

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LaHaye, W. S., R. J. Gutiérrez, and D. R. Call, 1997, Nest-site Selection and Reproductive Success of California Spotted Owls, Wilson Bulletin 109(1): 42-51

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San Bernardino County (SBC) Valley Region Vegetation by Holland Classification, February 13, 2001, 1 Inch = 10,200 Feet Scale Map.

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United States Department of Agriculture, Forest Service, Pacific Southwest Region (USDA), January 1993, California Spotted Owl Sierran Province Interim Guidelines Environmental Assessment.

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W. J. McKeever, Inc., May 7, 2003, 1 Inch = 50 Feet Map: *Church of the Woods and Lake Arrowhead Christian School, Tentative Parcel Map No. 16155.*

W. J. McKeever, Inc., May 7, 2003, 1 Inch = 50 Feet Map: *Church of the Woods and Lake Arrowhead Christian School, Conditional Use Permit Site Plan.*

Thomas Leslie Corporation

Results of a 2003 Mountain Yellow-Legged Frog Habitat Assessment

October 7, 2003

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

October 7, 2003

SUBJECT: Results of a 2003 Mountain Yellow-legged Frog Habitat Assessment

Dear Mr. Hopkins:

Thomas Leslie Corporation is pleased to present the results of a 2003 Mountain Yellow-legged Frog (*Rana muscosa*; MYLF) habitat assessment. The habitat assessment was conducted within the boundaries of Tentative Parcel Map No.16155 (TPM 16155), a 38± acre property situated northwest of the intersection of The Rim of the World Highway (Hwy. 18) and Daley Canyon Road in San Bernardino County, California. Although the property is comprised of two Assessors' Parcel Numbers (APN), 336-101-06 and 336-101-07, only APN 336-101-06 is being developed; APN 336-101-07 will be an undeveloped remainder parcel. The need to perform the MYLF habitat assessment was identified in TLC's, 09/19/01, biological constraints analysis (TLC, 2001).

I. SUMMARY OF MYLF HABITAT ASSESSMENT

- The 2003 MYLF habitat assessment is the *third* MYLF habitat assessment performed onsite.
- ***No*** potentially suitable MYLF habitat elements occur onsite due to the "closed-canopied nature of the forest" covering the Church of the Woods property.
- ***No*** MYLF individuals were observed onsite during field surveys performed onsite by four different biologists in 2003 and 2001.

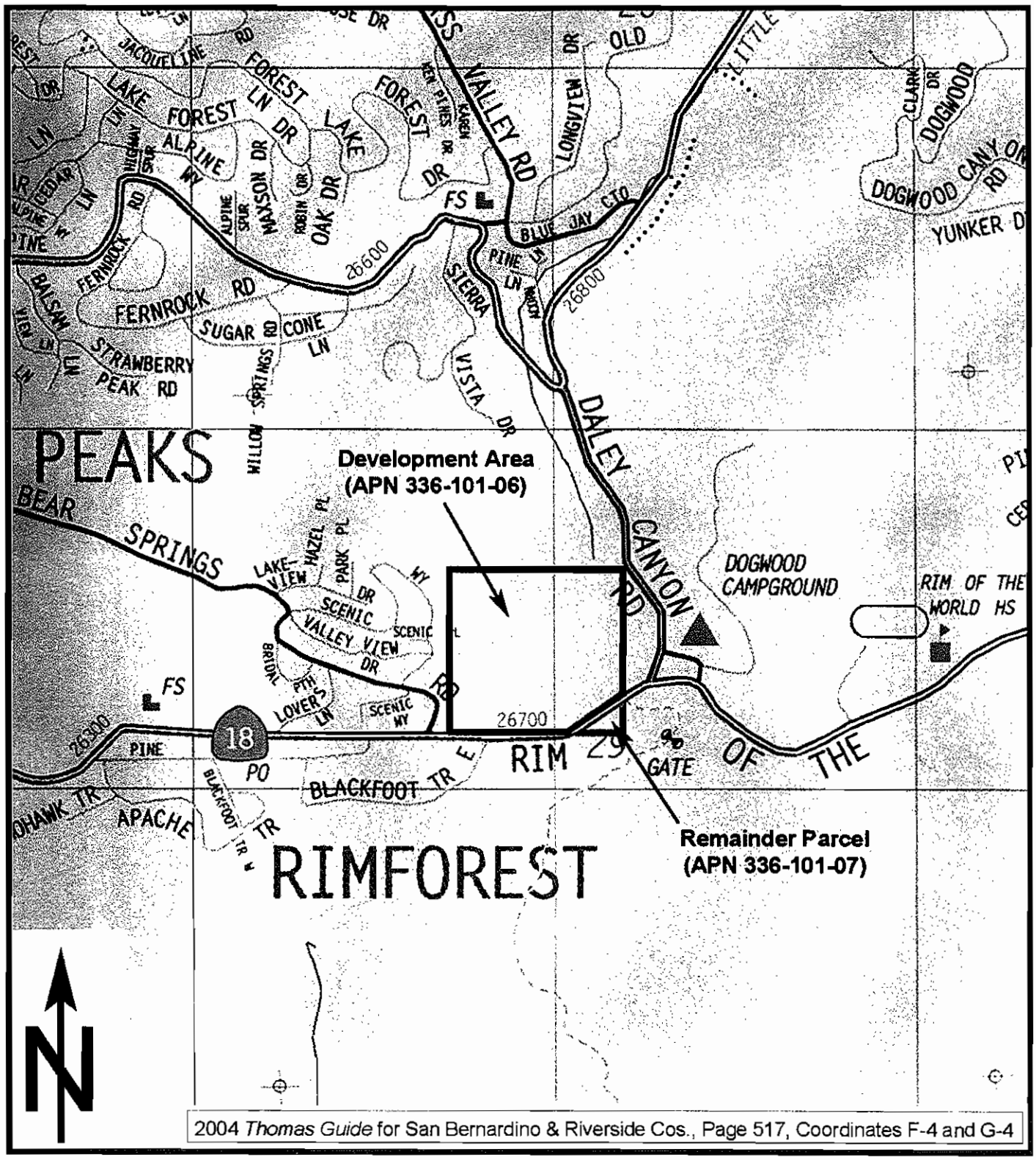
The findings of the 2003 MYLF habitat assessment, divided into *Pre-Field Survey* and onsite protocol *Field Surveys*, are summarized in this letter report.

II. LOCATION OF PROJECT SITE

Hwy. 18 provides regional access to the property. The property can be reached by exiting Hwy. 18 at Bear Springs or Daley Canyon Roads. More specifically, the property is situated northwest of the intersection of Hwy. 18 and Daley Canyon Road.

- **Figure 1** illustrates the boundaries of the property on the 2004 *Thomas Guide* San Bernardino and Riverside Counties Street Guide and Directory on Detail map page 517; map coordinates F-4 and G-4.
- **Figure 2** plots the boundaries of the property in the NW quadrant of Section 29, Township 2 North, Range 3 West; of the 1996 Harrison Mtn., CA, 7.5' United States Geological Survey (USGS) Topographic Quadrangle.

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233



2004 *Thomas Guide* for San Bernardino & Riverside Cos., Page 517, Coordinates F-4 and G-4

Thomas Leslie Corporation

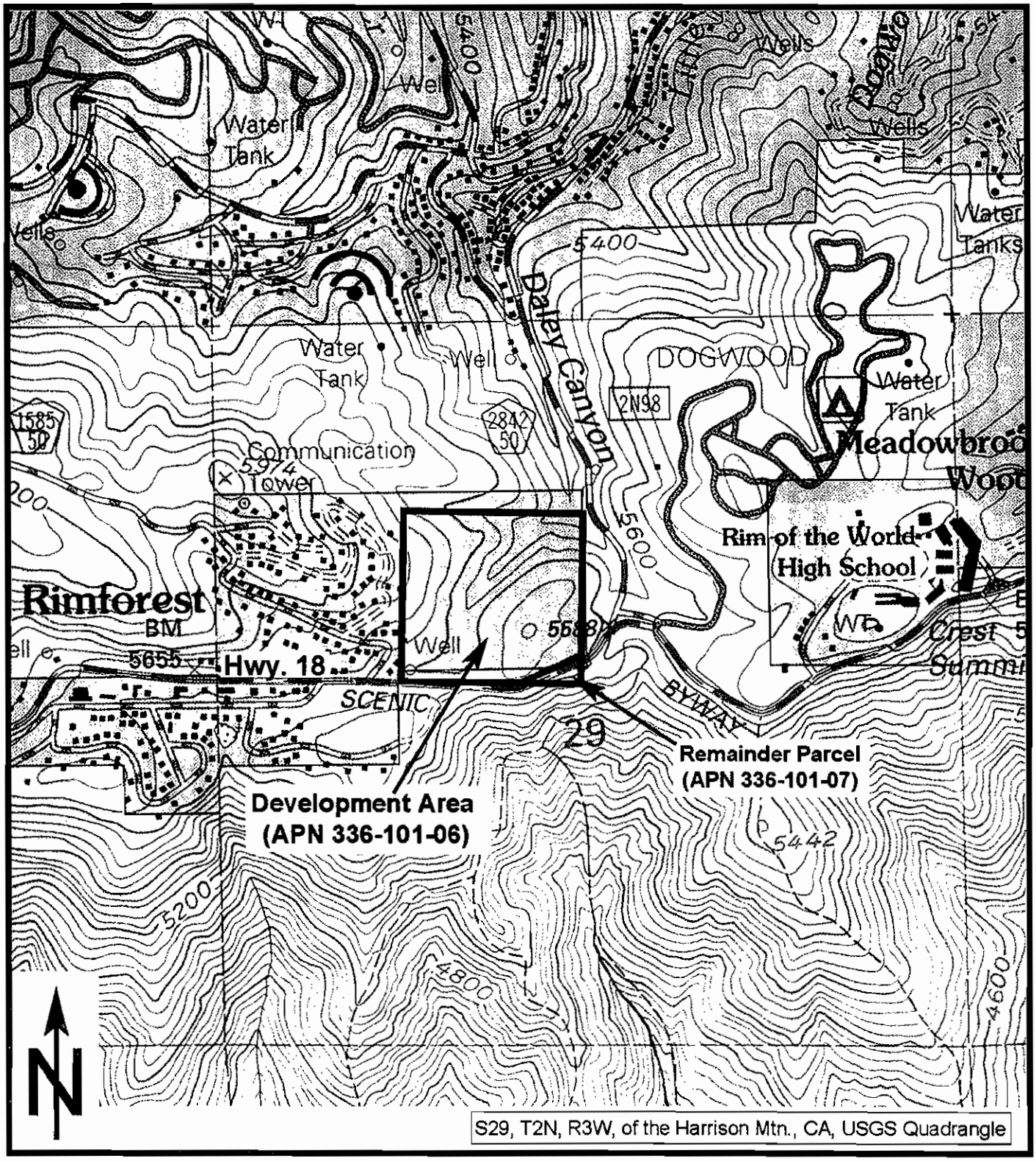
BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1

Location of

Tentative Parcel Map No. 16155

on Thomas Guide Map



Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 2

Location of
Tentative Parcel Map No. 16155
on a USGS Quadrangle Map

III. PURPOSE OF THE MYLF HABITAT ASSESSMENT

The MYLF habitat assessment was performed to ascertain the presence/absence onsite of potentially suitable MYLF habitat elements required by the MYLF: sunny (well-illuminated) riverbanks and rocky stream courses with open margins that gently slope up to a depth of ca. 5-8 cm (2-3 inches), meadow streams, isolated pools, and lakes. In addition, since the 2003 habitat assessment was performed during the MYLF breeding season, searches were also made for MYLF individuals.

IV. PROPOSED PROJECT

As illustrated on W.J. McKeever, Inc., May 7, 2003, 1 inch = 50 feet scale *Church of the Woods and Lake Arrowhead Christian School, Tentative Parcel Map No. 16155*, and *Conditional Use Permit Site Plan* map, the project proposed involves construction of a church (worship center, chapel retreat, natural park, children's ministry, youth center "gymnatorium") and associated sports facilities (volleyball, skateboard park, basketball, child play area), private Christian school, storage and residence buildings, a baseball field and associated onsite paved driveways, walkways, roadways, parking and ornamental landscaping.

V. LISTING STATUS AND DESCRIPTION OF THE MYLF

A. Listing Status

Designated federally endangered on July 2, 2002; no state listing status.

B. Description

MYLF is a moderate-sized frog with a dorsal pattern ranging from discrete dark spots to irregular lichen-like patches, or a poorly defined reticulum. The color of this frog is highly variable, usually a mix of brown and yellow, but often with gray, red, or green-brown. Dorsolateral folds are present, but not usually prominent. The throat is white or yellow, sometimes with mottling of dark pigment. The belly and undersurfaces of the high limbs are yellow, which ranges in hue from pale lemon yellow to an intense sun yellow. The tips of the fully webbed toes are dark; adults have swollen thumbs. In southern California, they breed March to May when high water in streams subsides (Stebbins 1985). According to the Forest Service, when captured, it has a pungent odor similar to garlic. The larvae of MYLFs eat organic debris, plant tissue, algae and small organism. Metamorphosed frogs are insectivorous. The call, made underwater during the day, is short and rasping, that often rises in pitch and accelerates at the end.

C. Distribution

The MYLF, "the only frog of the Sierran highlands," is found in the Sierra Nevada and higher mountains of southern California (Stebbins 1985, Stephenson and Calcarone 1999). In the mountains of *southern* California it ranges from Point Loma south to Mt. Palomar, between the 600 and 7,500 feet elevation above mean sea level (msl) (Stebbins 1985). The MYLF is a near-endemic species to California (primarily restricted to California and a small area of Nevada), historically ranging in distribution from southern Plumas County in northern California to northern San Diego County in southern California (Edited from the Federal Register, July 2, 2002, Vol. 67, #127).

D. Habitat

This chiefly *diurnal* frog species is "seldom found more than 2 or 3 jumps from water" (Stebbins 1985). In the mountains of southern California, the MYLF frequents the cool waters of sunny (well-illuminated) riverbanks and rocky stream courses with open margins that gently slope up to a depth of ca. 5-8 cm, meadow streams, isolated pools, and lakes above approximately 4,000 feet in elevation (Stebbins 1985)

originating from springs and snowmelt (Edited from the Federal Register, July 2, 2002, Volume 67, Number 127). "Such shorelines are probably essential for oviposition and important for theroregulation of larvae and postmetamorphs; additionally, this kind of shore line configuration probably provides refuge from predation if fishes occur in adjacent deeper water" (Jennings, 1994). MYLF seem to be absent from smaller creeks "probably because (they) have insufficient depth for adequate refuge and over-wintering" (Jennings, 1994).

E. Biology

Juvenile and adult MYLFs feed primarily on small, streamside insects such as beetles, flies, ants, bees, and similar small insects. The coldest winter months are spent in hibernation, probably underwater or in crevices in the stream banks. MYLFs emerge from over-wintering sites in early spring and breeding soon follows. Breeding activity typically begins in April at lower elevations, to June or July at upper elevations and continues for approximately a month (Edited from the Federal Register, July 2, 2002, Vol. 67, #127).

F. Presence Onsite of Suitable MYLF Habitat in 2003 and 2001

F-1. 2003 MYLF habitat Assessment

This is the *third* MYLF Habitat Assessment performed onsite. ***No*** potential MYLF habitat was identified during two field surveys performed onsite in June 21 and July 9, 2003 by TLC biologists.

F-2. 2001 MYLF Habitat Assessments

No potential MYLF habitat was identified onsite in 2001 during the two field surveys performed onsite on the following dates: August 26, 2001 by Thomas Leslie and Nadya Leslie (TLC, 2002) and September 6, 2001 by Mr. Bill La Haye (La Haye, 2001). MYLF require sunny (well-illuminated) riverbanks and rocky stream courses with open margins that gently slope up to a depth of ca. 5-8 cm (2-3 inches), meadow streams, isolated pools, and lakes. The following information describes the findings of the 2001 MYLF habitat assessment in more detail.

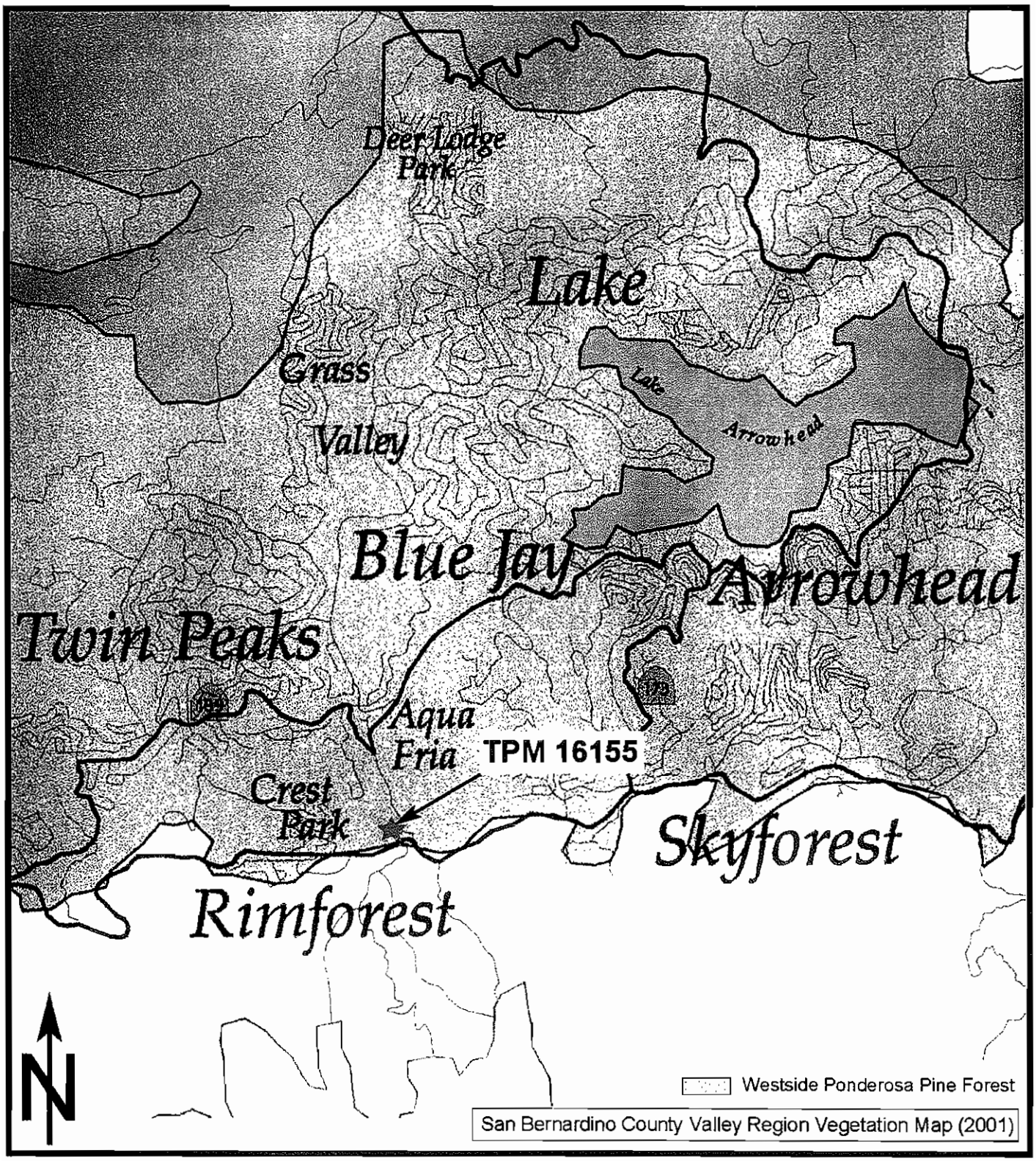
- Due to the "closed-canopied nature of the forest" covering the Church of the Woods property, ***no*** potentially suitable MYLF habitat elements were identified onsite by Thomas Leslie and Nadya Leslie on August 26, 2001.

- Mr. La Haye confirmed the absence of potential MYLF habitat from APN 336-101-06 in October 2001 when he concluded, "APN 336-101-06 is primarily closed-canopied forest" and "no mountain yellow-legged frog habitat exists on this property" (La Haye, 2001).

VI. PROJECT SITE EXISTING VEGETATIONAL COVER DESCRIPTION

As documented by TLC's September 19, 2001, *biological constraints analysis* report (TLC, 2001), the property is vegetated with Holland's (1986) closed canopied Westside Ponderosa Pine Forest. The pine forest habitat covers "close to 100 percent of the site" (NRA, 2001).

The *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property - Westside Ponderosa Pine Forest (Figure 3). Onsite, this forest habitat covers approximately 95%, of the 38±-acre property. The predominant plant species of the onsite forest tree canopy, shrub layer, herbaceous understory, and a few, small shady isolated onsite meadows, are briefly described below.



Thomas Leslie Corporation *BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING*	**Figure 3** **Vegetation Map for** **Tentative Parcel Map No. 16155**

A. **Tree Canopy**: The common species of the onsite tree canopy include Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*) and Black Oak (*Quercus kelloggii*).

B. **Shrub Layer**: The shrub layer, of the onsite forest, is primarily composed of Mountain Pink Currant (*Ribes nevadense*) and Mountain Dogwood (*Cornus nuttallii*). A variety of other less predominant shrubs and trees, such as Deer Brush (*Ceanothus integerrimus*) and California Coffeeberry (*Rhamnus californica*) are also scattered beneath the canopies of the forest trees of the property.

C. **Herbaceous Understory**: Due to the dense nature, of the closed canopied Westside Ponderosa Pine Forest, the herbaceous understory is primarily absent. The sparse scatter of herbaceous plants observed growing, on the ground beneath the tree and shrub canopies, were non-native herbs and grasses.

D. **Small Onsite Meadows**: The few, small meadows of the site are moderately to densely vegetated with a mix of grasses and herbs. The Western Bracken (*Pteridium aquilinum* var. *pubescens*) is the most prominent meadow species.

VII. RESULTS OF 2003 MYLF INVESTIGATIONS

This section discusses the results of *Pre-Field Survey* and *Field Survey* investigations including results of literature review and results of (a) contacts with San Bernardino National Forest Service staff, (b) MYLF habitat assessment and (c) search for MYLF individuals.

A. 2003 *PRE-FIELD SURVEY* INVESTIGATION RESULTS

The *Pre-Field Survey* analysis included the following work efforts.

- Contact with the San Bernardino National Forest (SBNF) Service in 2003 and 2001 to ascertain (a) the current know distribution of MYLF in the forest and (b) the need to perform protocol presence or absence surveys for the MYLF.
- Review of a current CDFG Natural Diversity Data Base (CNDDB) record search reports, and quadrangle velum overlay maps for the 1996 Harrison Mtn., CA and 1996 Lake Arrowhead, CA, US Geological Survey (USGS) 7.5 Minute Topographic Quadrangles (USGS, 1996a, b), to determine (a) if any state records for the MYLF occurrence records are located within the boundaries of the Church of the Woods property and (b) where the closest MYLF record is located.

A-1. Results of Contact With the SBNF Service Biologist

- **2001 Contact**: Mr. Steve Loe, SBNF Biologist, was contacted, by telephone in 2001, in attempt to obtain information regarding the need to perform the MYLF habitat assessment. Mr. Loe stated that MYLF habitat assessment must be performed to ascertain the presence or absence of potentially suitable MYLF habitat within the boundaries of the property. Therefore, the *first* and *second* MYLF habitat assessments were performed in 2001. He told TLC that the nearest recorded location of MYLF, in the San Bernardino National Forest, was in the City Creek area near confluence of the forks of the creek southeasterly of the intersection of Hwy. 18 and Daley Canyon Road.

- **2003 Contact**: Mr. Loe was contacted on July 14, 2003, to (1) notify him that the *third* MYLF habitat assessment was being performed on the property in 2003 and (2) obtain the most current MYLF location data for the San Bernardino Mountains. Mr. Loe confirmed that the nearest MYLF record was still in the City Creek area southeasterly of the intersection of Hwy. 18 and Daley Canyon Road.

A-2. Results of State Records Search for the MYLF

- *No* CNDDB occurrence records for MYLF are recorded within the boundaries of the Church of the Woods property: APNs 336-101-06 and 336-101-07.
- The nearest *off-site* recorded location of MYLF is approximately 2.5 miles southeasterly of the intersection of Hwy. 18 and Daley Canyon Road in the "City Creek area near confluence of forks of the creek, 4.5 miles NNE of Highland, San Bernardino National Forest" (CDFG, 2003a, b, c, d).

B. 2003 *FIELD SURVEY* INVESTIGATION RESULTS

B-1. Results of MYLF Habitat Assessment Field Surveys

MYLF habitat assessment surveys were conducted over the proposed church project site in 2003 and 2001. The results of the *Field Surveys* are summarized below.

- *No* suitable MYLF habitat was observed onsite in 2003. This confirms the negative findings of the August 26, 2001 habitat assessment field survey that:

  > the project site "is primarily closed-canopied forest" (La Haye, 2001). MYLF require sunny (well-illuminated) riverbanks and rocky stream courses with open margins that gently slope up to a depth of ca. 5-8 cm (2-3 inches), meadow streams, isolated pools, and lakes. Therefore, since "APN 336-101-06 is primarily closed-canopied forest" "*no* mountain yellow-legged frog habitat exists on this property" (La Haye, 2001).

B-2. Results of Searches for MYLF Individuals

Since the 2003 MYLF habitat assessment was performed during the April-June (July) MYLF breeding season, searches were also conducted for MYLF individuals over the Church of the Woods property on the following dates: June 21 and July 9, 2003 by TLC biologists Thomas Leslie and Nadya Leslie ***AND*** June 30 to July 5, 2003 by Mr. Philippe Vergne, the owner of ENVIRA. The results of the *Field Surveys* are as follows.

- **In 2003**, MYLF were ***not*** located onsite during focused MYLF habitat assessment investigations performed by TLC biologists: Thomas Leslie and Nadya Leslie on June 21 and July 9, 2003. In addition, none were observed by TLC associate biologist Mr. Philippe Vergne during field surveys he performed onsite between June 30 and July 5, 2003. According to Mr. Vergne:

  > "The main drainage bisecting the property is fed by a spring at the lower end of the property. Flowing water also occurs in this section of the drainage. Neither of these two areas supported amphibian species at the time of the surveys" (ENVIRA, 2003).

- **In 2001**, MYLF were ***not*** located onsite during two separate focused MYLF habitat assessment investigations performed by three different biologists: Thomas Leslie and Nadya Leslie on (August 26, 2001) and William S. La Haye (September 6, 2001). Due to the absence of potential MYLF habitat elements on the property required by the MYLF. Mr. La Haye concluded in September 2001 that

  > "APN 336-101-006 is primarily closed-canopied forest..." and "no mountain yellow-legged frog habitat exists on this property" (La Haye, 2001).

VII. PROBABILITY TO OCCUR ONSITE

It is extremely unlikely that MYLF could occur on the Church of the Woods property for the following reasons:

- ***No*** suitable MYLF habitat occurs on the Church of the Woods property.
- ***No*** MYLF individuals were observed onsite, during field surveys performed by four different biologists with three different biological consulting firms, during two different years: 2003 and 2001.

IX. THE NEED FOR ADDITIONAL MYLF INVESTIGATIONS

No additional focused MYLF field surveys or investigations are recommended on APN 336-101-06 (Church of the Woods).

Please call me if you have any questions or require additional information regarding this letter report.

Respectfully Submitted,

THOMAS LESLIE CORPORATION

T. Leslie

Thomas A. Leslie, President/BS-MS Biologist

TAL/nvl

REFERENCES

California Department of Fish and Game (CDFG), July 15, 2003a, Natural Diversity Data Base (NDDB) *Rare Find Records Search Report* for the 1996, United States Department of the Interior Geological Survey's (USGS) Harrison Mtn., CA, 7.5 Minute Series Topographic Quadrangle Sheet, Scale 1:24000.

California Department of Fish and Game (CDFG), July 30, 2003b, Natural Diversity Data Base (NDDB) *Quadrangle Velum Overlay* No. 34117B2 for the 1996, United States Department of the Interior Geological Survey's (USGS) Harrison Mtn., CA, 7.5 Minute Series Topographic Quadrangle Sheet, Scale 1:24000.

California Department of Fish and Game (CDFG), July 15, 2003c, Natural Diversity Data Base (NDDB) *Rare Find Records Search Report* for the 1996, United States Department of the Interior Geological Survey's (USGS) Lake Arrowhead, CA, 7.5 Minute Series Topographic Quadrangle Sheet, Scale 1:24000.

California Department of Fish and Game (CDFG), July 2, 2003d, Natural Diversity Data Base (NDDB) *Quadrangle Velum Overlay* No. 34117C2 for the 1996, United States Department of the Interior Geological Survey's (USGS) Lake Arrowhead, CA, 7.5 Minute Series Topographic Quadrangle Sheet, Scale 1:24000.

ENVIRA, August 25, 2003, White-eared Pocket Mouse Trapping Survey, Church of the Woods, Rim Forest, California.

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W. J. McKeever, Inc., May 7, 2003, 1 Inch = 50 Feet Map: *Church of the Woods and Lake Arrowhead Christian School, Tentative Parcel Map No. 16155.*

W. J. McKeever, Inc., May 7, 2003, 1 Inch = 50 Feet Map: *Church of the Woods and Lake Arrowhead Christian School, Conditional Use Permit Site Plan.*

Thomas Leslie Corporation

Completion of a 2003 White-Eared Pocket Mouse Trapping Survey

October 2, 2003

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
Church of the Woods
c/o: ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

October 2, 2003

SUBJECT: Completion of a 2003 White-eared Pocket Mouse Trapping Survey

Dear Mr. Hopkins:

Please find enclosed a report documenting the completion of a 2003 White-eared Pocket Mouse (WEPM) trapping surveys. Our subconsultant ENVIRA performed the trapping surveys.

A. TRAPPING STUDY RESULTS

A-1. WEPM

As documented by the report the "trapping surveys confirmed the absence of the species (WEPM) from the site and no mitigation measures should be required" (ENVIRA, 2003). This is the second WEPM trapping study performed over the project site by Mr. Philippe Vergne, the owner of ENVIRA. The first study performed by Mr. Vergne was dated December 11, 2001. The results of the 2003 "trapping survey re-confirmed the absence of the white-eared pocket mouse on the project site" (ENVIRA, 2003).

A-2. San Bernardino Flying Squirrel (*Glaucomys sabrinus californicus*; SBFS)

In addition to the mouse, ENVIRA's investigations, and report, also addressed the potential for the SBFS to occur onsite. ENVIRA's report states that (a) suitable habitat exists on site for the SBFS in the montane coniferous forest habitat of the Church of the Woods project site and (b) the "species was captured on the project site" in 2003.

B. VALIDITY OF SURVEY RESULTS

According to the US Fish and Wildlife Service, the results of the trapping survey report are valid for one year from the date of the last trapping survey was completed: July 5, 2003. Therefore, the report is valid through July 5, 2004. If project processing has not been completed by July 5, 2004, another study may be required to confirm the continued absence of the WEPM from the property.

RECOMMENDATION REGARDING THE SBFS

- The presence of the SBNF onsite "should be discussed with the U.S. Forest Service to determine what, if any, mitigation will be required" (ENVIRA, 2003).

Please call me if you have any questions regarding ENVIRA's report.

Respectfully Submitted,
THOMAS LESLIE CORPORATION

A. Leslie

Thomas A. Leslie
President

TAL/nvl// PH-100203-WEPM & SBFS Surveys Results

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233

White-eared Pocket Mouse Trapping Survey
Church of the Woods
Rim Forest, California

prepared for:

Thomas Leslie Corporation
42143 Avenida Alvarado, Unit B2
Temecula, CA 92590
909- 296- 6232

This report was prepared in accordance with professional requirements and recommended protocols for general biological assessments.		
Philippe Vergne ENVIRA 23849 Gymkhana Road, Ramona, CA 92065 760-788-0450 email PHVERGNE@aol.com		Date: August 25 of 2003

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Appendix A - Plant Species Observed
Appendix B - Wildlife Species Observed
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Introduction

Philippe Vergne of ENVIRA conducted a focused trapping survey for the Church of the Woods project located in the Rim Forest community of the San Bernardino Mountains, San Bernardino County. The work was intended to identify the potential for impacts to the white-eared pocket mouse (*Perognathus alticolus alticolus*) as a result of facility construction. The site is currently in open space.

Project Location and Description

The project is located in the community of Rim Forest off of State Route 189 (Figure 1). It lies to the west of State Route 189 and north of Highway 18. The property is in Section 29, Township 2 north, Range 3 west on the Harrison Mountain 7.5′ quadrangle, San Bernardino baseline and meridian .

The project is the construction of a youth camp, recreational areas, roads, parking areas and other support facilities.

Methods

Research

We reviewed available information on the known sensitive resources in the area. The literature review included a review of standard field guides and texts on sensitive and non-sensitive biological resources, as well as the following sources:

o List of sensitive biological resources provided by the California Natural Diversity Data Base

o *Mammalian Species of Special Concern in California,* listing on the white-eared pocket mouse (*Perognathus alticolus alticolus*), Remsen, 1978.

o *California's Wildlife,* listing for the white-eared pocket mouse (*Perognathus alticolus*), Zeiner, et al, 1990.

o Mammals of the Pacific States, Ingles, 1965.

We also reviewed other available technical information on this species, and discussed recent findings with researchers in the field. We also reviewed other available technical information on the biological resources of the site, including

Field Surveys

Field and trapping surveys were conducted by Mr. Philippe Vergne from June 30 to July 5, 2003. The site was surveyed using standard survey techniques for biological assessments in order to determine the best location for setting the trap lines. Sign surveyed for included tracks, scat, burrows, and habitat. During the surveys, notes were made on the plant and animal species observed, the surface characteristics and topography of the project area, and the suitability of the habitat for the white-eared pocket mouse.

Trapping Studies

ENVIRA conducted trapping according to protocols established for the Pacific pocket mouse (*Perognathus longimembris pacificus*), a related species found in Southern California. The protocol calls for five nights of trapping, conducted when the animal is active above-ground at night and preferably during a new moon phase. We placed the traps in suitable habitat areas on the project, concentrating on locating traps in areas containing small mammal burrows and suitable soils for the white-eared pocket mouse. All trap were left in place to ensure the same trap sites were trapped each night.

Each trap was baited with the bait placed at the back of the traps. Traps were opened at dusk each night and inspected at night and at dawn each day. All animals were identified and released at the point of capture.

Notes were taken on the habitats where the traps were placed, and recorded soil and other relevant characteristics. We also noted the weather conditions at the time of the trapping studies.

Results

Research

Potential habitat for the white-eared pocket mouse and the San Bernardino flying squirrel was observed on site.

White-eared Pocket Mouse

The white-eared pocked mouse is rarely found during general trapping studies, having an historical distribution limited to isolated montane areas in the Tehachapi and San Bernardino Mountains. Since the original work on the pocket mouse in 1938, this species has only been found in the Tehachapi Mountains.

Information gained from trapping in this region has increased the elevation range to 3500 to 6900 feet, but the current distribution is unknown.

Its preferred habitat is poorly known, but work by researchers has found that the pocket mouse seems to prefer ponderosa and Jeffrey pine forests, and it is uncommonly found in mixed chaparral and sagebrush habitats. The white-eared pocket mouse has once been trapped in a fallow field dominated by Russian thistle (*Salsola tragus*) (California Department of Fish and Game, 1990).

The nearest locality to the project site is to the west, in the vicinity of Strawberry Peak. The populations in this area have been found at elevations of 5400 to 5800 feet. The last time this species was observed in this area was in 1938, and these populations may no longer exist.

Dr. Paul Collins of the Santa Barbara Museum of Natural History has conducted extensive trapping for this species in the Tehachapi Mountains, and has contributed to the information on the elevational range of the animal. He has trapped this species in scrub or open scrub habitats on sandy soils. His trapping sites include areas on old alluvial fans.

San Bernardino Flying Squirrel

The San Bernardino flying squirrel (*Glaucomys sabrinus californicus*) occurs in the San Bernardino Mountains and historically in the San Jacinto Mountains. It has been found in mid to upper elevation coniferous forest plant communities (Stephenson and Calcarone 1999).

Flying squirrels are cavity nesters, using holes in large trees, snags and logs for cover. This species ranges from 5200 to 8500 feet in elevation. The preferred habitat is usually mature, dense conifer forest, typically with white fir, in sites close to riparian areas (Stephenson and Calcarone 1999) with 40 percent or greater canopy.

The available data suggests that, to a certain extent, flying squirrels can coexist with low density development such as organizational camps and cabins, but higher density areas may be avoided by this species (Stephenson and Calcarone 1999).

This species is listed as a Forest Service Sensitive Species.

Field and Trapping Surveys

Weather

The weather was warm, in the low fifties at night and the low eighties (degrees Fahrenheit) during the day, with calm conditions. The skies were clear throughout the survey.

Soils and Topography

The soils are fairly uniform over the project site, consisting primarily of decomposed granite and silt. Overlaying the soils on thirty percent of the sites trapped was a moderately thick organic duff layer of pine needles and oak leaves.

The site and surrounding terrain is hilly to mountainous.

Plant Communities

The property supports two plant communities. Montane coniferous forest is the dominant plant community, covering close to 100 percent of the site.

The second plant community is riparian. This plant community occurs along the main drainage bisecting the property. This drainage is adjacent to one of the water and sewer easements on site.

The montane coniferous forest community forms a high quality habitat on the property. The dominant plant species includes Jeffrey pine (*Pinus jeffreyi*), Ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*) and black oak (*Quercus kelloggii*). Tree cover varies from 20 to approximately 70 percent. Some historical logging and fire scarring is evident on the property. Herbaceous cover in this plant community was approximately 30 percent at the time of the survey. The plant communities are fully described in the general biological assessment report prepared for the project by Thomas Leslie Corporation. A complete list of plant species recorded during the current surveys can be found in Appendix A.

Wildlife

Wildlife observations made during the survey were dominated by mammal and bird species. Observations of wildlife included scat, tracks, burrows, nests, calls, and individual animals.

The main drainage bisecting the property is fed by a spring at the lower end of the property. Flowing water also occurs in this section of the drainage. Neither of these two areas supported amphibian species at the time of the surveys.

The main drainage bisecting the property is fed by a spring at the lower end of the property. Flowing water also occurs in this section of the drainage. Neither of these two areas supported amphibian species at the time of the surveys.

The side-blotched lizard, and granite spiny lizard were the only reptile species observed. Bird species observed included Stellar's jay, mountain chickadee and acorn woodpecker, mountain bluebird and evening grosbeak. Several mammal species were observed foraging on site, including gray squirrel, coyotes, and a skunk. Sign belonging to Botta's pocket gopher was also observed.

Disturbances

Disturbances on the property are limited to existing road and paths. The roads and paths have not seen much use other than hiking and mountain biking. At the entrance to the southeastern corner of the site there is s small area that has been used for picnicking and drinking parties. Other disturbance included logging (in the past), fire episodes and vehicle disturbance from routine maintenance activities along the sewer easement. The level of disturbance is low.

The surrounding properties include a housing development to the west, the town of Blue Jay to the north, State Route 189 to the east and State Route 18 to the south.

White-eared Pocket MouseTrap Sites

The sites selected were those located in suitable habitat and correspond to the areas trapped in 2001. The trapping areas are located in openings within the forest canopy. The ground cover on these sites consisted of a variety of grasses and annual wildflowers, with zero to less than 30 percent cover. All trap sites had relatively soft sandy soils. The six sites selected for trapping are shown on Figure 2.

Trap Sites A, B, C and F were located in open coniferous forest intermixed with sparse oaks. The soils were sandy. Bracken ferns were present in sections of the trapping lines.
Trap Sites D and E were located along the water and sewer easement in adjacent open spaces. Soils were composed of a mix of sandy and decomposed granite.

Trap Results

ENVIRA did not trap any individuals of white-eared pocket mouse. Table 1 provides information on the species trapped per site and includes the summarized results of the 2001 trapping survey.

Results of the trapping survey re-confirmed the absence of the white-eared pocket mouse on the project site. There are no significant direct impact to the species due to project implementation

Table 1. Trapping Results for the Church of the Woods Project

(Phylogenetic listing per Jameson & Peters, California Mammals, 1988)

Trap Site	Trap Nights	DIAG	PEBO	CHFA	PEMA	NELE	TAME	GLSA
Total 2001	1,035	2	37	3	8	3	3	
A	150		11	1	4			1
B	150	4	14		5		3	
C	150		7		4		2	
D	150		5					
E	150		9		7			
F	150		8		4			
TOTAL	**900**	**4**	**54**	**1**	**24**		**5**	**1**

Legend

DIAG - *Dipodomys agilis,* Pacific kangaroo rat
PEBO - *Peromyscus boylii,* Brush mouse
CHFA - *Chaetodippus fallax fallax,* Northwestern San Diego pocket mouse
PEMA - *Peromyscus maniculatus,* Deer mouse
NELE - *Neotoma lepida,* Desert woodrat
TAME - *Tamias merriami,* Merriam's chipmunk
GLSA *Glaucomys sabrinus californicus* , San Bernardino flying squirrel

The montane coniferous forest habitat is suitable and currently occupied by the San Bernardino flying squirrel and may be impacted by proposed construction and related human activities.

Discussion

Plant Communities

The proposed project will mostly impact the coniferous forest community on the property. Since this community is relatively common in the San Bernardino Mountains, the impacts are not considered to be significant.

Wildlife

Reduction of native plant communities through project development will result in the reduction of numbers of wildlife individuals in this area of the San Bernardino Mountains. Smaller and less mobile species, such as small mammals, reptiles and most invertebrates, will experience a direct reduction in population numbers through the loss of individuals resulting from destruction of habitat and direct individual mortality.

Larger or more mobile species, such as large mammals and birds, could experience some loss of individuals as a result of the loss of habitat. Loss of individuals from direct mortality is less than for smaller species, since most mobile animals will leave an area with high human disturbance.

Impacts to non-sensitive wildlife are not considered to be significant.

Sensitive Biological Resources

White-eared Pocket Mouse

Trapping surveys confirmed the absence of the species from the site and no mitigation measures should be required.

San Bernardino Flying Squirrel

Suitable habitat exists for the flying squirrel throughout the site. This species is listed as a Forest Service Sensitive Species, which makes the significance of impacts difficult to determine. This issue should be discussed with the U.S. Forest Service to determine what, if any, mitigation will be required.

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Appendix A - Plant Species Observed

* denotes non-native species

GYMNOSPERMAE NAKED SEED PLANTS

Dennstaedtiaceae **Bracken family**

Pteridium aquilinum	Bracken fern

CONIFERAE CONE-BEARING PLANTS

Cupressaceae **Cypress family**

Calocedras decurrens	Incense cedar

Pinaceae **Pine family**

Abies concolor	White fir
Pinus coulteri	Coulter pine
Pinus jeffreyi	Jeffrey pine
Pinus lambertiana	Sugar pine
Pinus ponderosa	Ponderosa pine

ANGIOSPERMAE: DICOTYLEDONES DICOT FLOWERING PLANTS

Apiaceae **Carrot family**

Sanicula graveolens	Montane yellow-flowered sanicle

Asteraceae **Sunflower family**

Erigeron divergens	Common fleabane daisy
Eriophyllum lanatum	Montane woolly daisy
Solidago californica	California goldenrod

Brassicaceae **Mustard family**

Erysimum capitatum	Western wallflower

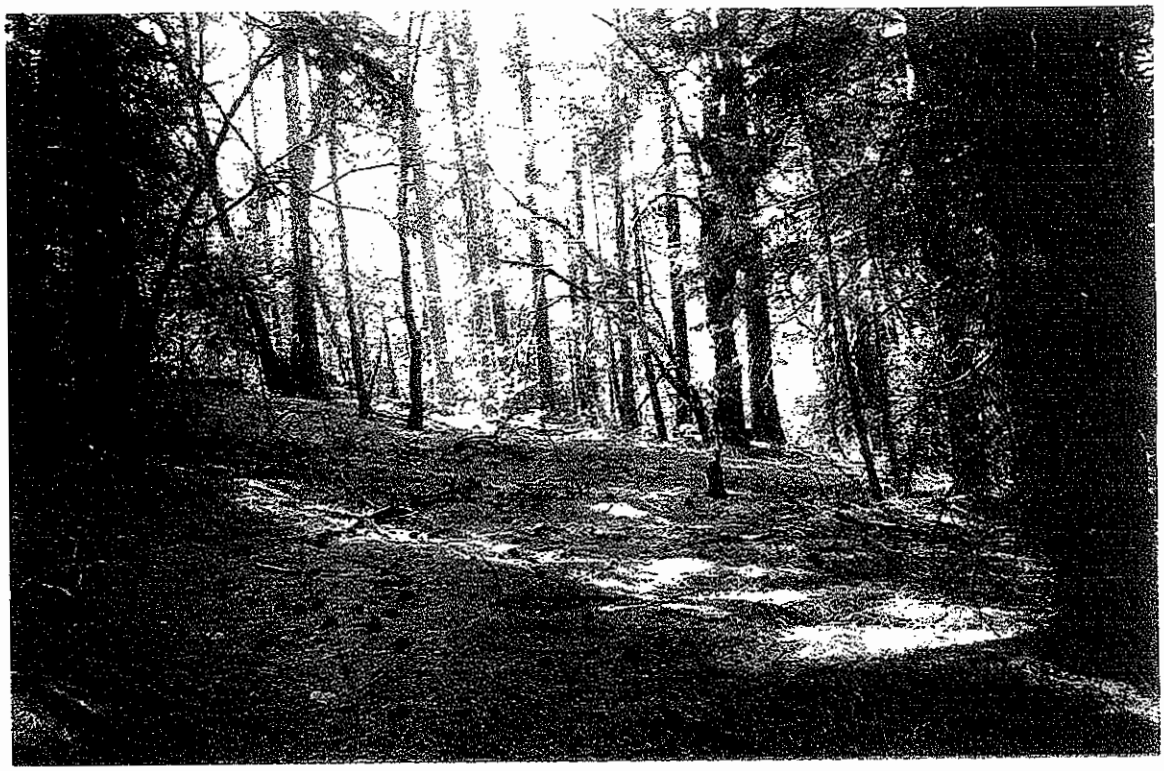
Ericaceae **Heath family**

Arctostaphylos sp.	Manzanita

Fabaceae **Pea family**

Lotus crassifolius	Large-flowered lotus
Lupinus latifolius	Flat-leaved lupine
Lupinus microcarpus	Small seeded lupine

PICTURE ONE - ON SITE OPEN CANOPY WITH LIGHT DUFF LAYER



PICTURE TWO - ON SITE OPEN AREAS WITHIN DENSER CANOPY

Fagaceae **Oak family**

Quercus chrysolepis	Canyon oak
Quercus kelloggii	Black oak

Hydrophyllaceae **Waterleaf family**

Phacelia sp.	Phacelia

Polygonaceae **Buckwheat family**

Eriogonum saxatile	Montane buckwheat
Eriogonum fasciculatum	California buckwheat

Portulacaceae **Purslane family**

Claytonia perfoliata	Miner's lettuce

Rhamnaceae **Buckthorn family**

Ceanothus integerrimus	Deer brush
Rhamnus californica	Coffeberry

Rosaceae **Rose family**

Potentilla glandulosa	Resinous cinquefoil

Saxifragaceae **Saxifrage family**

Ribes cereum	Squaw currant

Scrophulariaceae **Snapdragon family**

Castilleja applegati	Montane Indian paintbrush
Penstemon spectabilis	Chaparral beard's tongue

Viscaceae **Mistletoe family**

Phoradendron macrophyllum	Big-leaf mistletoe

ANGIOSPERMAE: MONOCOTYLEDONAE **MONOCOT FLOWERING PLANTS**

Iridaceae **Iris family**

Iris hartwegii	Mountain iris

Poaceae **Grass family**

Bromus ciliatus	Fringed brome
**Bromus tectorum*	Cheatgrass

Taxonomy and nomenclature follow Hickman 1993 and Munz 1974.

Appendix B - Wildlife Species Observed

REPTILIA **REPTILES**

Iguanidae **Iguanas and their allies**

Sceloporus orcutti	Granite spiny lizard
Uta stansburiana	Side-blotched lizard

AVES **BIRDS**

Picidae **Woodpeckers and relatives**

Melanerpes formicivorus	Acorn woodpecker

Corvidae **Crows and ravens**

Cyanocitta stelleri	Stellar's jay
Corvus corax	Common raven

Paridae **Titmice**

Parus gambeli	Mountain chickadee

Sittidae **Nuthatches**

Sitta carolinensis	White-breasted nuthatch

Turdidae **Thrushs**

Sialia currucoides	Mountain bluebird

Emberizidae **Warblers, sparrows, blackbirds and relatives**

Junco hyemalis	Dark-eyed junco

MAMMALIA **MAMMALS (Other than Trapped)**

Sciuridae **Squirrels, chipmunks and marmots**

Sciurus carolinensis	Gray squirrel

Geomyidae **Pocket gophers**

Thomomys umbrinus	Botta's pocket gopher

Mustelidae **Weasels and Allies**

Mephitis mephitis	Striped Skunk

Nomenclature follows Laudenslayer et al., 1991, Hall, 1981 and Stebbins, 1966.

FIGURE ONE - CHURCH OF THE WOODS SITE VICINITY AND PROJECT MAP

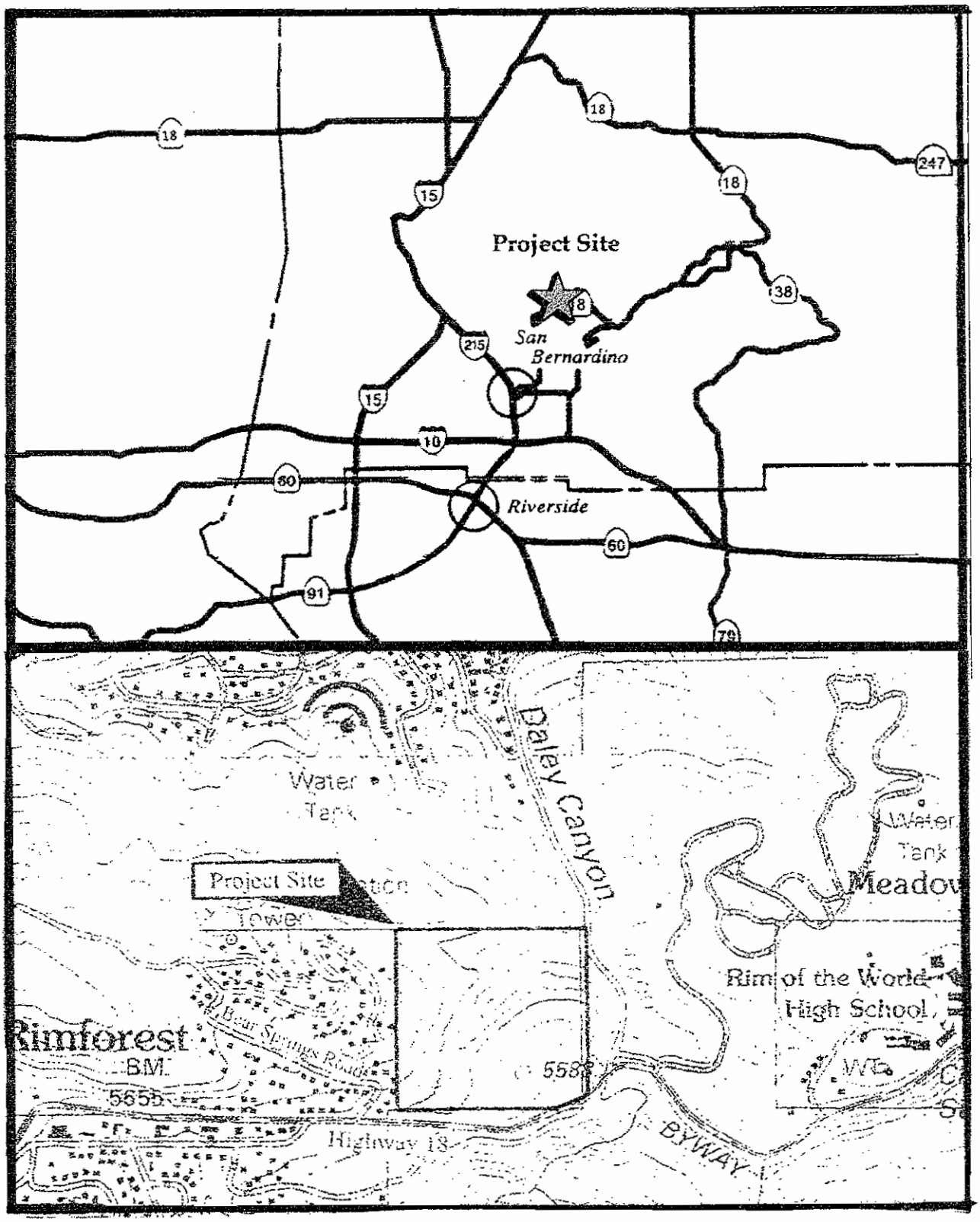
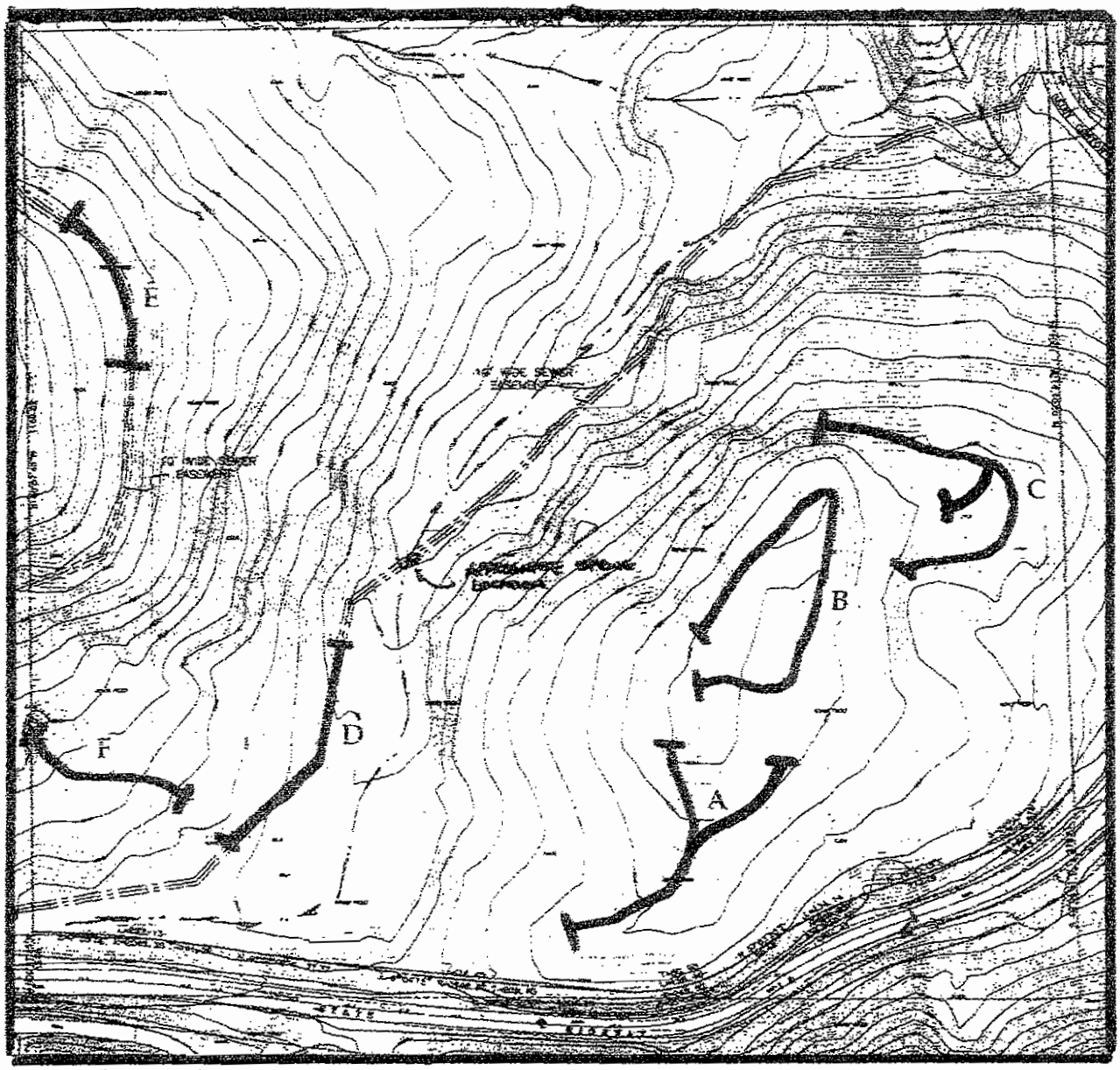


FIGURE TWO - CHURCH OF THE WOODS TRAPLINES



Base Map: Thomas Leslie and Associates, Inc.

Legend

A Trapline

N

Feet
(approximate)

0 117.5 235

Church of the Woods
Rim Forest
San Bernardino County, California

Thomas Leslie Corporation

Results of a Focused Southern Rubber Boa Surveys

June 10, 2002

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Raul Rodriguez
California Department of Fish ad Game
4775 Bird Farm Road
Chino Hills, California 91709

June 10, 2002

Subject: Results of Focused Southern Rubber Boa Surveys

Dear Mr. Rodriguez:

Thomas Leslie Corporation (TLC) was retained to determine the presence or absence of the Southern Rubber Boa (*Charina bottae umbratica*; SRB) within the boundaries of *Church of the Woods* property (property). The property, a 38± acre parcel, is comprised of two Assessor's Parcel Numbers: 336-101-06 and 336-101-07.

This letter report summarizes the methodologies and findings of focused surveys conducted for the state listed threatened SRB.

I. SUMMARY OF SRB SURVEY FINDINGS

- No SRB were discovered within the boundaries of the property during comprehensive surveys conducted between April 7 and 27, 2002.
- Photo Plate Nos. 1-3, located in Appendix A, provide representative photographs of the onsite conditions.
- Lists of all plant and wildlife species identified within the boundaries of the property, during April 2002 field surveys, are provided in Appendices B and C, respectively.
- Due to the careful thorough nature of the SRB surveys, and experience with locating SRB in 2002, it is our opinion that if present onsite SRB would have been identified.

II. PROPERTY AND PROJECT DESCRIPTION

A. Survey Area Location

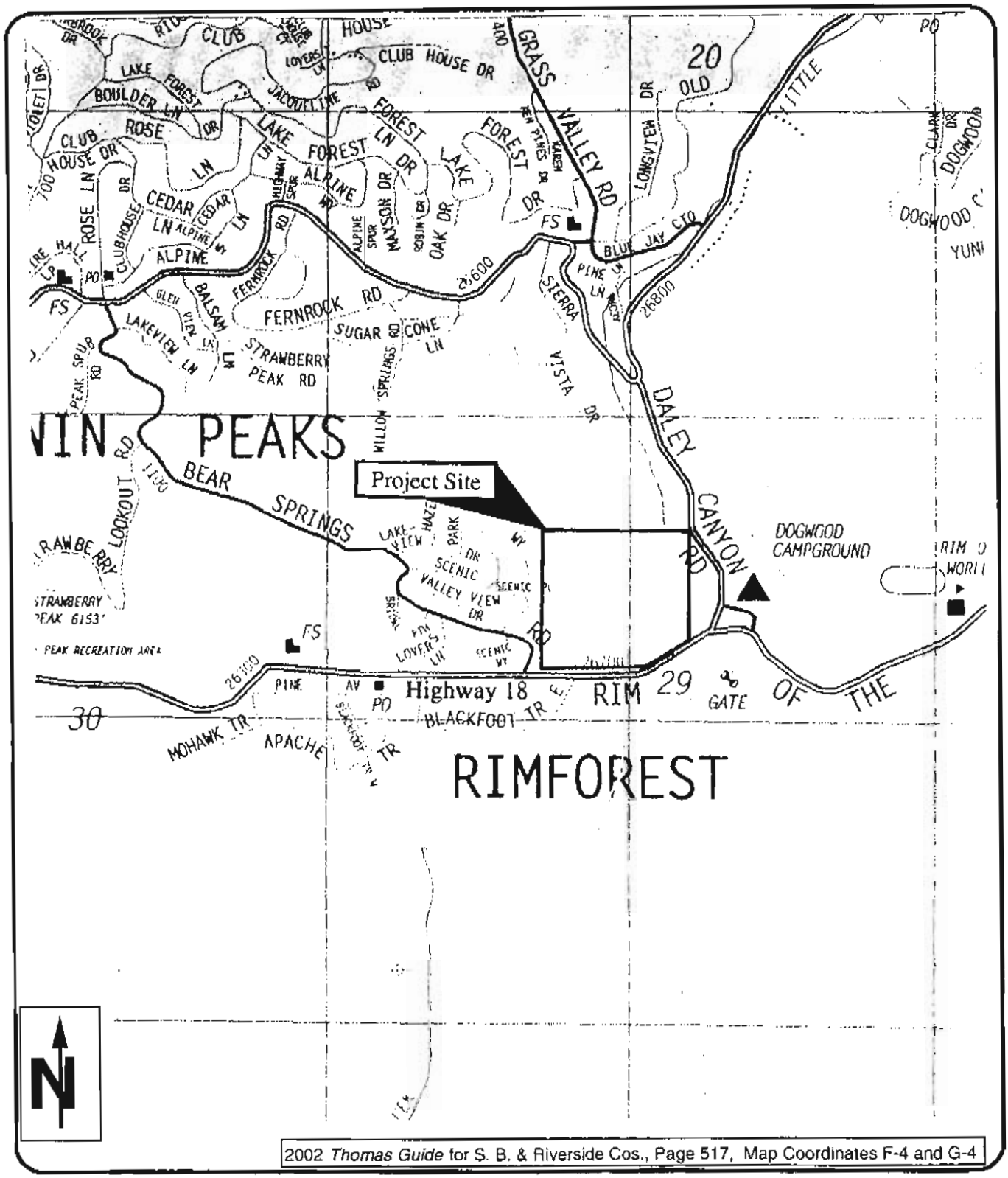
From a regional perspective, the property is located in San Bernardino County, California. Regional access to the property is provided by the Rim of the World Highway (State Highway 18; Hwy. 18).

More specifically, the property is located northwest of the intersection of Hwy 18 and Daley Canyon Road.

- Figure 1 illustrates the approximate boundaries of the property on the 2002 *Thomas Guide San Bernardino and Riverside Counties Street Guide And Directory* on Detail map page 517, map coordinates F-4 and G-4.
- Figure 2 plots the approximate boundaries of the property in the NW quadrant of Section 29, Township 2 North, Range 3 West; of the 1996 Harrison Mountain, California 7.5' United States Geological Survey (USGS) Topographic Quadrangle.

B. Project Description

As illustrated on W.J. McKeever, Inc., February 18, 2002, 1 inch = 80 feet scale *Preliminary Site Plan*, the project proposed involves construction of a baseball field, school and parking, school play yard, church sanctuary, youth/multi-purpose building, chapel and volleyball courts. A draft copy of the *Preliminary Site Plan* is provided in Appendix D.



2002 *Thomas Guide* for S. B. & Riverside Cos., Page 517, Map Coordinates F-4 and G-4

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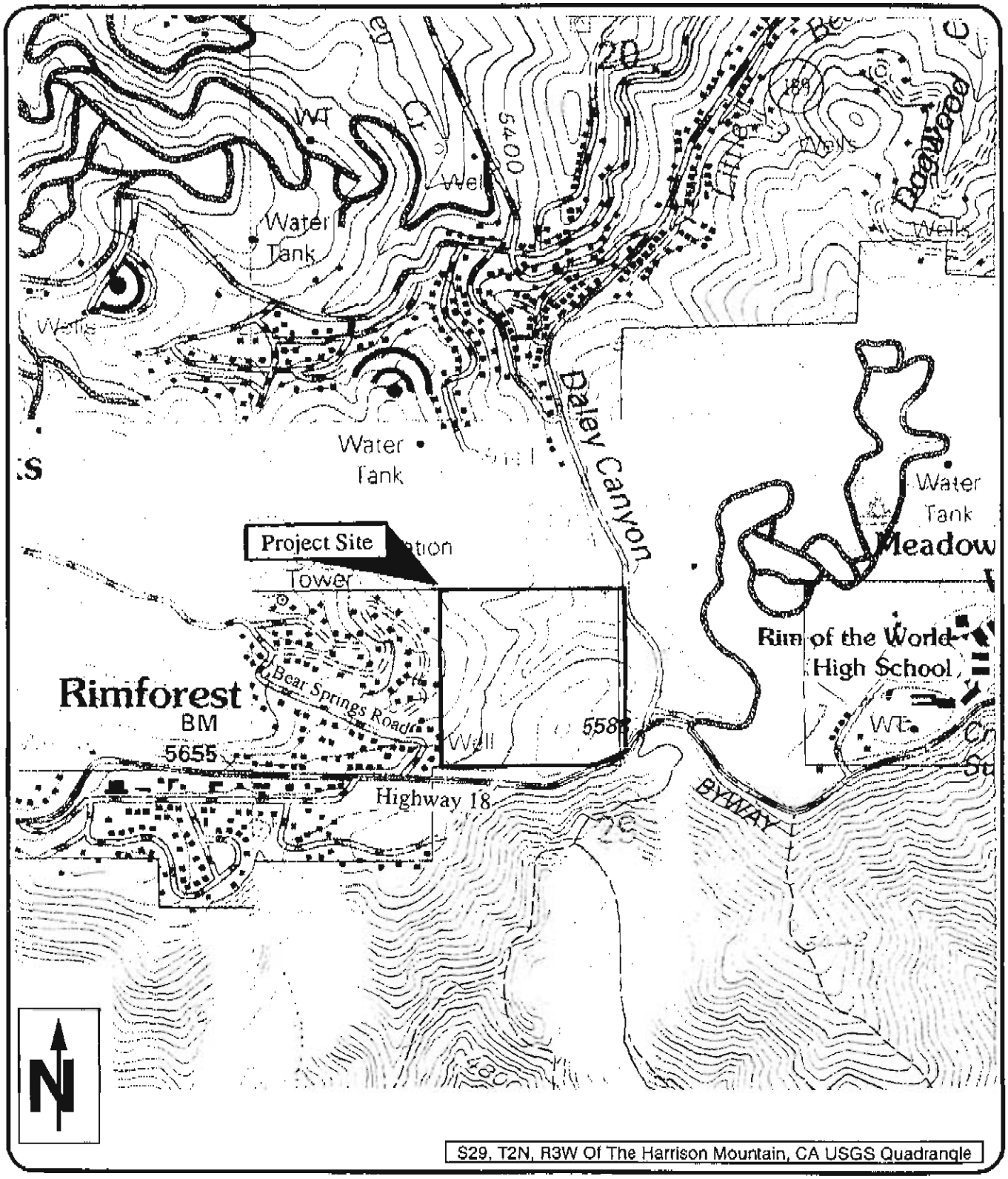
BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1
Vicinity Map

Illustrating Approximate Boundaries Of
APNs 336-101-06 and -07



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BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 2

Approximate Boundaries Of APNs 336-101-06 and -07

Plotted On A USGS Quadrangle Map

III. RESULTS

This section was prepared in accordance with the *Draft Survey Guidelines For Southern Rubber Boa (Charina bottae umbratica)* (CDFG, 2001).

A. SITE ANALYSIS

As illustrated on the *San Bernardino County Official Land Use Plan* map (SBC, 2000), the property is located within SRB habitat. Figure 3 provides a portion of the County land use plan map containing the property. Furthermore, since onsite elevation ranges from 5,620 (southeastern corner of the property) to 5,740 (western portion of the property) feet above mean sea level (msl), the property is within the elevational range of the SRB: 4,900 to 8,200 feet above msl.

B. HABITAT ASSESSMENT

SRB inhabit mixed-conifer and oak-conifer forests, in the "vicinity of streams or wet meadows," at elevations between 4,900 and 8,200 feet. SRB require loose, moist soil for burrowing and they seek cover in rotting logs. As illustrated on the *San Bernardino County Official Land Use Plan* maps (SBC, 2000), the property is located within the boundaries of historic SRB habitat.

Potentially suitable SRB habitat is present onsite and includes (a) small to large sized downed (fallen) logs, (b) previously cut tree stumps, (c) rock outcrops, (d) piles of leaves and branches, (e) litter/duff (decomposed and partially decomposed vegetable matter) and (f) a few small openings in the Western Ponderosa Pine Forest cover with a sparse cover of Bracken Fern (*Pteridium aquilinum*) and other herbaceous plants. Photo Plate Nos. 1-3 provide representative views of onsite SRB habitat. A more detailed description of the property is provided below.

B.1. Topography, Slope and Aspect

B-1.1. Topographic Topography: A copy, of the topographic map of the property prepared by W. J. McKeever, Inc (WJM, 2001b), is located in Appendix E. It provides detailed information regarding topography, slope and aspect of the property.

B-1.2 Slope and Aspect: As illustrated on Figure 2 and Appendix E maps, the relatively steep onsite slopes face all compass directions. All of the types of potentially suitable SRB habitat described above were observed on all slopes over the entire property.

B-1.3 Church of the Woods Property Map: A topographic map of the property, located in Appendix E, graphically provides information regarding topography, slope and aspect of the church property (WJM, 2001).

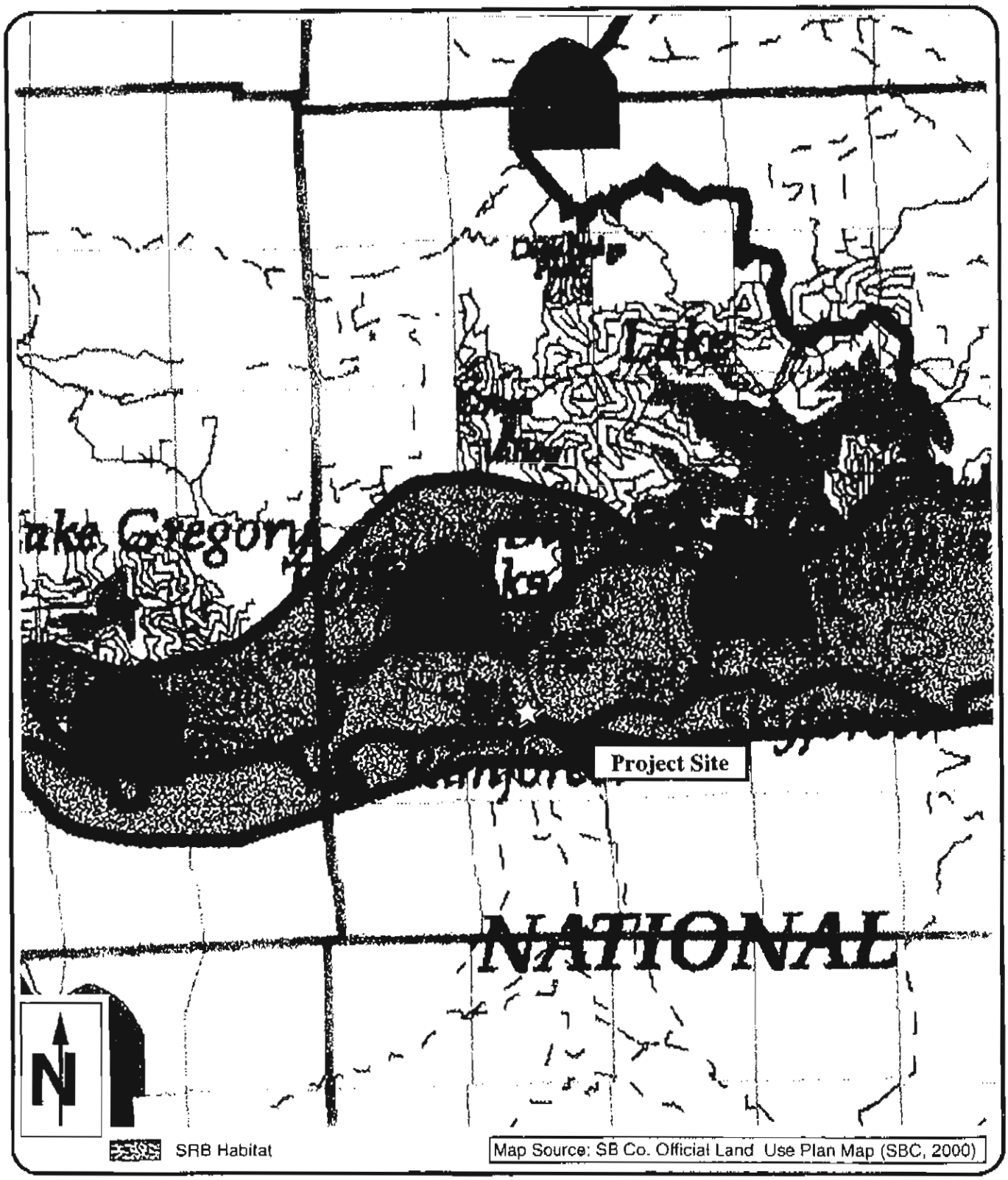
B.2. Map of Potential SBR Habitat on the property

Potentially suitable SRB habitat (fallen logs, litter/duff and rock outcrops) occurs randomly across the entire property, on all slopes, and compass directions.

B.3. Vegetation Map

The *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property – Westside Ponderosa Pine Forest (Figure 4). In addition, Riparian Habitat and Ruderal/Disturbed non-habitat vegetational association was identified within the boundaries of the property. The onsite habitat types are briefly discussed below.

Forest Habitat: In general, the tree canopy of the property is relatively continuous with few openings. Westside Ponderosa Pine Forest is the major habitat type of the project site. It covers "close to 100 percent of the site" (NRA, 2001). The other common tree species of this forest include Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*) and Black Oak (*Quercus kelloggii*). Shrub layer is represented by Mountain Pink Currant (*Ribes* nevadense), Mountain Dogwood (*Cornus nuttallii*), Deer Brush (*Ceanothus integerrimus*) and California Coffeeberry (*Rhamnus californica*). Tree cover "varies from 20 to approximately 70 percent" (NRA, 2001). Scattered Western Bracken (*Pteridium aquilinum* var. *pubescens*) occurs in the herb layer. Herbaceous layer covers "approximately 30 percent" (NRA, 2001).



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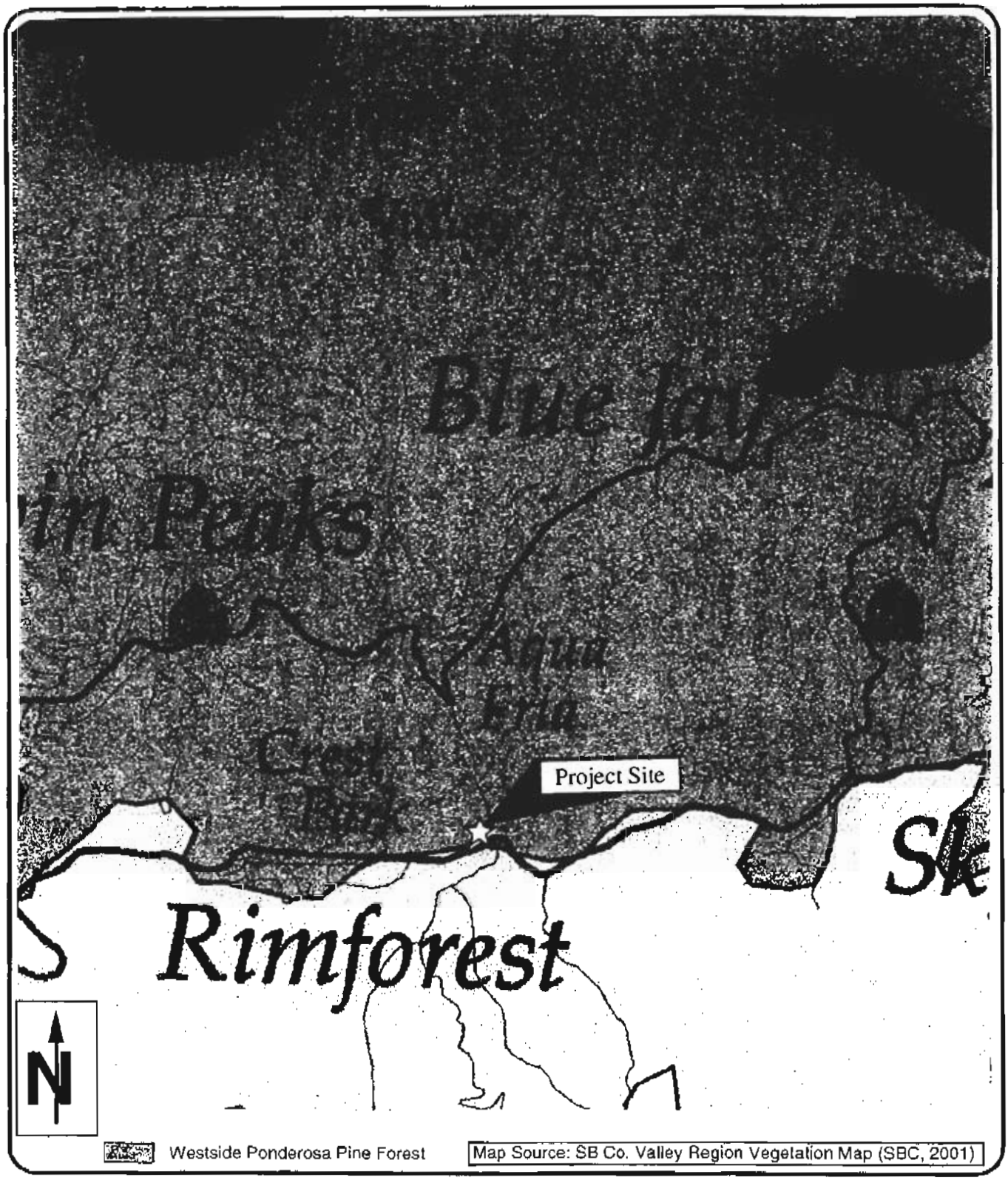
BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 3

SRB Habitat Map



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BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 4

Vegetation Map

For APNs 336-101-06 and -07

Riparian Habitat: The riparian habitat type, visible on Photo Plate No. 3b, occurs along the largest onsite stream. This is the only onsite stream with flowing water. The dominant tree of the onsite riparian habitat is Arroyo Willow (*Salix lasiolepis*). The Mountain Dogwood (*Cornus nuttallii*) dominates the shrub layer.

Ruderal/Disturbed Non-habitat Vegetational Association: Ruderal/Disturbed areas are comprised of a sparse variety of annual, locally common non-native grasses and forbs, and hardy native species, growing like weeds, occur along the old logging roads and skid trails (Photo Plate No. 1a). Plant species commonly occurring within the Ruderal/Disturbed areas of the property include non-native weeds such as Prickly Lettuce (*Lactuca serriola*), Black Bindweed (*Polygonum convolvulus*), Cheat Grass (*Bromus tectorum*), Ripgut Grass (*Bromus diandrus*) and native White Yarrow (*Achillea millefolium*), Common Ragweed (*Ambrosia artemisiifolia*), Tarplant (*Hemizonia paniculata*), Morning Glory (*Calystegia occidentalis*) and California Goldenrod (*Solidago californica*).

B.4. Map Indicating Location of Rocky Outcrops and Downed Logs

The Department's draft 2001 SRB survey protocols recommend preparation of a "map indicating (the) location and number of rocky out-crops, (and the) location and number of downed logs." However, during April 2002 phone conversations with Mr. Raul Rodriguez, it was acknowledged that the preparation of the map was not necessary. Instead, tables provided by John Hatcher and Jim Bridges, showing the square footage of logs and rocky outcrops, were used to calculate the acreages of potentially suitable SRB habitat. The tables are provided in Appendix F.

As documented by the forester's research, 0.671 acres of potentially suitable but unoccupied SRB habitat are present within the boundaries of the property: 0.395 acres of rock outcrops and 0.275 acres of logs.

B.5. Presence and Types of Water Bodies

Several stream courses, exhibiting definable banks and bed, occur onsite. Riparian vegetation and wetlands are associated with the main (largest) stream course (Photo Plate No. 3b). "The main drainage bisecting the property is fed by a spring at the lower end of the property" (NRA, 2001).

B.6. Current and Surrounding Land Use

The existing land uses on and in the vicinity of the property, are briefly described below and illustrated on Figures 1 and 2 and on Appendix D map for the property.

Existing Onsite Land Uses:	The property is currently vacant land. However, the property has been disturbed by construction of a northeast-southwest oriented sewer line onsite and numerous dirt access roads, extensive logging (evidenced by fallen cut logs and cut tree stumps), fires, hiking, mountains biking, etc. (NRA, 2001).
North:	Vacant forest land.
East:	Vacant forest land and Daley Canyon Road. The land easterly of Daley Canyon Road is also vacant.
South:	Highway 18, and further south, vacant, steep, shrub covered slopes.
West:	As illustrated on the Appendix E property map, single-family residential homes, built off Bear Springs Road, occur immediately adjacent to the western property line.

C. PERMITS AND NOTIFICATION

C.1. Permits

Focused SRB surveys were carefully and thoroughly conducted throughout the entire the property. All surveys were performed under the direct supervision of the one, or both, of the following two CDFG permitted biologists:

- Thomas A. Leslie, Ph.D.: CDFG Scientific Collecting Permit No. 801118-03 (expires 03-07-03),
- William S. La Haye, M.S.: CDFG Scientific Collecting Permit No. 801058-01 (expires 04-02-04).

C.2. Notification

Notification regarding the performance of focused SRB surveys on the property, was faxed to Mr. Raul Rodriguez, California Department of Fish and Game on April 8, 2002 (TLC, 2002). Mr. Rodriguez called to discuss the notification on April 10, 2002.

D. CRITERIA FOR NEGATIVE FINDINGS

Draft Survey Guidelines for the Southern Rubber Boa (CDFG, 2001) require the results of three seasons to meet the Criteria for Negative Findings. Although, the property has not been surveyed for "three seasons," It is our opinion that the property is not occupied by SRB for the reasons listed below.

- The entire property was thoroughly searched during seven survey periods conducted on six dates over a four week period in April 2002.
- Five SRB were discovered in the local vicinity easterly of the property in 2002. Therefore, if SRB were present on the church property, they would have been discovered by TLC's experienced SRB survey teams.
- Other secretive herpetiles (Monterey Salamander and Western Skink), smaller that the SRB, were discovered on the church property. Therefore, if SRB had been present onsite they would had been identified.

E. METHODS

E.1. Dates of Surveys

The Department's Draft SRB survey protocols reqnire performance of a "multi-day" spring SRB surveys between 15 March and 15 May (CDFG, 2001). As Table 2 documents, seven focused SRB survey periods were conducted on the property, on six survey days, over a four week period between April 7 and 27, 2002.

E.2. Required Daytime Surveys

- As shown by Column 3 of Table 1, the focused SRB surveys were conducted between 0900-1200 and 1600-1900 hours.
- No summer evening road surveys were performed because the surveys were conducted in the spring.

E-3. Total Time Surveyed

Seven focused SRB surveys were conducted between April 7 and 27, 2002.

The dates and time of each SRB survey and the total number of hours spent surveying for SRB, 57 survey hours, are documented on Table 2.

E-4. Hours of Survey

As Table 2 documents, all surveys were conducted during the mid-morning (0900-1200), and late afternoon/early evening (1600-1900) hours recommended by the Department's *Draft* 2001 SRB survey protocols for surveys performed "on sunny spring days."

Table 1: SUMMARY OF SURVEY DATES, HOURS, FIELD CONDITIONS AND SURVEY PERSONNEL

Survey Week	Survey Date	Survey Hours		Surveyor Hours	WEATHER CONDITIONS							Surveyors
					Temperature In Degrees Fahrenheit		Wind Speed In Miles Per Hour		Relative Humidity In %		Ambient Survey Conditions	
		Start	End		Start	End	Start	End	Start	End		
Week # 1	April 7, 2002	0900	1200	12	42.1	59.8	3.4	0.9	25.0	16.0	100% clear sky, sunny.	TAL NVL WSL SAS
	April 11, 2002	1600	1900	3	71.0	50.0	3.0	0.0	21.0	52.0	100% clear sky	WSL
Week # 2	April 14, 2002	0900	1200	9	63.7	74.1	0.3	1.4	14.0	13.0	100% clear sky, sunny.	TAL NVL SAS
	April 17, 2002	1600	1900	3	50.0	34.0	5.0	0.0	29.0	35.0	100% clear sky	WSL
Week # 3	April 20, 2002	0900	1200	9	41.7	52.1	0.8	1.4	28.0	26.0	100% clear sky, sunny	TAL NVL WSL
Week # 4	April 27, 2002	0900	1200	12	35.7	36.5	0.3	0.4	25.0	32.0	Overcast; some hail fell during survey.	TAL NVL WSL SAS
	April 27, 2002	1600	1900	9	43.4	38.3	0.7	0.9	48.0	73.0	Overcast; some hail fell during survey.	TAL NVL SAS
			Total Surveyor Hours:	57								

Temperatures and wind speeds were measured with a Kestrel 2000 Pocket Thermo Wind Meter. Humidity data for all survey dates, and temperatures and wind speeds for April 11 and 17, were provided by *Desert Research Institute Western Regional Center*.

Surveyors: TAL - Thomas A. Leslie, Ph.D. (Holds current SCP)
WSL - William S. La Haye, M.S. (Holds current SCP)
NVL - Nadya V. Leslie, M.S.
SAS - Shelley A. Sugino, B.S.

E-5. Weather Conditions

- Table 2 provides information regarding weather conditions for each focused SRB survey period including temperature readings (chest height in the shade), humidity and wind and sky conditions at the beginning and end of each survey period.
- No summer evening road surveys were performed because the surveys were conducted in the spring.

E-6. Elevation of Survey

E-6.1. Elevation of Project Site and Potential SRB Habitat

As illustrated on the Harrison Mountain, California 1996 USGS quadrangle (Figure 2), onsite elevations range from 5,620 (southeastern corner of the property) to 5,740 (western portion of the property) feet above msl.

E-6.2. Elevation Range of Survey

The focused SRB surveys were conducted over the entirety of the property, between 5,620 and 5,740 feet elevation.

E-7. Survey Team

- Names of all members of the SRB survey teams are listed on Table 2.
- Background information for each member, of the SRB survey teams, is provided in the Appendix G *Qualifications*.
- All members of the SRB survey teams were degreed biologists experienced in surveys for secretive species. In addition, the survey teams members had discovered five SRB specimens on Tentative Tract Map No. 16185 (TTM 16185) in 2002. TTM 16185 is located in the local vicinity easterly of the church property.

E-8. Presence of CDFG Permitted Biologist

As required by the Draft Survey protocols, at least one of the permitted CDFG biologist listed below was present during each of the seven focused SRB survey periods:

Thomas A. Leslie, Ph.D.: CDFG Scientific Collector's Permit No. 801118-03 (expires 03-07-03)

William S. La Haye, M.S.: CDFG Scientific Collector's Permit No. 801058-01 (expires 04-02-04).

E-9. Methods Used During Survey

SRB survey investigations primarily involve (a) looking under (turning) rocks and logs and (b) inspections in and around rocky outcrops and inspection of rock crevasses and associated leaf litter.

The Department's Draft SRB Survey Protocols made the following recommendations:

- "Each object moved shall be replaced in the same position and condition."
- "The investigation is to be done in the least disruptive manner as possible."
- "Individual judgement shall be used when potential harm to the habitat and the snake is possible"

In general, the potentially suitable SRB habitat of the property was comprised of highly decomposed fallen logs and highly decomposed previously cut pine tree stumps. Therefore, when they were turned they literally "fell apart." Consequently, potential SRB habitat was disrupted to varying degrees during performance of the comprehensive focused SRB investigations. However, even disrupted logs and stumps continue to provide potential habitat for SRB.

F. LITERATURE REVIEW

A list of the literature reviewed is provided in Section IV. *References Cited And Relevant, But Not Cited.*

G. INDIVIDUALS AND AGENCIES CONTACTED.

List of all individuals and agencies contacted is provided in Appendix H.

Please call me if you have any questions regarding this report of findings or require additional information.

Respectfully Submitted,
THOMAS LESLIE CORPORATION

Tom Leslie

Thomas A. Leslie, Ph.D.
President/Biologist

TAL/nvl

APPENDIX A

PHOTO PLATE NOS. 1-3

FOR

CHURCH OF THE WOODS PROPERTY

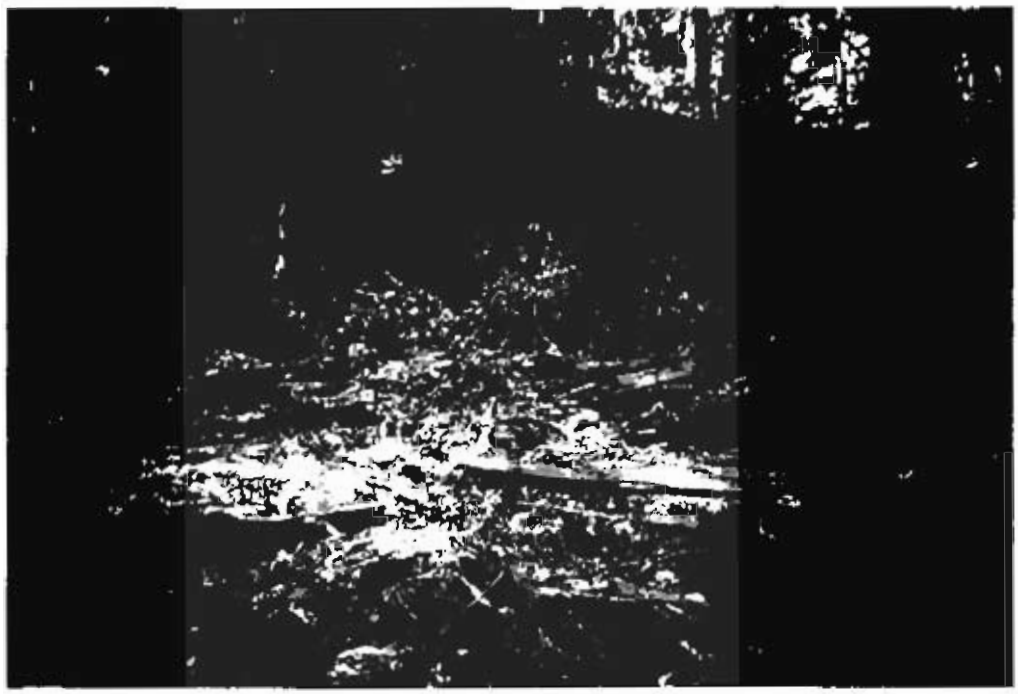
SAN BERNARDINO COUNTY, CALIFORNIA

PHOTO PLATE NO. 1

1a. Southwesterly view of an onsite dirt roadway, sparsely vegetated with Ruderal/Disturbed vegetational association. The roadway is bordered by Westside Ponderosa Pine Forest.

1b. Easterly view of one of the larger sized outcrops on APNs 336-101-06 and -07. All onsite outcrops were carefully and thoroughly searched for Southern Rubber Boa (*Charina bottae umbratica*; SRB).

PHOTO PLATE NO. 2

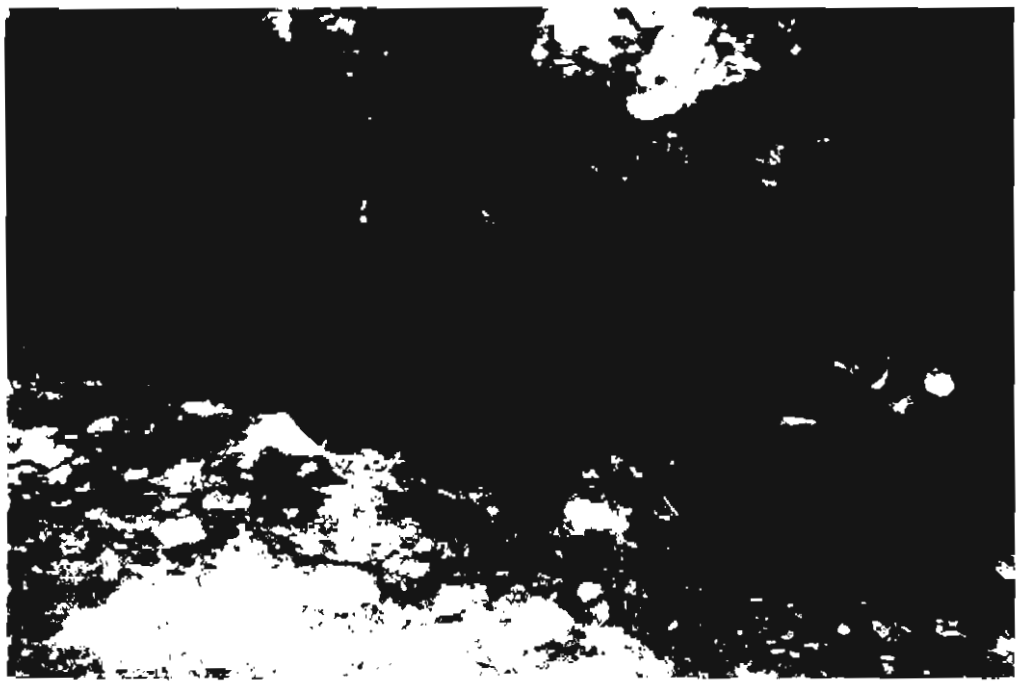


2a. Onsite downed (fallen) logs provide potential habitat for the Southern Rubber Boa. All fallen logs were carefully and thoroughly searched for SRB.

2b. Mr. Bill La Haye, M.S., carefully and thoroughly searching for SRB on APNs 336-101-06 and –07 on April 7, 2002. Mr. La Haye holds a current CDFG Scientific Collector's Permit.

PHOTO PLATE NO. 3

3a. Close-up view of a downed log. All downed logs were carefully and thoroughly searched to ascertain the presence or absence of the SRB.



3b. Close-up view of a pool of water located in the largest onsite stream course situated in the northeast quadrant of the property. No other stream courses have water in them. Since SRB are known to occur in the "vicinity of streams" the stream side environment was carefully and thoroughly searched for SRB.

APPENDIX B

FLORAL COMPENDIUM

FOR

CHURCH OF THE WOODS PROPERTY

SAN BERNARDINO COUNTY, CALIFORNIA

Non-Native 11/73 =15%	SCIENTIFIC NAMES	COMMON NAMES (73)	Flowering plants blooming during seven April 2002 survey periods
		Percent of plants blooming:	**10.9%**
	KINGDOM FUNGI	**MUSHROOMS (1)**	
	FAMILY LYCOPERDACEAE		
	Lycoperdum pyriforme	Pear-shaped Puffball	N/A
	KINGDOM LICHENS	**LICHENS (1)**	
	Letharia vulpina	Wolf Lichen	N/A
	KINGDOM PLANTAE	**HIGHER VASCULAR PLANTS**	
	DIVISION PTERIDOPHYTA	**FERNS (1)**	
	FAMILY DENNSTAEDTIACEAE	**BRACKEN FAMILY**	
	Pteridium aquilinum var. pubescens	Western Bracken	N/A
	DIVISION CONIFEROPHYTA	**CONIFERS (6)**	
	FAMILY CUPRESSACEAE	**CYPRESS FAMILY**	
	Calocedrus decurrens	Incense Cedar	N/A
	FAMILY PINACEAE	**PINE FAMILY**	
	Abies concolor	White Fir	N/A
	Pinus coulteri	Coulter Pine	N/A
	Pinus jeffreyi	Jeffrey Pine	N/A
	Pinus lambertiana	Sugar Pine	N/A
	Pinus ponderosa	Ponderosa Pine	N/A
	DIVISION ANTHOPHYTA	**FLOWERING PLANTS (64)**	
	Class Dicotyledones	**Dicots**	
	FAMILY APIACEAE	**CARROT FAMILY**	
	Osmorhiza chilensis	Sweet Celery	- - -
	Sanicula graveolens	Montane Yellow-flowered Sanicle	- - -
	FAMILY APOCYNACEAE	**DOGBANE FAMILY**	
X	*Vinca major*	Greater Periwinkle	- - -
	FAMILY ASTERACEAE	**SUNFLOWER FAMILY**	
	Achillea millefolium	White Yarrow	- - -
X	*Ambrosia artemisiifolia*	Common Ragweed	- - -
	Artemisia douglasiana	Mugwort	- - -
	Artemisia dracunculus	Tarragon	- - -
	Erigeron divergens	Common Fleabane Daisy	- - -
	Eriophyllum lanatum	Montane Wooly Daisy	- - -
	Gnaphalium canescens ssp. beneolens	Fragrant Everlasting	- - -
	Hemizonia paniculata	Tarplant	- - -
	Hieracium c.f. albiflorum	Alpine Hawkweed	- - -
X	*Lactuca serriola*	Prickly Lettuce	- - -

	Malacothrix saxatilis	Cliff-aster	- - -
	Solidago californica	California Goldenrod	- - -
X	*Tanacetum parthenium*	Feverfew	- - -
X	*Taraxacum officinale*	Dandelion	F
	FAMILY BRASSICACEAE	**MUSTARD FAMILY**	
	Erysimum capitatum	Western Wallflower	F
X	*Lunaria annua*	Dollar Plant	F
	FAMILY CARYOPHYLLACEAE	**PINK FAMILY**	
	Silene lemmonii	Catchfly	- - -
	FAMILY CONVOLVULACEAE	**MORNING GLORY FAMILY**	
	Calystegia occidentals ssp. fulcrata	Sonora Morning Glory	- - -
	FAMILY CORNACEAE	**DOGWOOD FAMILY**	
	Cornus nuttallii	Mountain Dogwood	F
	FAMILY ERICACEAE	**HEATH FAMILY**	
	Arctostaphylos sp.	Manzanita	- - -
	Pterospora andromedea	Pinedrops	- - -
	FAMILY FABACEAE	**LEGUME FAMILY**	
	Lotus crassifolius	Large-flowered Lotus	- - -
	Lupinus latifolius	Flat-leaved Lupine	- - -
	Lupinus luteolus	Butter Lupine	- - -
	Lupinus microcarpus	Chick Lupine	- - -
	Vicia c.f. americana	American Vetch	- - -
	FAMILY FAGACEAE	**OAK FAMILY**	
	Quercus chrysolepis	Canyon Oak	- - -
	Quercus kelloggii	California Black Oak	- - -
	FAMILY HYDROPHYLLACEAE	**WATERLEAF FAMILY**	
	Phacelia sp.	Phacelia	- - -
	Nemophila menziesii spp. *menziesii*	Baby Blue Eyes	F
	FAMILY GROSSULARIACEAE	**GOOSEBERRY FAMILY**	
	Ribes c.f. nevadense	Mountain Pink Currant	F
	FAMILY LAURACEAE	**LAUREL FAMILY**	
	Umbellularia californica	California Bay	- - -
	FAMILY ONAGRACEAE	**EVENING PRIMROSE FAMILY**	
	Clarkia rhomboidea	Rhomboid Clarkia	- - -
	Epilobium brachycarpum	Panicled Willow-herb	- - -
	Epilobium canum	California Fuchsia	
	FAMILY POLEMONIACEAE	**PHLOX FAMILY**	
	Polemonium occidentale	Jacob's Ladder	- - -

	FAMILY POLYGONACEAE	**BUCKWHEAT FAMILY**	
	Eriogonum fasciculatum	California Buckwheat	- - -
	Eriogonum saxatile	Montane Buckwheat	- - -
X	*Polygonum convolvulus*	Black Bindweed	- - -
	FAMILY PORTULACACEAE	**PURSLANE FAMILY**	
	Claytonia perfoliata	Miner's Lettuce	F
	FAMILY RHAMNACEAE	**BUCKTHORN FAMILY**	
	Ceanothus integerrimus	Deer Brush	- - -
	Rhamnus californica	California Coffeeberry	- - -
	FAMILY ROSACEAE	**ROSE FAMILY**	
	Potentilla glandulosa	Sticky Cinquefoil	- - -
	Rubus parviflorus	Thimbleberry	- - -
	FAMILY SALICACEAE	**WILLOW FAMILY**	
	Salix lasiolepis	Arroyo Willow	- - -
	FAMILY SCROPHULARIACEAE	**FIGWORT FAMILY**	
	Castilleja applegatei	Montane Indian Paintbrush	- - -
	Penstemon centranthifolius	Scarlet Bugler	- - -
	Penstemon spectabilis	Chaparral Beard-tongue	- - -
	FAMILY VISCACEAE	**MISTLETOE FAMILY**	
	Phoradendron macrophyllum	Big-leaf Mistletoe	- - -
	Class Monocotyledones	**Monocots**	
	FAMILY CYPERACEAE	**SEDGE FAMILY**	
	Carex sp.	Sedge	- - -
	FAMILY IRIDACEAE	**IRIS FAMILY**	
	Iris hartwegii ssp. australis	Hartweg's Iris	- - -
	FAMILY LILIACEAE	**LILY FAMILY**	
	Bloomeria crocea	Common Goldenstar	- - -
	Dichelostemma capitatum	Blue Dicks	- - -
	FAMILY POACEAE	**GRASS FAMILY**	
	Bromus carinatus	California Brome	- - -
	Bromus ciliatus	Fringed Brome	- - -
X	*Bromus diandrus*	Ripgut Grass	- - -
X	*Bromus tectorum*	Cheat Grass	- - -
X	*Hordeum murinum*	Hare Barley	- - -
X	*Phalaris minor*	Littleseed Canary Grass	- - -

Symbols/Abbreviations:

c.f. = Indicates a species very closely comparable to, but not certainly the same as those of a named species.

N/A = Non-flowering plants.

- - - = Indicates cell was intentionally left blank.

APPENDIX C

WILDLIFE COMPENDIUM

FOR

CHURCH OF THE WOODS PROPERTY

SAN BERNARDINO COUNTY, CALIFORNIA

SCIENTIFIC NAMES	COMMON NAMES (32)	Survey Week			
		Week # 1 (4/6-4/12)	Week # 2 (4/13-4/19)	Week # 3 (4/20-4/26)	Week # 4 (4/27-4/30)
VERTEBRATES					
CLASS AMPHIBIA	**AMPHIBIANS (1)**				
FAMILY PLETHODONTIDAE	**LUNGLESS SALAMANDERS**				
Ensatina eschscholtzi ssp. *eschscholtzi*	Monterey Salamander	X	- - -	- - -	- - -
CLASS REPTILIA	**REPTILES (3)**				
FAMILY IGUANIDAE	**IGUANIDS**				
Sceloporus graciosus	Sagebrush Lizard	- - -	X	- - -	- - -
FAMILY SCINCIDAE	**SKINKS**				
Eumeces skiltonianus	Western Skink	- - -	- - -	X	- - -
FAMILY ANGUIDAE	**ALLIGATOR LIZARDS AND ALLIES**				
Gerrhonotus multicarinatus	Southern Alligator Lizard	X	- - -	- - -	- - -
CLASS AVES	**BIRDS (16)**				
FAMILY COLUMBIDAE	**PIGEONS AND DOVES**				
Columba livia	Band-tailed Pigeon	X	- - -	- - -	- - -
Zenaida macroura	Mourning Dove	X	X	- - -	X
FAMILY PICIDAE	**WOODPECKERS**				
Colaptes auratus	Northern Flicker	X	- - -	- - -	- - -
FAMILY CORVIDAE	**JAYS, MAGPIES, AND CROWS**				
Corvus corax	Common Raven	X	- - -	- - -	X
Cyanocitta stelleri	Steller's Jay	X	- - -	- - -	X
FAMILY PARIDAE	**CHICKADEES**				
Poecile gambeli	Mountain Chickadee	X	- - -	- - -	X
FAMILY SITTIDAE	**NUTHATCHES**				
Sitta carolinensis	White-breasted Nuthatch	X	- - -	- - -	- - -
Sitta canadensis	Red-breasted Nuthatch	X	- - -	- - -	- - -
FAMILY CERTHIIDAE	**CREEPERS**				
Certhia americana	Brown Creeper	X	- - -	- - -	- - -
FAMILY TURDIDAE	**THRUSHES, SOLITAIRES AND BLUEBIRDS**				
Turdus migratorius	American Robin	X	- - -	- - -	X

FAMILY PARULIDAE	**WOOD WARBLERS**				
Dendroica coronata	Yellow-rumped Warbler	X	- - -	- - -	- - -
FAMILY CARDINALIDAE	**CARDINALS**				
Pheucticus melanocephalus	Black-headed Grosbeak	X	- - -	- - -	- - -
FAMILY EMBERIZIDAE	**SPARROWS**				
Junco hyemalis	Dark-eyed Junco	X	- - -	- - -	X
Pipilo maculatus	Spotted Towhee	X	- - -	- - -	- - -
FAMILY FRINGILLIDAE	**FINCHES**				
Carpodacus mexicanus	House Finch	X	- - -	- - -	- - -
FAMILY VIREONIDAE	**VIREOS**				
Vireo huttoni	Hutton's Vireo	X	- - -	- - -	- - -
CLASS MAMMALIA	**MAMMALS (2)**				
FAMILY SCIURIDAE	**SQUIRRELS**				
Sciurus griseus	Western Gray Squirrel	X	- - -	- - -	X
FAMILY CRICETIDAE	**DEER MICE, WOOD RATS AND ALLIES**				
Peromyscus maniculatus	Deer Mouse	- - -	X	- - -	- - -
INVERTEBRATES					
CLASS INSECTA	**INSECTS (9)**				
Camponotus laevigatus	Carpenter Ant	- - -	X	- - -	X
Culex c.f. incidens	Cool Weather Mosquito	- - -	X	- - -	- - -
Phoebis sennae	Senna Sulfur	- - -	X	- - -	- - -
Iridomyrmex humilis	Argentine Ant	- - -	X	- - -	X
Pristonychus complanatus	Black Ground Beetle	- - -	- - -	X	X
Solenopsis molesta	Thief Ant	- - -	X	- - -	- - -
Solenopsis xyloni	Southern Fire Ant	X	- - -	- - -	X
Stenopelmatus fuscus	Jerusalem Cricket	- - -	X	- - -	X
Zootermopsis angusticollis	Pacific Dampwood Termite	- - -	X	X	X
CLASS CHILOPODA	**CENTIPEDES (1)**				
Scolopendra polymorpha	Mulitcolored Centipede	X	X	- - -	- - -

Symbols/Abbreviations:

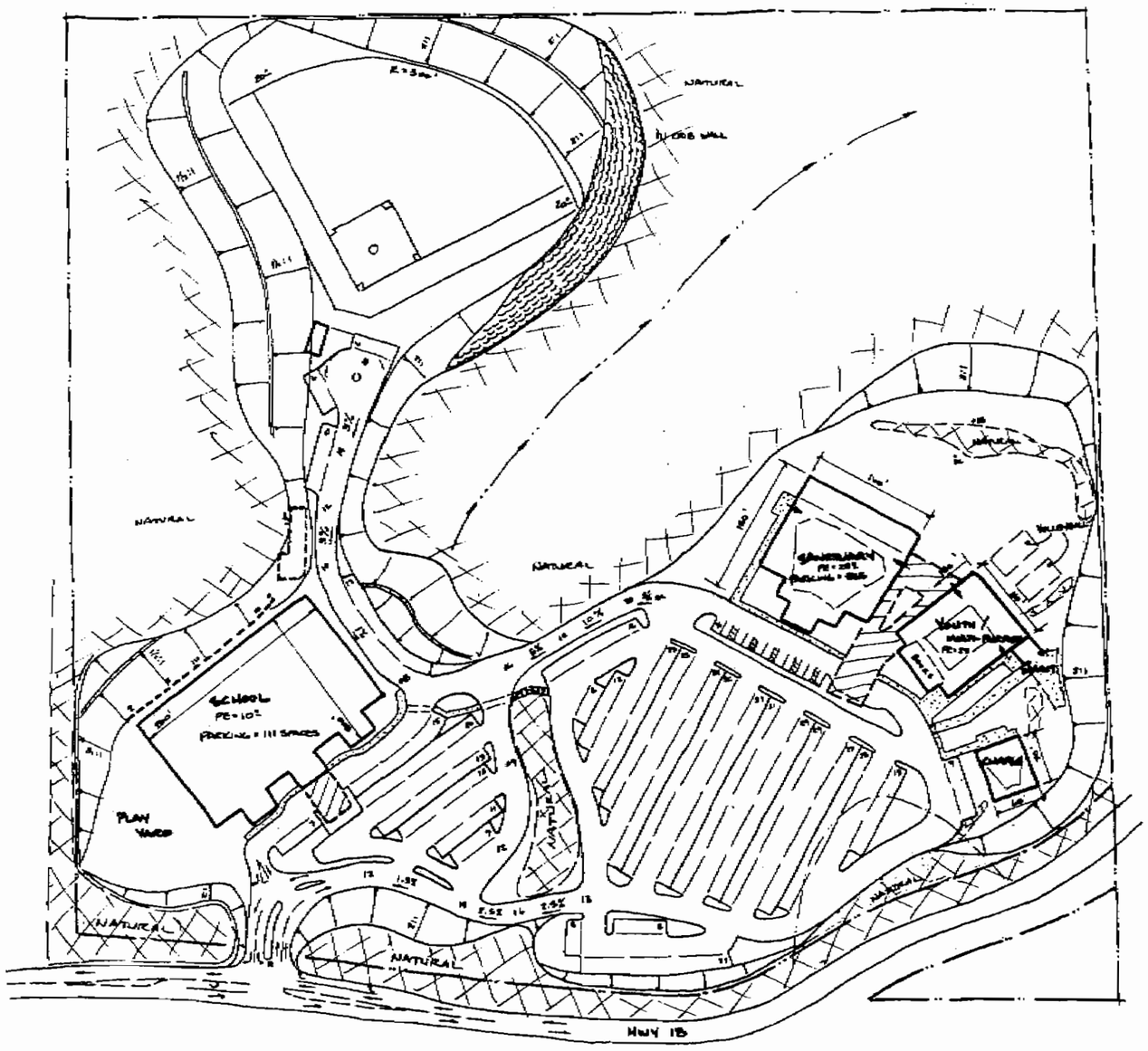
sp. = Animal identified to genus only.

c.f. = Indicates a species very closely comparable to, but not certainly the same as those of a named species.

APPENDIX D

PRELIMINARY SITE PLAN MAP (WJM, 2002) FOR CHURCH OF THE WOODS PROPERTY

SAN BERNARDINO COUNTY, CALIFORNIA



N
1" = 60'

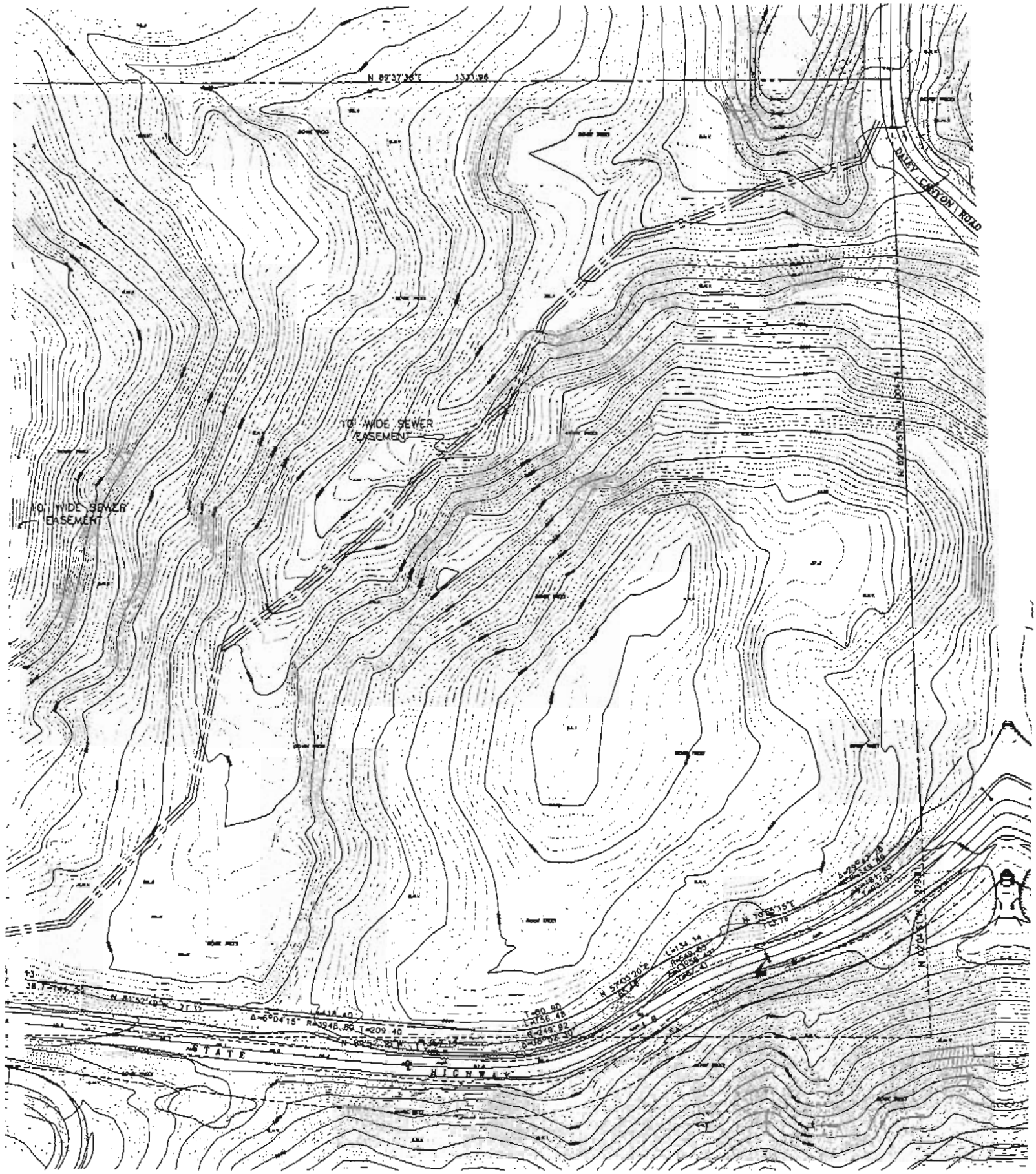
W.J. McKeever Inc.
647 N. Main St. #2A
Ridgecrest, Ca. 93501
(805) 371-3210

DCS 2-18-02

APPENDIX E

TOPOGRAPHIC SITE MAP (WJM, 2001) FOR CHURCH OF THE WOODS PROPERTY

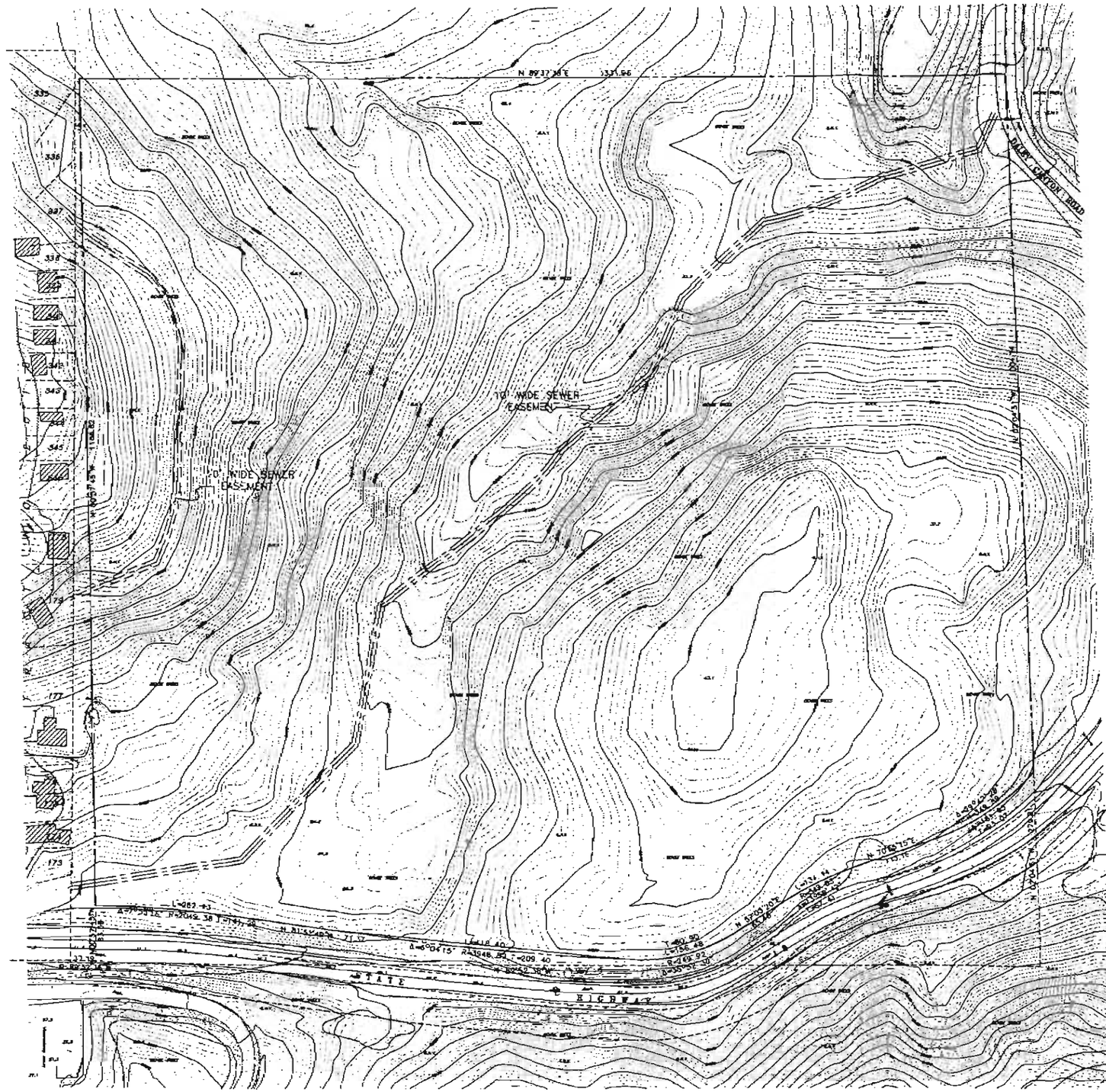
SAN BERNARDINO COUNTY, CALIFORNIA


N 89°37'30"E 1337.96
DALLEY CANYON ROAD
N 07°04'51"W 1004.14
70' WIDE SEWER EASEMENT
70' WIDE SEWER EASEMENT
N 57°03'20"E
N 70°53'15"E
N 07°04'51"W 279.71
Δ=6°04'15" R=1948.80 T=209.40
N 80°52'30"W
STATE HIGHWAY

APPENDIX E

TOPOGRAPHIC SITE MAP (WJM, 2001) FOR CHURCH OF THE WOODS PROPERTY

SAN BERNARDINO COUNTY, CALIFORNIA



W.J. McKEEVER, INC.
CIVIL ENGINEERING

APPENDIX F

ACREAGES OF LOGS AND ROCK OUTCROPS

FOR

CHURCH OF THE WOODS PROPERTY

SAN BERNARDINO COUNTY, CALIFORNIA

Marking, Mapping and Recording Rubber Boa Habitat Sites

Mr. John B. Hatcher, Registered Professional Forester #681 and Mr. Jim Bridges worked on the Church of the Woods property to find, record, and map all Southern Rubber Boa (SRB) potentially suitable habitat locations within the boundaries of the property. Tables 1 and 2 provide information (dimensions, description and square footage and acreages) regarding the unoccupied potentially suitable SRB habitat.

- Table 1 – Dead and Decomposed Logs: Within the boundaries of the property the location of every dead and decomposing log over 12 inches in diameter were flagged with yellow ribbon, recorded and mapped. Table 1 records the square footage (11,960 square feet) and acreage (0.275 acres) for potential but unoccupied habitat: lots and roads.

- Table 2 - Rock Outcrops: Every unoccupied, but potential SRB habitat rock outcrop site over 50 square feet, was also located and mapped. Table 2 records the square footage (17,220 square feet) and acreage (0.395 acres) for each rock outcrop site over 50 square feet.

Table 1 Square Footage For Each Dead And Decomposing Log = Potential But Unoccupied SRB Habitat.

Potential Habitat Site Number	Potential SRB Habitat Description	Potential SRB Habitat Dimensions	Square Footage of Potential but Unoccupied SRB Habitat
1-1	Stump and Logs	20" and 20' log	50
1-2	Stump	18"	25
1-3	Log	14" X 20'	30
1-4	Stump	24"	25
1-5	Stump	18"	20
1-6	Stump	12"	15
1-7	Log	14" X 20'	60
1-8	Log	20" X 40'	160
1-9	Stump & Log	26" X 10'	50
1-10	Stump	20"	25
1-11	Stump	24"	25
1-12	Stump	24"	25
1-13	Stump	30"	35
1-14	Log	12" X 30'	90
1-15	Stump	40"	35
1-16	Log	18" X 10'	35
1-17	Stump	24"	15
1-18	Stump	18"	10
1-19	Log	18" X 10'	35
1-20	Log	30" X 40'	180
1-21	Stump	48"	35
1-22	Log	18" X 40'	140
1-23	Log	18" X 30'	100
1-24	2 Logs	24" X 20' and 30'	200
1-25	Stump	24"	15
1-26	Log	30" X 8'	35
1-27	Log	12" X 10'	30
1-28	Log	24" X 20'	80
1-29	Log	12" X 25'	75

Table 1 (Continued):

1-30	Stump	30"	25
1-31	Log	18" X 30'	100
1-32	Log	18" X 30'	100
1-33	Log	12" X 30'	90
1-34	Log	12" X 10'	30
1-35	Stump	12"	10
1-36	Stump	24"	15
1-37	Log	18" X 10'	35
1-38	Log	42" X 20'	110
1-39	Log	24" X 12'	50
1-40	Log	24" X 20'	80
1-41	Log	24" X 30'	120
1-42	Log	30" X 16'	70
1-43	Log	36" X 10'	50
1-44	Log	18" X 10'	35
1-45	Stump	48"	50
1-46	Stump	40"	40
1-47	Stump	48"	50
1-48	Stump	36"	35
1-49	Log	18" X 20'	70
1-50	Log	30" X 24'	110
1-51	Log	30" X 60'	270
1-52	Stump	18"	10
1-53	Log	28" X 30'	130
1-54	Stump	36"	25
1-55	Log	18" X 30'	100
1-56	Log	24" X 30'	120
1-57	Log	24" X 20'	80
1-58	Log	36" X 60'	300
1-59	Stump	24"	15
1-60	Stump	36"	25
1-61	Log	18" X 40'	140
1-62	Log	16" X 40'	130
1-63	Log	24" X 40'	160
1-64	Log	24" X 30'	120
1-65	Log	30" X 80'	360
1-66	Log	24" X 30'	120
1-67	Log	24" X 20'	80
1-68	Log	18" X 12'	40
1-69	Log	36" X 50'	250
1-70	Log	18" X 40'	140
1-71	Log	18" X 20"	70
1-72	Log	24" X 40'	160
1-73	Log	24" X 30'	120
1-74	Stump	42"	30
1-75	Log	18" X 30'	100
1-76	Stump & Log	40" & 30" X 14'	100
1-77	Log	24" X 20'	80
1-78	Log	30" X 20'	90
1-79	Log	12" X 20'	60

Table 1 (Continued):

1-80	4 Logs	30" X 10', 18"X12', 24"X40' &12"X30'	350
1-81	Log	16" X 60'	120
1-82	2 Logs	36" X 50', 26"X50'	450
1-83	Stump & Log	18" & 18" X 16'	70
1-84	Log	12" X 20'	60
1-85	Log	12" X 20'	60
1-86	Stump	48"	35
1-87	2 Logs	28"X20' & 18"X10'	125
1-88	Log	18" X 30'	100
1-89	Stump & Log	36" & 30" X 20'	115
1-90	Log	50" X 40'	250
1-91	Log	36" X 50'	250
1-92	Log	18" X 40'	130
1-93	Log	24" X 12'	50
1-94	Log	30" X 30'	135
1-95	Log	18" X 20'	70
1-96	Log	24" X 20'	40
1-97	Stump & Log	24" & 24" X 20'	100
1-98	Log	30" X 20'	90
1-99	Log	12" X 20'	60
1-100	Log	12" X 10'	30
1-101	Log	30" X 30'	135
1-102	Log	40" X 60'	330
1-103	Log	36" X 20'	100
1-104	2 Logs	20" X 20', 10" X10'	100
1-105	Log	10" X 10'	30
1-106	2 Logs	18"x30'& 20" x 12'	150
1-107	Stump	42"	30
1-108	Log	24" X 40'	160
1-109	Log	18" X 30'	100
1-110	Log	12" X 15'	45
1-111	Log	30" X 20'	90
1-112	Stump	36"	25
1-113	Stump	42"	30
1-114	Stump and Log	24" & 24" X 20'	95
1-115	Log	24" X 20'	80
1-116	Log	18" X 30'	100
1-117	Log	16" X 20'	70
1-118	Log	24" X 15'	60
1-119	Log	18" X 20'	70
1-120	Log	24" X 15'	60
1-121	Log	18" X 30'	100
1-122	Log	28" X 30'	130
1-123	Stump & Log	24" & 24" X 20'	100
1-124	Log	30" X 10'	45
1-125	Log	24" X 20'	80
1-126	Log	24" X 40'	160
1-127	Log	14" X 20'	65
1-128	Stump	24"	15

Table 1 (Continued):

1-129	Log	24" X 20'	80
1-130	Log	12" X 20'	60
1-131	Log	24" X 20'	80
1-132	Log	16" X 20'	70
1-133	Stump	24"	15
1-134	Stump	22"	15
	TOTAL Square Feet of Potential Habitat:		11,960
	TOTAL Acres of Potential Habitat:		0.275

Table 2: Square Footage For Each Rock Outcrop = Potential But Unoccupied Habitat.

Rock Outcrop Site Number	Description	Potential Habitat (Rock Outcrop) Dimensions	Square Footage
2-1	Granite Outcrop	10' X 15'	150
2-2	Granite Outcrop	15' X 20'	300
2-3	Granite Outcrop	15' X 20'	300
2-4	Granite Outcrop	20' X 15'	300
2-5	Granite Outcrop	100' X 100'	10,000
2-6	Granite Outcrop	40' X 30'	1,200
2-7	Granite Outcrop	30' X 30'	900
2-8	Granite Outcrop	10' X 10'	100
2-9	Granite Outcrop	20' X 20'	400
2-10	Granite Outcrop	8' X 12'	100
2-11	Granite Outcrop	20' X 40'	800
2-12	Granite Outcrop	10' X 12'	120
2-13	Granite Outcrop	20' X 30'	600
2-14	Granite Outcrop	10' X 20'	200
2-15	Granite Outcrop	20' X 30'	600
2-16	Granite Outcrop	10' X 20'	200
2-17	Granite Outcrop	20' X 20'	400
2-18	Granite Outcrop	8' X 12'	100
2-19	Granite Outcrop	15' X 30'	450
	TOTAL Square Feet of Potential Habitat:		17,220
	TOTAL Acres of Potential Habitat:		0.395

APPENDIX G

QUALIFICATIONS OF SRB SURVEY TEAM

THOMAS A LESLIE, PH.D., PRESIDENT (SCP No. 801118-03)

Dr. Leslie is a certified consulting and research biologist and the President of the firm of Thomas Leslie Corporation (TLC). His professional and academic experiences include consulting and scholarly work throughout the western United States (Great Basin, Mojave Desert, northern and southern California, etc.) and Baja and mainland Mexico. He has multi-disciplinary expertise in the areas of sensitive plant species surveys, sensitive wildlife species surveys, resources management, wetland ecology, 401/404/1601-1603 regulatory work, sensitive habitat, desert biology, paleontology, botany, zoology, and ornithology. In the course of his professional experiences he has also conducted and managed numerous environmental resources projects involving baseline resource inventories, archaeological surveys/mitigation work (e.g., significance testing, excavations, etc.), environmental impact assessments, reports, statements, CEQA mitigation program design/implementation and CEQA 5-year monitoring and reporting program development and implementation, pre-construction paleontological resource assessment, surveys and in-grading archaeological, biological and paleontological construction activities mitigation monitoring, quarrying, salvage and taxonomic identification of paleontological resources. He is also a co-author of *The Baja Highway, A Field Guide to the Geology and Biology of Baja CA, Mexico.*

CREDENTIALS

State Scientific Collector's Permit No. 801118-03, California Department of Fish and Game (expires 03/07/03): **Field identified Southern Rubber Boa (*Charina bottae umbratica*) in San Bernardino Mountains in 2002.**

National Forest Serv. Botanical Collector's Permit: Angeles, Los Padres, Cleveland, & San Bernardino Nat. Forests.

Federal Fish and Wildlife Threatened & Endangered Species Permits for California Gnatcatcher and Southwestern Willow Flycatcher No. TE-781384-4 (expires 05/09/05)

Certified Biologist: Counties of Riverside, Los Angeles, Orange, San Bernardino, San Diego and Ventura

PROFESSIONAL HISTORY

Thomas Leslie Corporation - 2/1999 to present: President.

Thomas Leslie Associates - 1997 to 2/1999: Principal.

John Minch & Associados, S.C., Recursos Naturales & Ambientales - 1992-1995: Presidente.

Michael Brandman Associates, Inc. - 1996-1997: Principal/Director of Resources Management.

L&L Environmental, Inc.: Principal: 12/1995-9/1996.

Michael Brandman Associates, Inc. - 1/90-11/90: Section Mgr., Resources Management.

South Counties Consultants - Principal: 1977 - 1989.

Saddleback College, 1975-1993: Full Professor of Botany, Ornithology, Invertebrate & Vertebrate Zoology.

EDUCATION

Ph.D. Theology
M.S., Botany (extensive course work in Ornithology, Paleontology)
B.S., Botany/Zoology/Ecology

RECENT PROFESSIONAL TRAINING

CLE International, California Wetlands Conference

Southwestern Willow Flycatcher Survey Training Workshop

Wetland Delineation: Atypical & Problem Areas, Wetland Training Institute, Poolesville, MD.

Wetland Delineation: Based On US Army Corps Of Engineer's 1987 Manual, WTI.

SW Willow Flycatcher Workshop, Fed. Fish & Wildlife Serv., San Diego Natural Hist. Museum.

Branchiopod Taxonomy Course from Dr. Denton Belk.

WILLIAM S. LA HAYE (SCP No. 801058-01)

Address: P. O. Box 523
Big Bear City, CA 92314
(909) 585-1029
blahaye@gte.net

Education:

Master of Science, 1989, Humboldt State University, Arcata, CA, Major: Natural Resources with an emphasis in Wildlife Management.

Bachelor of Arts, 1977, California State University, Chico, Chico, CA, Major: Geology.

Research and Work Experience:

Full Time — Humboldt State University Foundation, Arcata, CA; as of 1 April, 2000, University of Minnesota, St. Paul, MN

1987 to Present — **Project Leader** for Spotted Owl research projects in the San Bernardino, San Jacinto and San Gabriel Mountains of southern California. Specific research included radio-telemetry monitoring to determine home range size, configuration and habitat use; Spotted Owl surveys to determine owl distribution in the mountain range and within different habitat types; capture and banding of Spotted Owls to closely monitor the demographics of this population; collection and analysis of prey remains; collection, analysis and description of nesting and roosting habitat. Extracting blood samples for genetic and parasite analysis.

Part Time — Institute for Wildlife Studies, Arcata, CA

1992 & 1993 — **Project Coordinator** for general biological survey of the Sonoran Desert near El Centro, CA. The emphasis of the project was on plants and reptiles with special state and federal conservation status. Specific duties included plant transects, desert tortoise surveys, flat-tailed horned lizard surveys and providing species lists of birds and mammals.

Part Time — Institute for Wildlife Studies, Arcata, CA

1986 to 1996 — Predatory Bird Research Group, University of California, Santa Cruz, Santa Cruz, CA
Research Assistant for Bald Eagle reintroduction projects in California. Specific duties included construction of hack sites, climbing eagle nests to collect eaglets, caring for eaglets while transporting them from British Columbia to California, maintaining provisions for hack site attendants and eaglets at three hack sites, helicopter surveys for active eagle nests, banding and installing radio-transmitters on eaglets. Radio-tracking eaglets after their release.

Part Time — Various Organizations and Individuals

1984 to Present — **Biological Consultant** on projects that required biological input to acquire city, county, state or federal approval. Specific duties included surveys for Bald Eagles, Golden Eagles, Goshawks, Osprey, Spotted Owls, Flat-tailed Horned Lizards, Desert Tortoises and general wildlife; habitat surveys, mapping and assessment for potential sensitive species occurrence; climbing Bald Eagle nests to retrieve eggs for pesticide contamination analysis and construction of an Osprey nesting platform.

Full Time — Humboldt State University Foundation, Arcata, CA

1984 to 1987 — **Graduate Student** working on my Master's Thesis studying "Nest Site Selection and Nesting Habitat of the Northern Spotted Owl in Northwestern California". Specific duties included Spotted Owl Surveys, assessment of social status, nest location, climbing of nest trees, establishing a sampling design, extensive vegetation sampling, data analysis and interpretation, annual report and thesis organization and writing.

Full Time	Humboldt State University Foundation, Arcata, CA
1983	**Research Assistant** working on a Spotted Owl juvenile dispersal project. Specific duties included Spotted Owl surveys, assessment of social status, nest location, locating fledged owlets, capture, banding and radio-transmitter installation on adult and juvenile Spotted Owls, radio-monitoring of adult and dispersing juvenile Spotted Owls.
Part Time	Various Organizations and Individuals
1981 & 1982	**Carpenter's Helper** assisting in foundation work, building layout and organization, framing, roofing, cement work and finish work.
	Landing Man and Choker Setter for a logging company in northwestern California. Specific duties included maintenance of heavy equipment, operation and maintenance of chain saws, maintaining U. S. Forest Service records and setting chokers
Full Time	Durham Pump, Inc., Durham, CA
1979 & 1980	**Irrigation Designer**. Specific duties included drafting, designing irrigation systems for various agricultural crops, pump selection, mapping orchards, surveying and trouble shooting problems in the field.
	Boom Truck Helper assisting on well tests, pump installation, boom operation, plumbing, electrical work, diesel engine and gearhead hookups.
Full Time	AMAX Exploration, Inc., Tucson, AZ
1978	**Exploration Geologist** working on geological reconnaissance projects throughout the western U. S. Specific duties included stream sediment, rock chip, mine dump and vegetation sampling; geological mapping; overseeing a drilling operation; splitting core; logging core; geologic mapping; drafting; data compilation and database management.

NADYA V. LESLIE, DIRECTOR

Mrs. Leslie is a consulting biologist and the Director of the firm of Thomas Leslie Corporation (TLC). Her professional and academic experiences include consulting work in southern California and scholarly and performance of professional work in the Tver region of Russia. She has multi-disciplinary academic and practical experience in the areas of sensitive species surveys, ornithology, wetland ecology, habitat classification, desert biology, botany, soil science, cytology, ecology, species taxonomy and zoology. In the course of her professional experiences she has performed numerous biological field surveys and species and community resource inventories. In addition she has written and co-authored reports concerning taxonomic identification of biological resources and scientific articles regarding conservation of biological resources. Most recently she co-authored *The Index of seeds and spores collected in 2000 from Tver State University Botanical Garden and in Tver Region of Russia.* Mrs. Leslie is listed on Dr. Leslie's 10(a)(1)(A) recovery permit as a "authorized individual" and is therefore may conduct activities pursuant to permit TE-781384-4 under the direct onsite supervision of Dr. Leslie.

PROFESSIONAL HISTORY

Thomas Leslie Corporation – 3/20 01 to present: **Field identified Southern Rubber Boa (*Charina bottae umbratica*) in San Bernardino Mountains in 2002.**

Botanical Garden of Tver State University - 2/1997 – 3/2001: Head of the Herbarium Department.

EDUCATION

Tver State University - 9/1993 – 6/1998: MS (equivalent) in biology.

PROFESSIONAL QUALIFICATION

Qualified by diploma to teach university level courses biology and chemistry.

RELEVANT PROFESSIONAL TRAINING

CLE International, California Wetlands Conference

Southwestern Willow Flycatcher Survey Training Workshop

Wetland Delineation Field Training

Methods of teaching university level biology and ecology courses.

PUBLICATIONS

Shubinskaya, N., November 2000, Additions To The Native Vascular Plants Flora Of The Tver Region.

Shubinskaya, N., April 1999, Experiments In The Establishment Native Plant Communities Of The Tver Region Of Russia Within The Tver State University Botanical Garden.

Notov, A. and Shubinskaya, N., October 1999, New Species Records For The Western Portion Of The Tver Region Of Russia.

Notov, A. and Shubinskaya, N., October 1999, New And Rare Non-Native Plant Species Of The Flora Of The Tver Region Of Russia.

Notov, A. and Shubinskaya, N., November, 2000a, Materials For The Botanical-Geographical Analysis Of The Native Flora Of Vascular Plants Of The Tver Region Of Russia.

Notov, A. and Shubinskaya, N., November, 2000b, The Index Of Seeds And Spores Collected In 2000 From Tver State University Botanical Garden And In Tver Region Of Russia.

APPENDIX H

INDIVIDUALS AND AGENCIES CONTACTED

INDIVIDUALS AND AGENCIES CONTACTED

Individual	Agency	Date Contacted	Comments
Ms. Tracy Creason, Senior Associate Planner	County of San Bernardino	April 8, 2002	Called to discuss notification of California Department of Fish and Game that TLC was performing Southern Rubber Boa surveys on the property.
Ms. Christa Ostoich, Planner	County of San Bernardino	April 8, 2002	Called to discuss notification of California Department of Fish and Game that TLC was performing Southern Rubber Boa surveys on the property
		May 15, 2002	Discussed status of SRB report of findings
Mr. Raul Rodriguez	California Department of Fish and Game	April 12, 2002	Discussed providing editional comments to clarify the Department's Draft SRB Survey protocols.
		April 15, 2002	Inquiry regarding whether to stop SRB surveys if specimens are discovered. Also discussed the type of SRB survey protocols to be used on the property.

Thomas Leslie Corporation

Results of a Mountain Yellow-Legged Frog Habitat Assessment

January 10, 2002

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
Church of the Woods
c/o: ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

January 10, 2002

SUBJECT: Results of a Mountain Yellow-legged Frog Habitat Assessment

Dear Mr. Hopkins:

Thomas Leslie Corporation is pleased to present the results of a Mountain Yellow-legged Frog (*Rana muscosa*; MYLF) habitat assessment. The habitat assessment was conducted within the boundaries of the 38± acre Church of the Woods property (Church of the Woods property or property). The property, situated northwest of the intersection of Hwy 18 and Daley Canyon Road in San Bernardino County, California, is comprised of two Assessors' Parcel Numbers (APN) 336-101-006 and 336-101-007. The need to perform additional MYLF investigations was identified in TLC's, September 19, 2001, biological constraints analysis (TLC, 2001).

This letter documents the results of a habitat assessment. The findings of the MYLF habitat assessment is divided into *Pre-Field Survey* investigations and onsite protocol *Field Surveys*.

I. PURPOSE OF THE MYLF HABITAT ASSESSMENT

The MYLF habitat assessment was performed to accomplish the following.

- Ascertain the presence/absence onsite of potentially suitable MYLF habitat elements required by the MYLF: sunny (well-illuminated) riverbanks and rocky stream courses with open margins that gently slope up to a depth of ca. 5-8 cm, meadow streams, isolated pools, and lakes.
- Determine the need to perform focused diurnal field searches of the Church of the Woods property in 2002 to ascertain the presence or absence of this frog onsite.

II. LOCATION OF PROJECT SITE

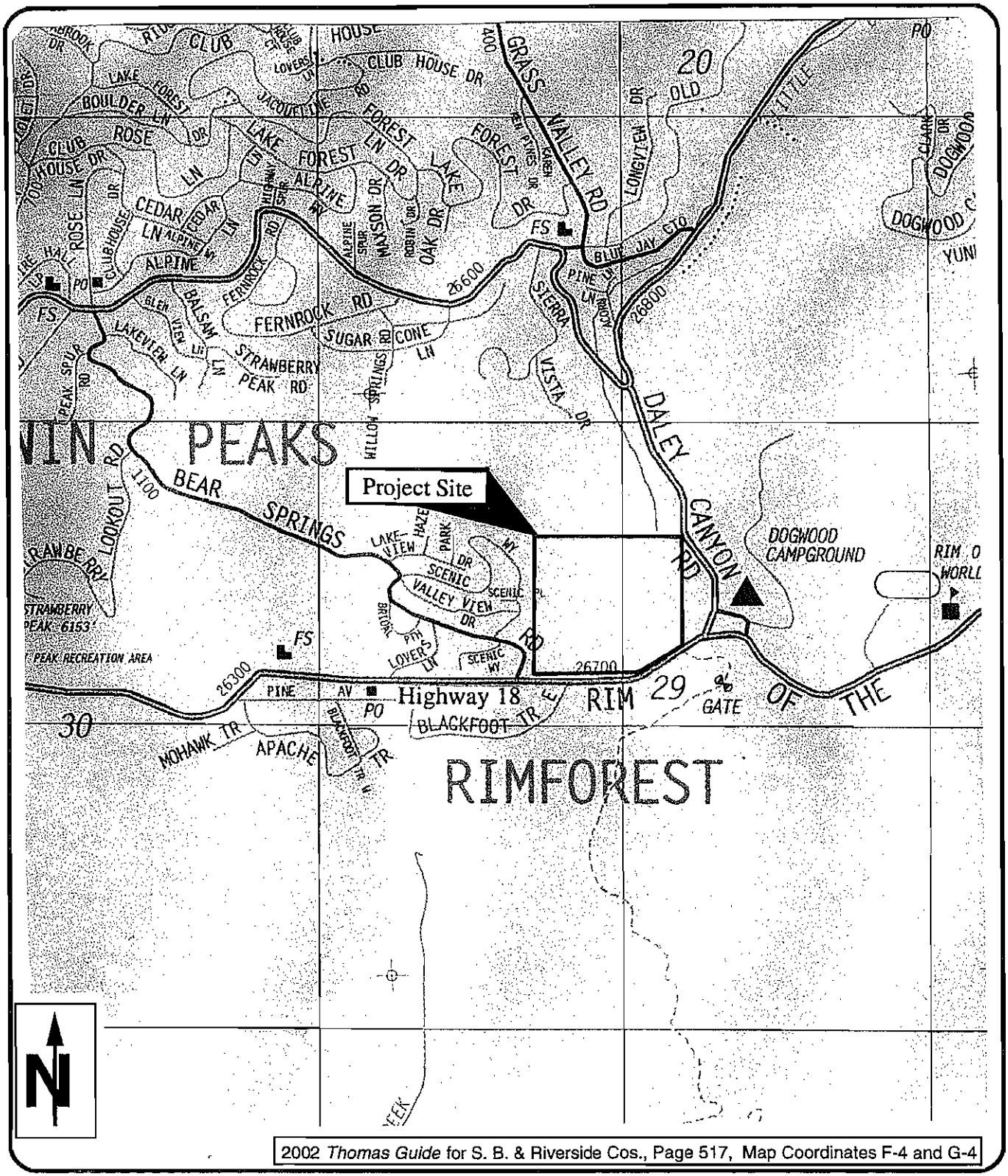
The Rim of the World Highway (State Highway 18; Hwy 18) provides regional access to the Church of the Woods property. The property can be reached by exiting Hwy 18 at Bear Springs or Daley Canyon Roads.

- Figure 1 illustrates the approximate boundaries of the Church of the Woods property on the 2002 *Thomas Guide* San Bernardino and Riverside Counties Street Guide and Directory on Detail map page 517; map coordinates F-4 and G-4.
- Figure 2 plots the approximate boundaries of the Church of the Woods property in the NW quadrant of Section 29, Township 2 North, Range 3 West; of the 1996 Harrison Mountain, California 7.5' United States Geological Survey (USGS) Topographic Quadrangle, San Bernardino Base and Meridian.

III. PROPOSED PROJECT

As illustrated on W.J. McKeever, Inc., August 20, 2001, 1 inch = 80 feet scale *Preliminary Site Plan*, the project proposed involves construction of a church, private school, storage and residence buildings, a baseball field and associated onsite paved driveways, roadways and parking.

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233



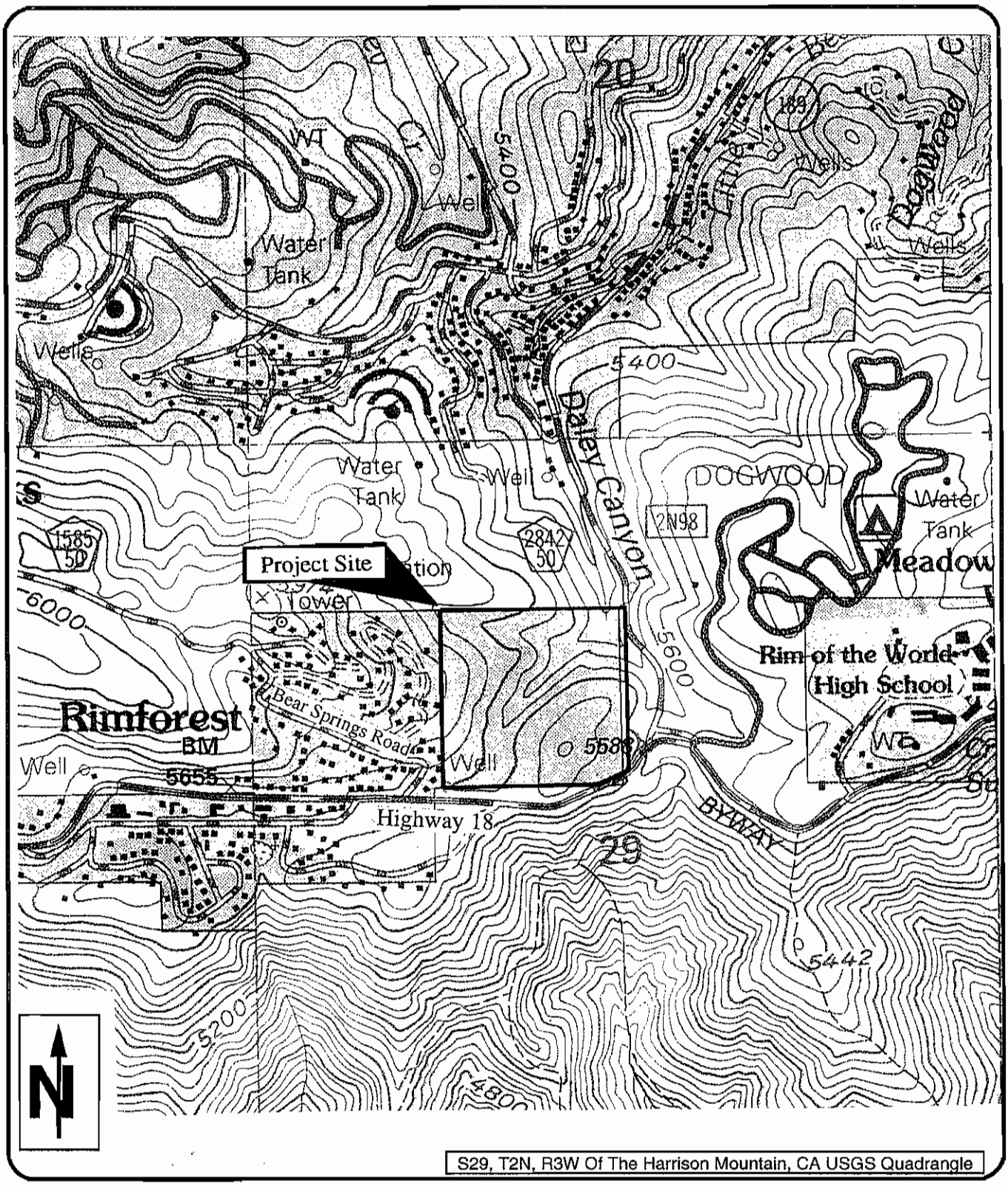
2002 *Thomas Guide* for S. B. & Riverside Cos., Page 517, Map Coordinates F-4 and G-4

Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1
Vicinity Map

Illustrating Approximate Boundaries Of
APNs 336-101-006 and -007



Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 2

Approximate Boundaries Of APNs 336-101-006 and -007 Plotted On A USGS Quadrangle Map

IV. GENERAL STATUS OF THE MYLF

A. Listing Status: MYLF, a California Department of Fish and Game (CDFG) Species of Special Concern (CSC), is proposed for listing as a federally endangered amphibian species.

B. Description: MYLF is a moderate-sized frog with a dorsal pattern ranging from discrete dark spots to irregular lichen-like patches, or a poorly defined reticulum. The color of this frog is highly variable, usually a mix of brown and yellow, but often with gray, red, or green-brown. Dorsolateral folds are present, but not usually prominent. The throat is white or yellow, sometimes with mottling of dark pigment. The belly and undersurfaces of the high limbs are yellow, which ranges in hue from pale lemon yellow to an intense sun yellow. In southern California, they breed March to May when high water in streams subsides (Stebbins 1985).

C. Distribution: The MYLF, "the only frog of the Sierran highlands," is found in the Sierra Nevada and higher mountains of southern California (Stebbins 1985, Stephenson and Calcarone 1999). In the mountains of *southern* California it ranges from Point Loma south to Mt. Palomar, between 600 and 7,500 feet the elevation above mean sea level (msl) (Stebbins 1985).

D. Habitat: This chiefly *diurnal* frog species is "seldom found more than 2 or 3 jumps from water (Stebbins 1985). In the mountains of southern California, the MYLF frequents sunny (well-illuminated) riverbanks and rocky stream courses with open margins that gently slope up to a depth of ca. 5-8 cm, meadow streams, isolated pools, and lakes above approximately 4,000 feet in elevation (Stebbins 1985). "Such shorelines are probably essential for oviposition and important for theroregulation of larvae and postmetamorphs; additionally, this kind of shore line configuration probably provides refuge from predation if fishes occur in adjacent deeper water" (Jennings, 1994). MYLF seem to be absent from smaller creeks "probably because (they) have insufficient depth for adequate refuge and overwintering" (Jennings, 1994).

V. PROJECT SITE EXISTING VEGETATIONAL COVER DESCRIPTION

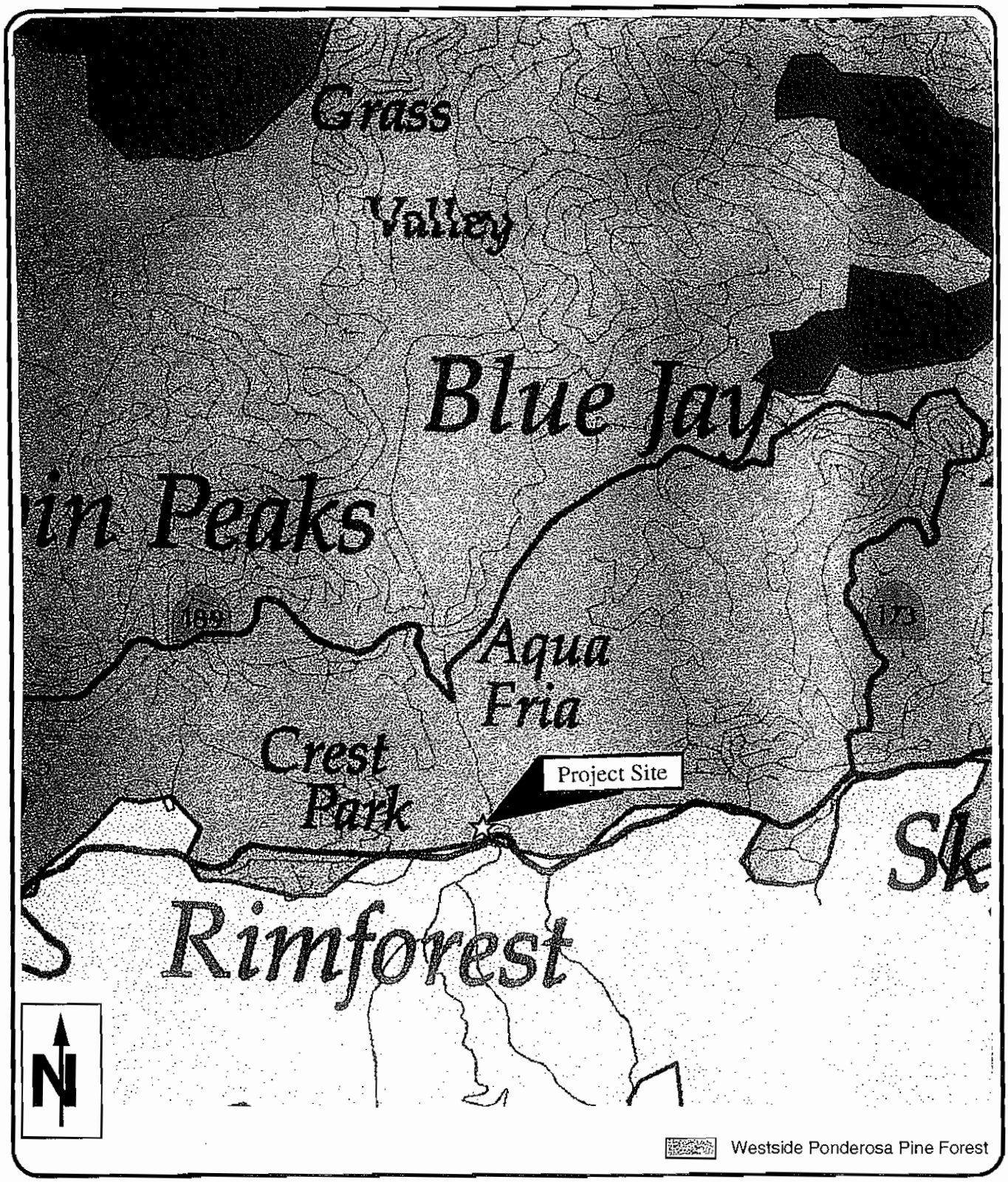
As documented by TLC's September 19, 2001, *biological constraints analysis* report (TLC, 2001), the Church of the Woods property is vegetated with Holland's (1986) closed canopied Westside Ponderosa Pine Forest. The pine forest habitat covers "close to 100 percent of the site" (NRA, 2001). The *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property – Westside Ponderosa Pine Forest (Figure 3). Onsite, this forest habitat covers approximately 95%, of the 38± acre Church of the Woods property. The predominant plant species of the onsite forest tree canopy, shrub layer, herbaceous understory, and a few, small shady isolated onsite meadows, are briefly described below. A complete list of the plant species identified onsite is provided in the Appendix A *Floral Compendium*. The list was prepared by TLC and NRA biologists.

- **Tree Canopy**: The common species of the onsite tree canopy include Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*) and Black Oak (*Quercus kelloggii*).

- **Shrub Layer**: The shrub layer, of the onsite forest, is primarily composed of Mountain Pink Currant (*Ribes nevadense*) and Mountain Dogwood (*Cornus nuttallii*). A variety of other less predominant shrubs and trees, such as Deer Brush (*Ceanothus integerrimus*) and California Coffeeberry (*Rhamnus californica*) are also scattered beneath the canopies of the forest trees of the property.

- **Herbaceous Understory**: Due to the dense nature, of the closed canopied Westside Ponderosa Pine Forest, the herbaceous understory is primarily absent. The sparse scatter of herbaceous plants observed growing, on the ground beneath the tree and shrub canopies, were non-native herbs and grasses.

- **Small Onsite Meadows**: The few, small meadows of the site are sparsely to moderately vegetated with a mix of grasses and herbs. The Western Bracken (*Pteridium aquilinum* var. *pubescens*) is the most prominent meadow species.



Thomas Leslie Corporation

BIOLOGICAL & CULTURAL
INVESTIGATIONS & MONITORING

Figure 3
Vegetation Map
For APNs 336-101-006 and -007

VI. RESULTS

This section discusses the results of *Pre-Field Survey* and *Field Survey* investigations including results of literature review, results of contacts with San Bernardino National Forest Service staff and MYLF habitat assessment.

A. PRE-FIELD SURVEY INVESTIGATIONS

The *Pre-Field Survey* analysis primarily included the following.

- Contact with the San Bernardino National Forest Service to ascertain the need to perform protocol presence or absence surveys for the MYLF.
- Review of a current CDFG Natural Diversity Data Base (CNDDB) records search report and velum overlay map, for the 1996 Harrison Mtn., California, U. S. Geological Survey (USGS) topographic quadrangle (CDFG, 2001a, b) to determine if any state records for the MYLF are located within the boundaries of the Church of the Woods property.
- Reviews of the following relevant documents: (1) the California Department Of Fish And Game's (CDFG) *Reptile Species Of Special Concern In California* (Jennings, 1994) and (2) a 1999 *The Press Enterprise* article.

A-1. Contact With the San Bernardino National Forest (SBNF) Service Biologist

Mr. Steve Loe, San Bernardino National Forest Service Biologist, was contacted by telephone to obtain information regarding the need to perform the MYLF habitat assessment.

A-1.1. Results of Contact With SBNF

Mr. Loe stated that a MYLF habitat assessment should be performed to ascertain the presence or absence of potentially suitable MYLF habitat within the boundaries of the Church of the Woods property.

A-2. State Records Search Results for the MYLF

Current CDFG Natural Diversity Data Base (CNDDB) record search reports, and quadrangle velum overlay maps for the 1996 Harrison Mtn. and 1996 Lake Arrowhead, California, US Geological Survey (USGS) 7.5 minute topographic quadrangles (USGS, 1996a, b), were analyzed to determine if any state records for the MYLF are recorded on, or in the vicinity immediately surrounding the Church of the Woods property (CDFG, 2001a, b, c, d).

A-2.1. Records Search Results

- There are no CNDDB records for MYLF within the boundaries of the Church of the Woods property. The nearest recorded location of MYLF is approximately 2.5 miles southeasterly of the intersection of Hwy 18 and Daley Canyon Road.
- No listed threatened or endangered species, or species candidate for listing, or any other unlisted but sensitive species were identified within the boundaries of the Church of the Woods property by CNDDB records (CDFG, 2001a, b, c, d).

A-3. Review Results of Relevant Documents

- According to the CDFG "*R. mucosa* has probably been extirpated from > 99% of its historic range in southern California" and "no MYLF have been observed in the San Bernardino Mountains since the 1970s (Jennings, 1994)."
- The local newspaper, *The Press Enterprise* published an article in 1999 that discussed the probable absence of MYLF in the San Bernardino Mountains.

B. RESULTS OF THE 2001 MYLF HABITAT ASSESSMENT FIELD SURVEYS

MYLF habitat assessment field surveys were conducted over the Church of the Woods property on August 26, 2001 by Dr. Leslie and Nadya Leslie (TLC, 2001) and in September and October 2001 by Mr. William S. La Haye (La Haye, 2001). The results of the *Field Surveys* are summarized below.

B-1. Purpose of the MYLF Habitat Assessment Field Surveys

The *Field Survey* investigations were primarily performed to accomplish the following.

- Ascertain the presence/absence, of potentially suitable MYLF habitat elements, on the Church of the Woods property.
- Determine the need to perform additional spring 2002 MYLF investigations.

Searches for MYLF individuals could not be made since this February-June active amphibian species, would not have been observable in August and September 2001.

B-2. Results of MYLF Habitat Assessment Field Surveys

- The is Church of the Woods property "is primarily closed-canopied forest with no surface water"
- Due to the "closed-canopied nature of the forest" covering the Church of the Woods property, no potentially suitable MYLF habitat elements were identified onsite by Dr. Leslie and Nadya Leslie on August 26, 2001.
- Mr. La Haye concluded in September 2001 that "APN 336-101-006 is primarily closed-canopied forest with no surface water" and "no mountain yellow-legged frog habitat exists on this property" (La Haye, 2001). This confirmed the negative findings of the August 26, 2001 habitat assessment field survey.
- No other listed threatened or endangered species, or species candidate for listing, or any other unlisted but sensitive species, were identified onsite during performance of the August and September 2001 MYLF habitat assessment field surveys.

VI. PROBABILITY TO OCCUR ONSITE

It is extremely unlikely that MYLF could occur on the Church of the Woods property for the following reasons: (a) no potentially suitable MYLF habitat occurs on the Church of the Woods property, (b) the CDFG believes that the MYLF "has probably been extirpated from > 99% of its historic range in southern California" and "no MYLF have been observed in the San Bernardino Mountains since 1970s (Jennings, 1994), and (c) the local newspaper, "*The Press Enterprise*" published an article in 1999 that discussed the probable absence of MYLF in the San Bernardino Mountains.

B-3. The Need for Additional MYLF Investigations

Due to the absence of potential MYLF habitat, "no additional field surveys or investigations are recommended (on APN 336-101-006 and APN 336-101-007) for this species" (La Haye, 2001).

Please call me if you have any questions regarding this letter report or require additional information.

Respectfully Submitted,
THOMAS LESLIE CORPORATION

T. Leslie

Thomas A. Leslie, Ph.D.,
President/Biologist

TAL/nvl

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San Bernardino County (SBC) Valley Region Vegetation by Holland Classification, February 13, 2001, 1 inch = 10,200 feet scale map.

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The Press Enterprise, 1999, An Article Discussing The Probable Absence Of MYLF In The San Bernardino Mountains.

Thomas Guide 2002 San Bernardino and Riverside Counties Street Guide and Directory, Detail Map Page 517, Coordinates F-4 and G-4.

Thomas Leslie Corporation (TLC), September 19, 2001, Results of A Biological Constraints Analysis of APN 336-101-006 And APN 336-101-007.

Tom Dodson and Associates (TDA), March 18, 1998, (Revised May 31, 1998) Biological Assessment for Mr. Rob Roy (Tract 15612).

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W. J. McKeever, Inc., August 20, 2001, 1 Inch = 80 Feet Map: "*Preliminary Site Plan*".

APPENDIX A

FLORAL COMPENDIUM

FOR
APN 336-101-006
AND APN 336-101-007

SAN BERNARDINO COUNTY, CALIFORNIA

Non-Native 8/66 = 12%	SCIENTIFIC NAMES	COMMON NAMES (66)	47 Species Identified On August 26, 2001 By Habitat Type	36 Species Identified On October 1-6, 2001	Flowering Period (Munz, 1974)
	KINGDOM PLANTAE	**HIGHER VASCULAR PLANTS**			
	DIVISION PTERIDOPHYTA				
	FAMILY DENNSTAEDTIACEAE	**BRACKEN FAMILY**			
	Pteridium aquilinum var. *pubescens*	Western Bracken	F	X	N/A
	DIVISION CONIFEROPHYTA				
	FAMILY CUPRESSACEAE	**CYPRESS FAMILY**			
	Calocedrus decurrens	Incense Cedar	F	X	N/A
	FAMILY PINACEAE	**PINE FAMILY**			
	Abies concolor	White Fir	F	X	N/A
	Pinus coulteri	Coulter Pine	- - -	X	N/A
	Pinus jeffreyi	Jeffrey Pine	F	X	N/A
	Pinus lambertiana	Sugar Pine	F	X	N/A
	Pinus ponderosa	Ponderosa Pine	F	X	N/A
	DIVISION ANTHOPHYTA	**FLOWERING PLANTS**			
	Class Dicotyledones (Dicots)	**Cotyledons (Seed Leaves) 2**			
	FAMILY APIACEAE	**CARROT FAMILY**			
	Osmorhiza chilensis	Sweet Celery	F	- - -	April-July
	Sanicula graveolens	Montane Yellow-flowered Sanicle	- - -	X	April-June
	FAMILY APOCYNACEAE	**DOGBANE FAMILY**			
X	*Vinca major*	Greater Periwinkle	D	- - -	March-July

	FAMILY SALICACEAE	**WILLOW FAMILY**			
	Salix lasiolepis	Arroyo Willow	R	- - -	February-April
	FAMILY SCROPHULARIACEAE	**FIGWORT FAMILY**			
	Castilleja applegatei	Montane Indian Paintbrush	- - -	X	May-July
	Penstemon centranthifolius	Scarlet Bugler	F	- - -	April-July
	Penstemon spectabilis	Chaparral Beard-tongue	- - -	X	April-June
	FAMILY VISCACEAE	**MISTLETOE FAMILY**			
	Phoradendron macrophyllum	Big-leaf Mistletoe	- - -	X	October-March
	Class Monocotyledones (Monocots)	**Cotyledons (Seed Leaf) 1**			
	FAMILY CYPERACEAE	**SEDGE FAMILY**			
	Carex sp.	Sedge	F	- - -	Summer
	FAMILY IRIDACEAE	**IRIS FAMILY**			
	Iris hartwegii ssp. *australis*	Hartweg's Iris	F	X	May-June
	FAMILY LILIACEAE	**LILY FAMILY**			
	Bloomeria crocea	Common Goldenstar	D	- - -	April-June
	Dichelostemma capitatum	Blue Dicks	D	- - -	February-May
	FAMILY POACEAE	**GRASS FAMILY**			
	Bromus carinatus	California Brome	F, D	- - -	April-August
	Bromus ciliatus	Fringed Brome	- - -	X	July-August
X	*Bromus diandrus*	Ripgut Grass	D	- - -	April-June
X	*Bromus tectorum*	Cheat Grass	D	X	May-June
X	*Hordeum murinum*	Hare Barley	D	- - -	April-June

Symbols/Abbreviations:

X = Non-native plant species
sp. = Plant identified to genus only; species not assigned.
c.f. = Indicates the field identified specimen is very closely comparable to, but not certainly identifiable as, the assigned species.
D = Ruderal/Disturbed vegetational association.
F = Westside Ponderosa Pine Forest.
R = Riparian habitat.

	FAMILY ASTERACEAE	**SUNFLOWER FAMILY**			
	Achillea millefolium	White Yarrow	D	- - -	June-September
X	*Ambrosia artemisiifolia*	Common Ragweed	D	- - -	August-November
	Artemisia douglasiana	Mugwort	D	- - -	June-October
	Artemisia dracunculus	Tarragon	D	- - -	August-October
	Erigeron divergens	Common Fleabane Daisy	- - -	X	March-November
	Eriophyllum lanatum	Montane Wooly Daisy	- - -	X	June-July
	Gnaphalium canescens ssp. *beneolens*	Fragrant Everlasting	F	- - -	July-October
	Hemizonia paniculata	Tarplant	D	- - -	May-November
	Hieracium c.f. *albiflorum*	Alpine Hawkweed	F	- - -	June-August
X	*Lactuca serriola*	Prickly Lettuce	D	- - -	May-September
	Malacothrix saxatilis	Cliff-Aster	D	- - -	March-September
	Solidago californica	California Goldenrod	D	X	July-October
X	*Tanacetum parthenium*	Feverfew	D	- - -	June-September
	FAMILY BRASSICACEAE	**MUSTARD FAMILY**			
	Erysimum capitatum	Western Wallflower	F, D	X	March-July
	FAMILY CARYOPHYLLACEAE	**PINK FAMILY**			
	Silene lemmonii	Catchfly	D	- - -	June-August
	FAMILY CONVOLVULACEAE	**MORNING GLORY FAMILY**			
	Calystegia occidentals ssp. *fulcrata*	Sonora Morning Glory	D	- - -	May-August
	FAMILY CORNACEAE	**DOGWOOD FAMILY**			
	Cornus nuttallii	Mountain Dogwood	F, R	- - -	April-July
	FAMILY ERICACEAE	**HEATH FAMILY**			
	Arctostaphylos sp.	Manzanita	- - -	X	January-March
	Pterospora andromedea	Pinedrops	F	- - -	June-August
	FAMILY FABACEAE	**LEGUME FAMILY**			
	Lotus crassifolius	Large-flowered Lotus	- - -	X	May-August
	Lupinus latifolius	Flat-leaved Lupine	- - -	X	April-July
	Lupinus luteolus	Butter Lupine	- - -	X	May-August
	Lupinus microcarpus	Chick Lupine	- - -	X	April-May
	Vicia c.f. *americana*	American Vetch	F	- - -	April-June

	FAMILY FAGACEAE	**OAK FAMILY**			
	Quercus chrysolepis	Canyon Oak	- - -	X	April-May
	Quercus kelloggii	California Black Oak	F	- - -	April-May
	FAMILY HYDROPHYLLACEAE	**WATERLEAF FAMILY**			
	Phacelia sp.	Phacelia	- - -	X	March-May
	FAMILY GROSSULARIACEAE	**GOOSEBERRY FAMILY**			
	Ribes cereum	Squaw currant	- - -	X	June-July
	Ribes c.f. *nevadense*	Mountain Pink Currant	F	- - -	April-June
	FAMILY LAURACEAE	**LAUREL FAMILY**			
	Umbellularia californica	California Bay	F	- - -	December-May
	FAMILY ONAGRACEAE	**EVENING PRIMROSE FAMILY**			
	Clarkia rhomboidea	Rhomboid Clarkia	F	- - -	May-July
	Epilobium brachycarpum	Panicled Willow-Herb	F, R	- - -	June-September
	Epilobium canum	California Fuchsia	F	- - -	August-October
	FAMILY POLEMONIACEAE	**PHLOX FAMILY**			
	Polemonium occidentale	Jacob's Ladder	F, R	- - -	June-August
	FAMILY POLYGONACEAE	**BUCKWHEAT FAMILY**			
	Eriogonum fasciculatum	California Buckwheat	- - -	X	March-October
	Eriogonum saxatile	Montane Buckwheat	- - -	X	May-July
X	*Polygonum convolvulus*	Black Bindweed	D	- - -	May-September
	FAMILY PORTULACACEAE	**PURSLANE FAMILY**			
	Claytonia perfoliata	Miner's lettuce	- - -	X	February-May
	FAMILY RHAMNACEAE	**BUCKTHORN FAMILY**			
	Ceanothus integerrimus	Deer Brush	F	X	May-June
	Rhamnus californica	California Coffeeberry	F	X	May-July
	FAMILY ROSACEAE	**ROSE FAMILY**			
	Potentilla glandulosa	Sticky Cinquefoil	F	X	May-June
	Rubus parviflorus	Thimbleberry	F	- - -	March-August

Thomas Leslie Corporation

Completion of White-Eared Pocket Mouse Trapping Survey

December 27, 2001

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
Church of the Woods
c/o: ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

December 27, 2001

SUBJECT: Completion of White-eared Pocket Mouse Trapping Survey Dated December 11, 2001

Dear Mr. Hopkins:

Please find enclosed a report documenting the completion of six White-eared Pocket Mouse (WEPM) trapping surveys dated December 11, 2001. Our subconsultant Natural Resources Assessment, Inc. (NRA) performed the trapping surveys. As documented by the report the "trapping surveys confirmed the absence of the species (WEPM) from the site and no mitigation measures should be required" (NRA, 2001).

According to the US Fish and Wildlife Service, the results of the trapping survey report are valid for one year from the date of the last trapping survey was completed. Therefore, the report is valid through October 6, 2002. If project processing has not been completed by that date, another study may be required to confirm the continued absence of the White-eared Pocket Mouse on the property.

San Bernardino Flying Squirrel (***Glaucomys sabrinus californicus***; **SBFS**): In addition to the mouse, NRA's investigations, and report, also addressed the potential for the SBFS to occur onsite. Their report states that it is their opinion that "habitat exists on site for the San Bernardino flying squirrel (*Glaucomys sabrinus californicus*) in the montane coniferous forest habitat" and therefore, "this species is probably present on the project site." This finding is in agreement with what the information provided by the San Bernardino National Forest Service. More specifically on August 27, 2001, I met with a Forest Service biologist, Mr. Steve Loe, at his office in San Bernardino, California, to (a) review maps identifying the locations of sensitive wildlife species on and in the vicinity of the project site and (b) discuss the potential for specific sensitive species, such as the SBFS, to occur onsite. Mr. Loe told me that the Forest Service assumes the region surrounding, and including the project site, is inhabited by flying squirrels. Therefore, NRA's report made the following recommendation regarding the SBFS.

RECOMMENDATION REGARDING THE SBFS

- "Suitable habitat exists for the flying squirrel throughout the site. This species is listed as a Forest Service Sensitive Species, which makes the significance of impacts difficult to determine. This issue should be discussed with the U.S. Forest Service to determine what, if any, mitigation will be required."

Please call me to discuss the flying squirrel issue in more detail. Also let me know if you have any questions regarding NRA's report.

Respectfully Submitted,
THOMAS LESLIE CORPORATION

Tom Leslie

Thomas A. Leslie, Ph.D.
President

TAL/nvl// PH-122701-WEPM & SBFS Surveys Results

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233

Natural Resources Assessment, Inc.

This report was prepared in accordance with professional requirements and recommended protocols for general small mammal biological assessments.

Karen Kirtland

11 Dec. 01
Date

Project Number: TLE01-101

3415 Valencia Hill Drive
Riverside, CA 92507

Phone/Fax: 909 686 1141
E-mail: kkirtland@aol.com

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Appendices

Appendix A - Plant Species Observed
Appendix B - Wildlife Species Observed

Executive Summary

Natural Resources Assessment, Inc. (NRA, Inc.) conducted a focused trapping survey for the Church of the Woods project located in the Rim Forest community of the San Bernardino Mountains, San Bernardino County. The trapping studies were required due to the potential presence on the property of the white-eared pocket mouse (*Perognathus alticolus alticolus*).

No white-eared pocket mouse were captured during the course of the trapping survey. Based on the trapping results, this species is not currently present on the project site.

Habitat exists on site for the San Bernardino flying squirrel (*Glaucomys sabrinus californicus*) in the montane coniferous forest habitat. This species is probably present on the project site.

Introduction

Natural Resources Assessment, Inc. (NRA, Inc.) conducted a focused trapping survey for the Church of the Woods project located in the Rim Forest community of the San Bernardino Mountains, San Bernardino County. The work was intended to identify the potential for impacts to the white-eared pocket mouse (*Perognathus alticolus alticolus*) as a result of facility construction. The site is currently in open space.

Project Location and Description

The project is located in the community of Rim Forest off of State Route 189 (Figure 1). It lies to the west of State Route 189 and north of Highway 18. The property is in Section 29, Township 2 north, Range 3 west on the Harrison Mountain 7.5' quadrangle, San Bernardino baseline and meridian (Figure 2).

The project is the construction of a youth camp, recreational areas, roads, parking areas and other support facilities.

Methods

Research

NRA, Inc. reviewed available information on the known sensitive resources in the area. The literature review included a review of standard field guides and texts on sensitive and non-sensitive biological resources, as well as the following sources:

- List of sensitive biological resources provided by the California Natural Diversity Data Base
- *Mammalian Species of Special Concern in California,* listing on the white-eared pocket mouse (*Perognathus alticolus alticolus*), Remsen, 1978.
- *California's Wildlife,* listing for the white-eared pocket mouse (*Perognathus alticolus*), Zeiner, et al, 1990.
- Mammals of the Pacific States, Ingles, 1965.

NRA, Inc. also reviewed other available technical information on this species, and discussed recent findings with researchers in the field. NRA, Inc. also reviewed other available technical information on the biological resources of the site. We used the information to focus our survey effort in the field.

Field Surveys

Field and trapping surveys were conducted by Mr. Philippe Vergne from October 1 to 6, 2001. The site was surveyed using standard survey techniques for biological assessments in order to determine the best location for setting the trap lines. Sign surveyed for included tracks, scat, burrows, and habitat. During the surveys, notes were made on the plant and animal species observed, the surface characteristics and topography of the project area, and the suitability of the habitat for the white-eared pocket mouse.

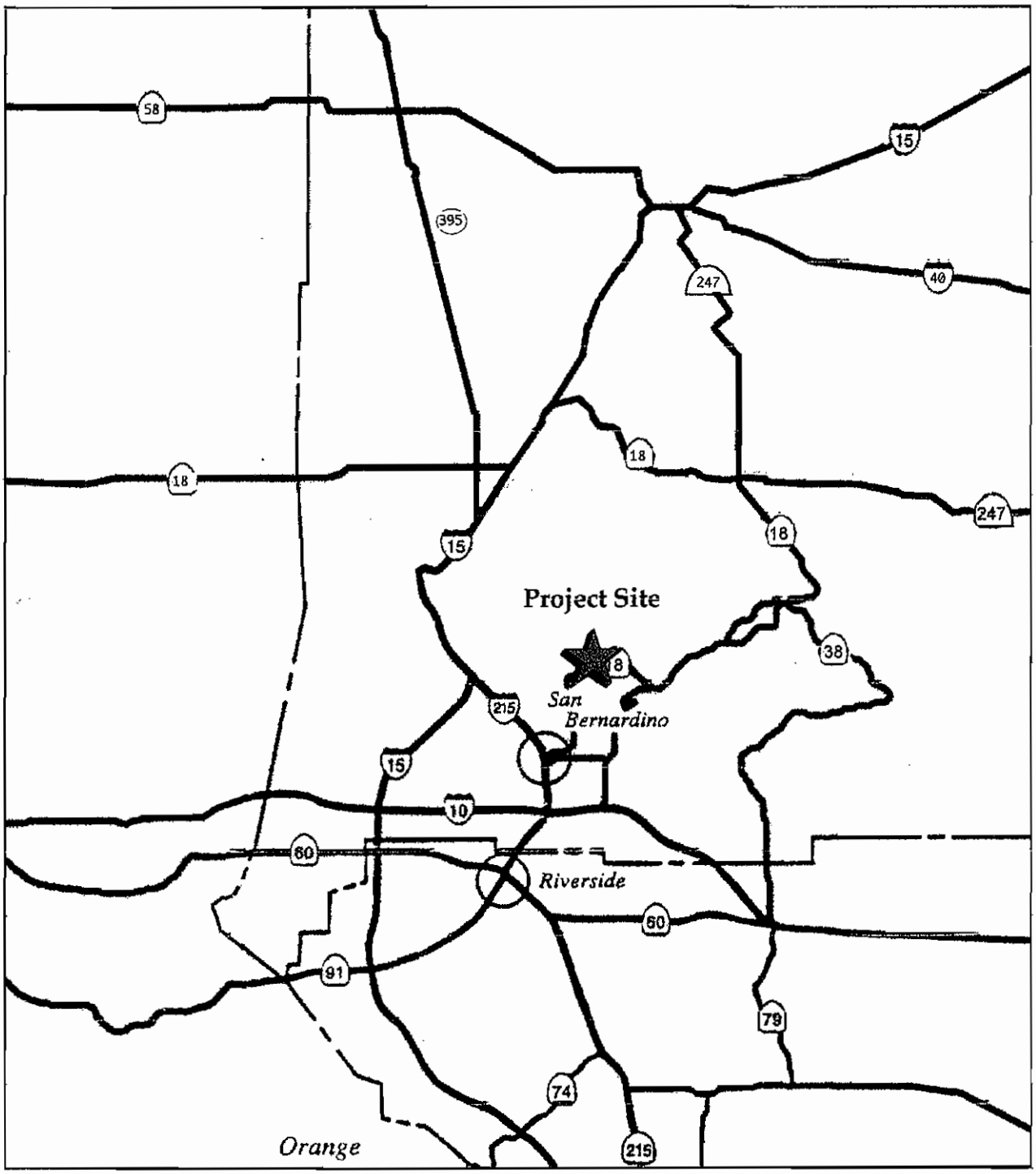
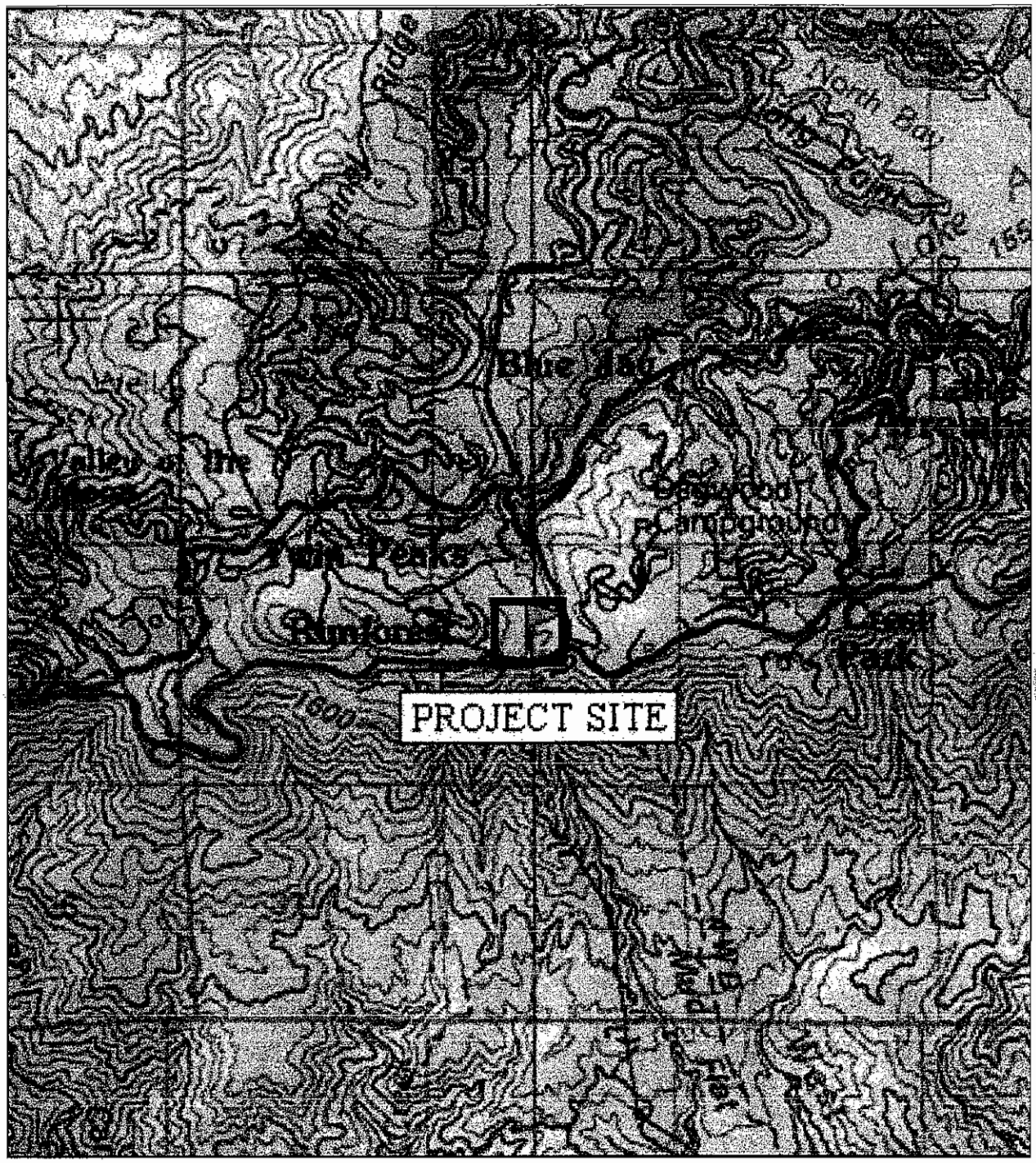


Figure 1 Regional Location

N

Not to Scale

Church of the Woods
Rim Forest
San Bernardino County, California



Base Map: Harrison Mountain (1996) 7.5′ USGS topographic quadrangle

Figure 2 Project Vicinity

N

Feet (approximate)

0 1760 3520

Church of the Woods
Rim Forest
San Bernardino County, California

Trapping Studies

NRA, Inc. conducted trapping according to protocols established for the Pacific pocket mouse (*Perognathus longimembris pacificus*), a related species found in Southern California. The protocol calls for five nights of trapping, conducted when the animal is active above–ground at night and preferably during a new moon phase. We placed the traps in suitable habitat areas on the project, concentrating on locating traps in areas containing small mammal burrows and suitable soils for the white-eared pocket mouse. All trap were left in place to ensure the same trap sites were trapped each night.

Each trap was baited with the bait placed at the back of the traps. Traps were placed at dusk each night and inspected at night and at dawn each day. All animals were identified and released at the point of capture.

NRA, Inc. took notes on the habitats where the traps were placed, and recorded soil and other relevant characteristics. We also noted the weather conditions at the time of the trapping studies.

Results

Research

Potential habitat for the white-eared pocket mouse and the San Bernardino flying squirrel was observed on site.

White-eared Pocket Mouse

The white-eared pocked mouse is rarely found during general trapping studies, having an historical distribution limited to isolated montane areas in the Tehachapi and San Bernardino Mountains. Since the original work on the pocket mouse in 1938, this species has only been found in the Tehachapi Mountains. Information gained from trapping in this region has increased the elevation range to 3500 to 6900 feet, but the current distribution is unknown.

Its preferred habitat is poorly known, but work by researchers has found that the pocket mouse seems to prefer ponderosa and Jeffrey pine forests, and it is uncommonly found in mixed chaparral and sagebrush habitats. The white-eared pocket mouse has once been trapped in a fallow field dominated by Russian thistle (*Salsola tragus*) (California Department of Fish and Game, 1990).

The nearest locality to the project site is to the west, in the vicinity of Strawberry Peak. The populations in this area have been found at elevations of 5400 to 5800 feet. The last time this species was observed in this area was in 1938, and these populations may no longer exist.

Dr. Paul Collins of the Santa Barbara Museum of Natural History has conducted extensive trapping for this species in the Tehachapi Mountains, and has contributed to the information on the elevational range of the animal. He has trapped this species in scrub or open scrub habitats on sandy soils. His trapping sites include areas on old alluvial fans.

San Bernardino Flying Squirrel

The San Bernardino flying squirrel (*Glaucomys sabrinus californicus*) occurs in the San Bernardino Mountains and historically in the San Jacinto Mountains. It has been found in mid to upper elevation coniferous forest plant communities (Stephenson and Calcarone 1999).

Flying squirrels are cavity nesters, using holes in large trees, snags and logs for cover. This species ranges from 5200 to 8500 feet in elevation. The preferred habitat is usually mature, dense conifer forest, typically with white fir, in sites close to riparian areas (Stephenson and Calcarone 1999) with 40 percent or greater canopy.

The available data suggests that, to a certain extent, flying squirrels can coexist with low density development such as organizational camps and cabins, but higher density areas may be avoided by this species (Stephenson and Calcarone 1999).

This species is listed as a Forest Service Sensitive Species.

Field and Trapping Surveys

Weather

The weather was warm, in the low fifties at night and the mid seventies (degrees Fahrenheit) during the day, with calm conditions. The skies were clear throughout the survey.

Soils and Topography

The soils are fairly uniform over the project site, consisting primarily of decomposed granite and silt. Overlaying the soils on thirty percent of the sites trapped was a moderately thick organic duff layer of pine needles and oak leaves.

The site and surrounding terrain is hilly to mountainous.

Plant Communities

The property supports two plant communities. Montane coniferous forest is the dominant plant community, covering close to 100 percent of the site.

The second plant community is riparian. This plant community occurs along the main drainage bisecting the property. This drainage is adjacent to one of the water and sewer easements on site.

The montane coniferous forest community forms a high quality habitat on the property. The dominant plant species includes Jeffrey pine (*Pinus jeffreyi*), Ponderosa pine (*Pinus ponderosa*), sugar pine (*Pinus lambertiana*) and black oak (*Quercus kelloggii*). Tree cover varies from 20 to approximately 70 percent. Some historical logging and fire scarring is evident on the property. Herbaceous cover in this plant community was approximately 30 percent at the time of the survey.

The riparian plant community is more fully described in the general biological assessment report prepared for the project by Thomas Leslie Corporation. A complete list of plant species recorded during the surveys can be found in Appendix A.

Wildlife

Wildlife observations made during the survey were dominated by mammal and bird species. Observations of wildlife included scat, tracks, burrows, nests, calls, and individual animals.

The main drainage bisecting the property is fed by a spring at the lower end of the property. Flowing water also occurs in this section of the drainage. Neither of these two areas supported amphibian species at the time of the surveys.

The side-blotched lizard, alligator lizard and granite spiny lizard were the only reptile species observed. Bird species observed included Stellar's jay, mountain chickadee and acorn woodpecker, mountain bluebird and evening grosbeak. Several mammal species were observed foraging on site, including gray squirrel, coyotes, and a juvenile black bear. Sign belonging to Botta's pocket gopher was also observed.

Disturbances

Disturbances on the property are limited to existing road and paths. The roads and paths have not seen much use other than hiking and mountain biking. At the entrance to the southeastern corner of the site there is s small area that has been used for picnicking and drinking parties. Other disturbance included logging (in the past), fire episodes and vehicle disturbance from routine maintenance activities along the sewer easement. The level of disturbance is low.

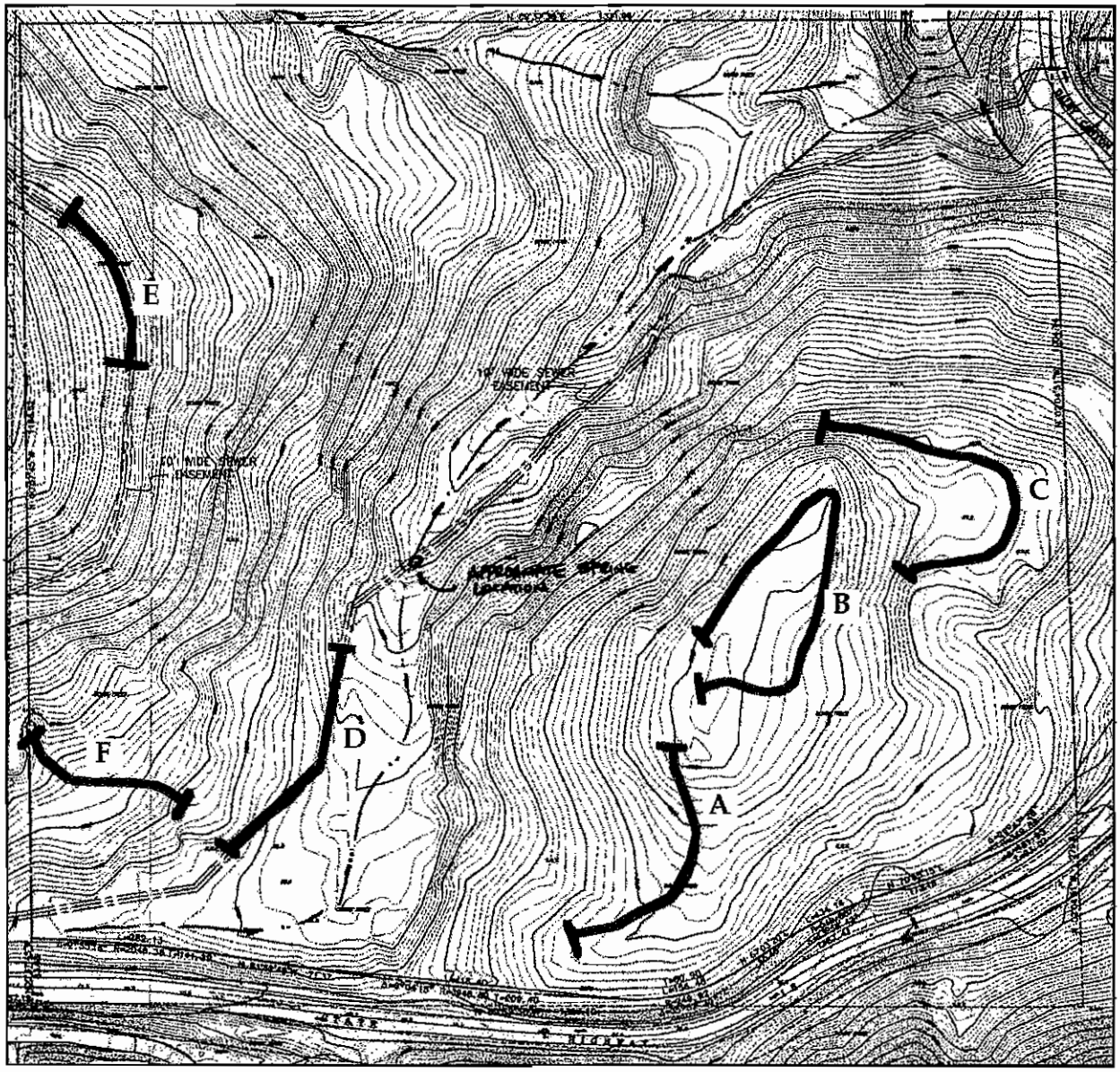
The surrounding properties include a housing development to the west, the town of Blue Jay to the north, State Route 189 to the east and State Route 18 to the south.

White-eared Pocket MouseTrap Sites

The sites selected by NRA, Inc. as suitable for trapping were areas located in openings within the forest canopy. The ground cover on these sites consisted of a variety of grasses and annual wildflowers, with zero to less than 30 percent cover. All trap sites had relatively soft sandy soils. The six sites selected for trapping are shown on Figure 3.

Trap Sites A, B, C and F were located in open coniferous forest intermixed with sparse oaks (Pictures 1 - 4). The soils were sandy. Bracken ferns were present in or near Trap Site A and B, indicating recent disturbance or fire in these areas.

Trap Sites D and E were located along the water and sewer easement in adjacent open spaces. Soils were composed of a mix of sandy and decomposed granite.



Base Map: Thomas Leslie Corporation, Inc. 2001

Figure 3 Trap Line

Legend

A Trapline

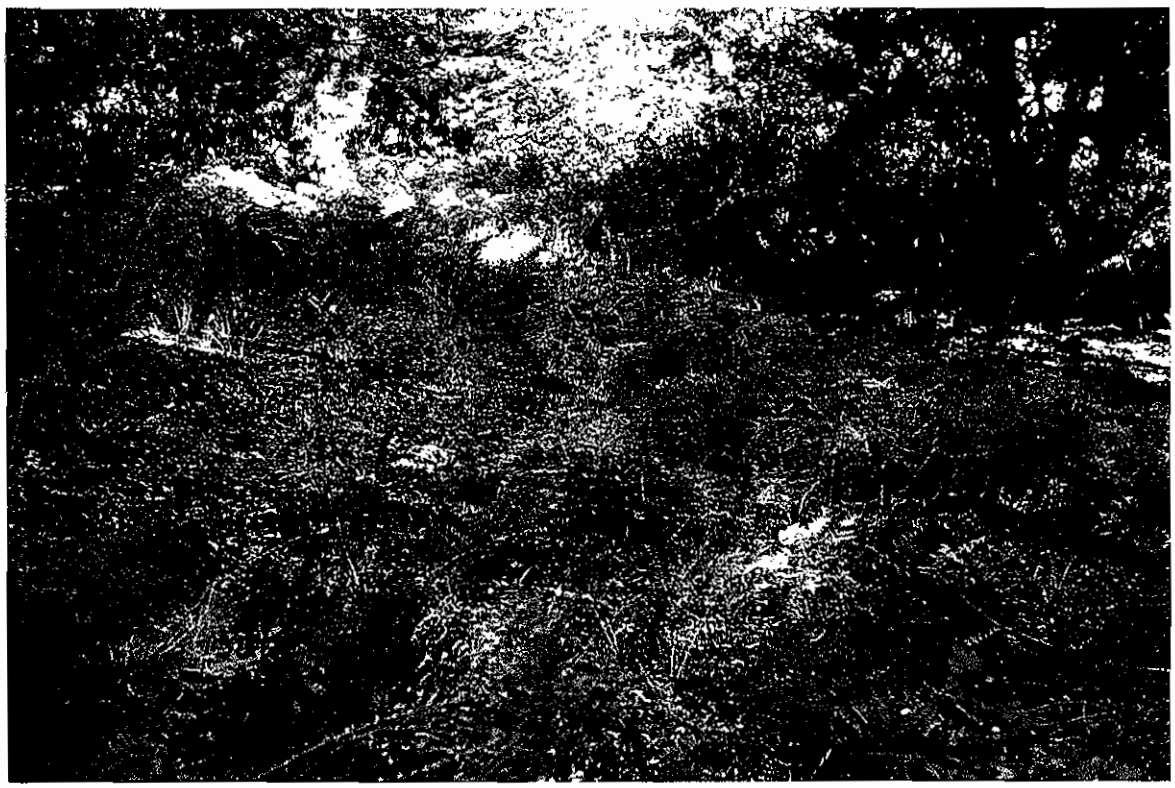
N

Feet (approximate)

0 117.5 235

Church of the Woods
Rim Forest
San Bernardino County, California

Picture 1. Trap Site A.



Picture 2. Trap Site B.

Picture 3. Trap Site C.

Picture 4. Trap Site F.

Trap Results

NRA, Inc. did not trap any individuals of white-eared pocket mouse. Trapping success was less than ten percent over the entire trapping period.

Table 1 provides information on the species trapped per site and per night.

Results of the trapping survey confirmed the current absence of the white-eared pocket mouse on the project site. There are no significant direct impact to the species due to project implementation

Table 1. Trapping Results for the Church of the Woods Project

(Phylogenetic listing per Jameson & Peters, California Mammals, 1988)

Trap Site	Nos. of Traps	Trap Dates	Species*					
			DIAG	PEBO	CHFA	PEMA	NELE	TAME
A	35	Oct 1-6, 2001		5	2		2	
B	45	Oct 1-6, 2001	2	7		2		1
C	35	Oct 1-6, 2001		9		3	1	1
D	35	Oct 1-6, 2001		3				1
E	20	Oct 1-6, 2001		6	1	3		
F	37	Oct 1-6, 2001		7				
Total	207		2	37	3	8	3	3
Capture success			0.97%	17.87%	1.45%	3.86%	1.45%	1.45%

*No animals were marked for identification; therefore, the total number of captures over 1,035 trap nights may include recaptures of previously trapped animals

Legend

DIAG - *Dipodomys agilis*, Pacific kangaroo rat
PEBO - *Peromyscus boylii*, Brush mouse
CHFA - *Chaetodippus fallax fallax*, Northwestern San Diego pocket mouse
PEMA - *Peromyscus maniculatus*, Deer mouse
NELE - *Neotoma lepida*, Desert woodrat
TAME - *Tamias merriami*, Merriam's chipmunk

San Bernardino Flying Squirrel

The montane coniferous forest habitat is suitable for the San Bernardino flying squirrel. Individual animals have been observed in similar habitat in the Twin Peaks area (personal observation, Natural Resources Assessment, Inc. pers. comm.) and are recorded elsewhere in coniferous forest habitat. Based on the known habitat requirements of the species, this species is most likely present on site and may be impacted by proposed construction and related human activities.

Discussion

Plant Communities

The proposed project will mostly impact the coniferous forest community on the property. Since this community is relatively common in the San Bernardino Mountains, the impacts are not considered to be significant.

Wildlife

Reduction of native plant communities through project development will result in the reduction of numbers of wildlife individuals in this area of the San Bernardino Mountains. Smaller and less mobile species, such as small mammals, reptiles and most invertebrates, will experience a direct reduction in population numbers through the loss of individuals resulting from destruction of habitat and direct individual mortality.

Larger or more mobile species, such as large mammals and birds, could experience some loss of individuals as a result of the loss of habitat. Loss of individuals from direct mortality is less than for smaller species, since most mobile animals will leave an area with high human disturbance.

Impacts to non-sensitive wildlife are not considered to be significant.

Sensitive Biological Resources

White-eared Pocket Mouse

Trapping surveys confirmed the absence of the species from the site and no mitigation measures should be required.

San Bernardino Flying Squirrel

Suitable habitat exists for the flying squirrel throughout the site. This species is listed as a Forest Service Sensitive Species, which makes the significance of impacts difficult to determine. This issue should be discussed with the U.S. Forest Service to determine what, if any, mitigation will be required.

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Appendix A - Plant Species Observed

* denotes non-native species

GYMNOSPERMAE	**NAKED SEED PLANTS**
Dennstaedtiaceae	**Bracken family**
Pteridium aquilinum	Bracken fern
CONIFERAE	**CONE-BEARING PLANTS**
Cupressaceae	**Cypress family**
Calocedras decurrens	Incense cedar
Pinaceae	**Pine family**
Abies concolor	White fir
Pinus coulteri	Coulter pine
Pinus jeffreyi	Jeffrey pine
Pinus lambertiana	Sugar pine
Pinus ponderosa	Ponderosa pine
ANGIOSPERMAE: DICOTYLEDONES	**DICOT FLOWERING PLANTS**
Apiaceae	**Carrot family**
Sanicula graveolens	Montane yellow-flowered sanicle
Asteraceae	**Sunflower family**
Erigeron divergens	Common fleabane daisy
Eriophyllum lanatum	Montane woolly daisy
Solidago californica	California goldenrod
Brassicaceae	**Mustard family**
Erysimum capitatum	Western wallflower
Ericaceae	**Heath family**
Arctostaphylos sp.	Manzanita
Fabaceae	**Pea family**
Lotus crassifolius	Large-flowered lotus
Lupinus latifolius	Flat-leaved lupine
Lupinus luteolus	Yellow-flowered montane lupine
Lupinus microcarpus	Small seeded lupine

Fagaceae	**Oak family**
Quercus chrysolepis	Canyon oak
Quercus kelloggii	Black oak
Hydrophyllaceae	**Waterleaf family**
Phacelia sp.	Phacelia
Polygonaceae	**Buckwheat family**
Eriogonum saxatile	Montane buckwheat
Eriogonum fasciculatum	California buckwheat
Portulacaceae	**Purslane family**
Claytonia perfoliata	Miner's lettuce
Rhamnaceae	**Buckthorn family**
Ceanothus integerrimus	Deer brush
Rhamnus californica	Coffeberry
Rosaceae	**Rose family**
Potentilla glandulosa	Resinous cinquefoil
Saxifragaceae	**Saxifrage family**
Ribes cereum	Squaw currant
Scrophulariaceae	**Snapdragon family**
Castilleja applegati	Montane Indian paintbrush
Penstemon spectabilis	Chaparral beard's tongue
Viscaceae	**Mistletoe family**
Phoradendron macrophyllum	Big-leaf mistletoe

ANGIOSPERMAE: MONOCOTYLEDONAE MONOCOT FLOWERING PLANTS

Iridaceae	**Iris family**
Iris hartwegii	Mountain iris
Poaceae	**Grass family**
Bromus ciliatus	Fringed brome
* *Bromus tectorum*	Cheatgrass

Taxonomy and nomenclature follow Hickman 1993 and Munz 1974.

Appendix B - Wildlife Species Observed

REPTILIA	**REPTILES**
Iguanidae	**Iguanas and their allies**
Sceloporus orcutti	Granite spiny lizard
Uta stansburiana	Side-blotched lizard
AVES	**BIRDS**
Picidae	**Woodpeckers and relatives**
Melanerpes formicivorus	Acorn woodpecker
Corvidae	**Crows and ravens**
Cyanocitta stelleri	Stellar's jay
Corvus corax	Common raven
Paridae	**Titmice**
Parus gambeli	Mountain chickadee
Sittidae	**Nuthatches**
Sitta carolinensis	White-breasted nuthatch
Turdidae	**Thrushs**
Sialia currucoides	Mountain bluebird
Emberizidae	**Warblers, sparrows, blackbirds and relatives**
Junco hyemalis	Dark-eyed junco
MAMMALIA	**MAMMALS**
Sciuridae	**Squirrels, chipmunks and marmots**
Sciurus carolinensis	Gray squirrel
Geomyidae	**Pocket gophers**
Thomomys umbrinus	Botta's pocket gopher

Nomenclature follows Laudenslayer et al., 1991, Hall, 1981 and Stebbins, 1966.

Thomas Leslie Corporation

Results of an Andrew's Marble Butterfly Habitat Assessment

December 26, 2001

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
Church of the Woods
c/o: ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

December 26, 2001

SUBJECT: Results of an Andrew's Marble Butterfly Habitat Assessment

Dear Mr. Hopkins:

Thomas Leslie Corporation is pleased to present the results of an Andrew's Marble Butterfly (*Euchloe hyantis andrewsii*; AMB) habitat assessment. The habitat assessment was conducted within the boundaries of 38± acre property situated northwest of the intersection of Hwy 18 and Daley Canyon Road in San Bernardino County, California. The property is comprised of two Assessors' Parcel Numbers (APN) 336-101-006 and 336-101-007 (property). The need to perform the AMB habitat assessment was identified in TLC's, September 19, 2001, biological constraints analysis (TLC, 2001). The findings of the AMB habitat assessment, divided into *Pre-Field Survey* and onsite protocol *Field Surveys*, are summarized in this letter report.

I. LOCATION OF PROJECT SITE

The Rim of the World Highway (State Highway 18; Hwy 18) provides regional access to the property. The property can be reached by exiting Hwy 18 at Bear Springs or Daley Canyon Roads.

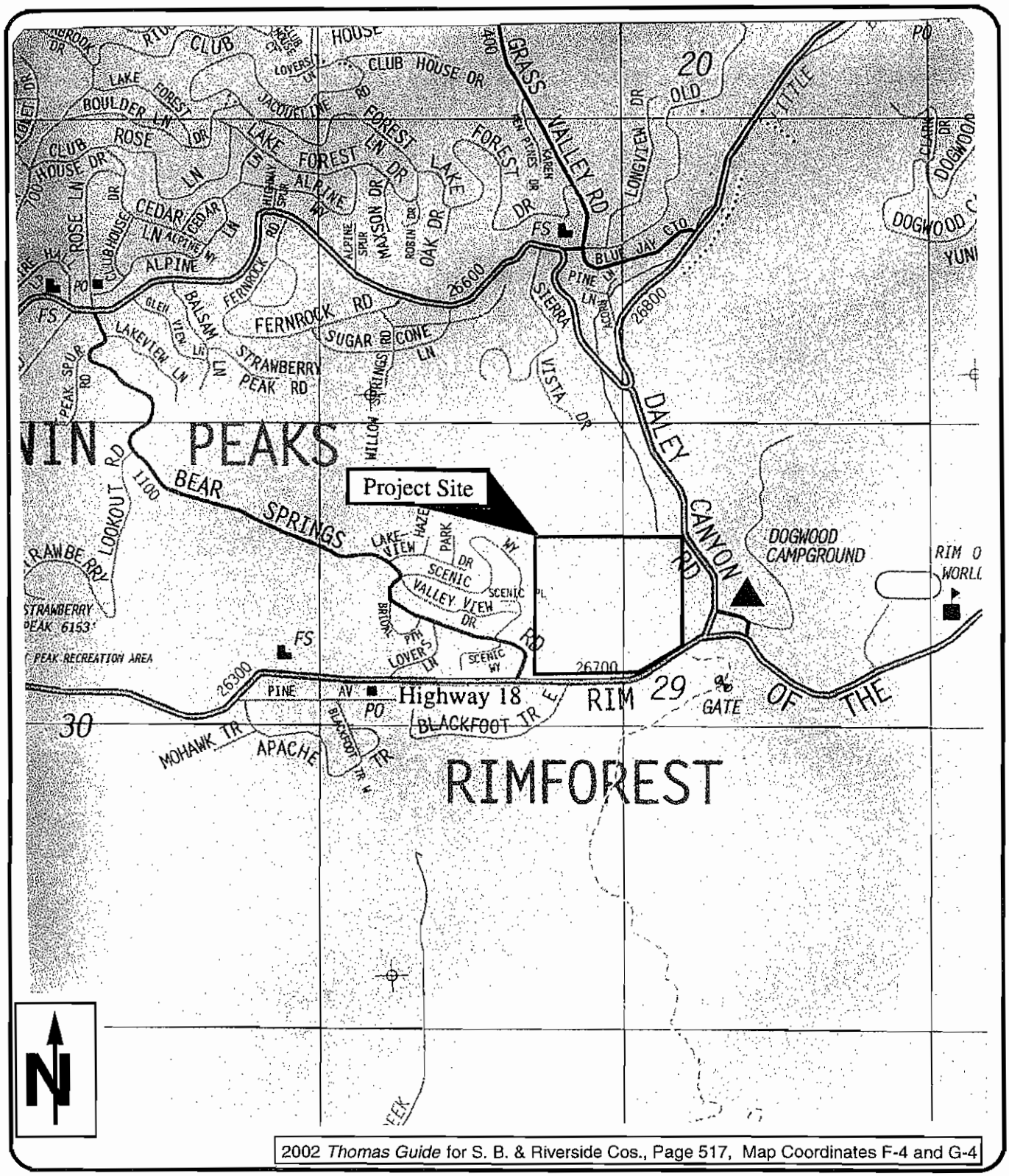
- Figure 1 illustrates the approximate boundaries of the property on the 2002 *Thomas Guide* San Bernardino and Riverside Counties Street Guide and Directory on Detail map page 517; map coordinates F-4 and G-4.
- Figure 2 plots the approximate boundaries of the property in the NW quadrant of Section 29, Township 2 North, Range 3 West; of the 1996 Harrison Mountain, California 7.5' United States Geological Survey (USGS) Topographic Quadrangle, San Bernardino Base and Meridian.

II. PURPOSE OF THE AMB HABITAT ASSESSMENT

The AMB habitat assessment was performed to accomplish the following.

- Ascertain the presence/absence of plant habitat potentially capable of supporting AMB within the boundaries of the property.
- Search for the property for the plant species identified in the literature as potential AMB host plants.
- Ascertain the presence/absence onsite of potentially suitable abiotic, physical habitat elements required by the AMB including ridgelines and minor summits, sunny flats and open slopes, trails, fields of wildflowers and other similar areas.
- Determine the need to perform additional spring 2002 AMB investigations.

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233



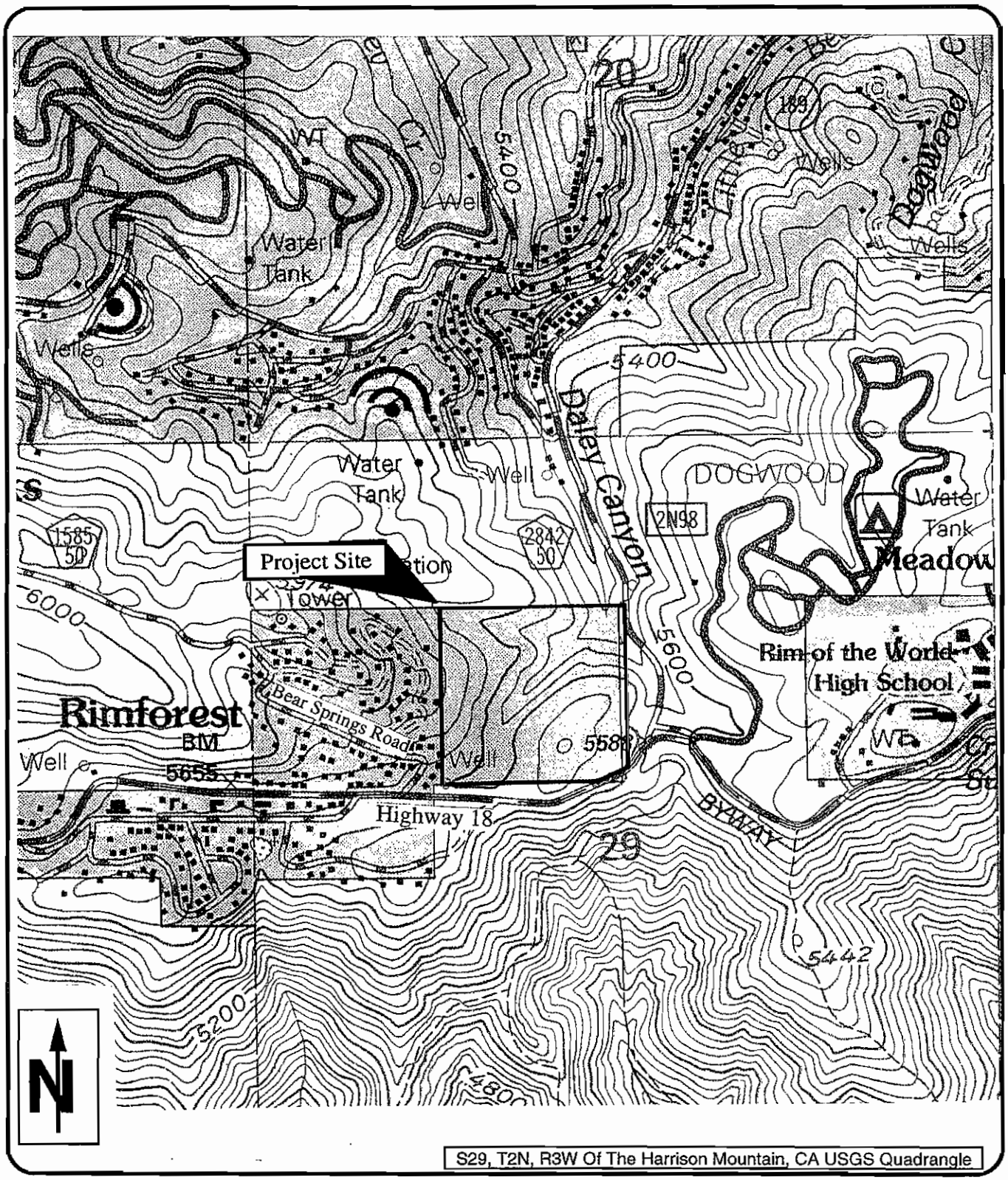
2002 *Thomas Guide* for S. B. & Riverside Cos., Page 517, Map Coordinates F-4 and G-4

Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1
Vicinity Map

Illustrating Approximate Boundaries Of
APNs 336-101-006 and -007



S29, T2N, R3W Of The Harrison Mountain, CA USGS Quadrangle

Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 2

Approximate Boundaries Of APNs 336-101-006 and -007 Plotted On A USGS Quadrangle Map

III. PROPOSED PROJECT

As illustrated on W.J. McKeever, Inc., August 20, 2001, 1 inch = 80 feet scale *Preliminary Site Plan,* the project proposed involves construction of a church, private school, storage and residence buildings, a baseball field and associated onsite paved driveways, roadways and parking.

IV. GENERAL STATUS OF THE AMB

A. Listing Status: The AMB is a state and federally *unlisted* insect. However, according to Mr. Steve Loe, a San Bernardino National Forest biologist, this butterfly is a locally sensitive species.

B. Description: This species has very light yellow-green marbling and lacks pearly luster on the ventral surface of the hindwings.

C. Habitat And Host Plants: The AMB is restricted to the San Bernardino Mountains above approximately 5,000 feet elevation above mean sea level [msl] (Garth and Tilden 1986, Stephenson and Calcarone 1999). It primary inhabits sunny flats, open slopes, trails, fields of wildflowers and other similar areas within pine and mixed-conifer forests. Like many higher elevation butterfly species, AMB adults "hilltop", and repeatedly fly up and over ridgelines and minor summits.

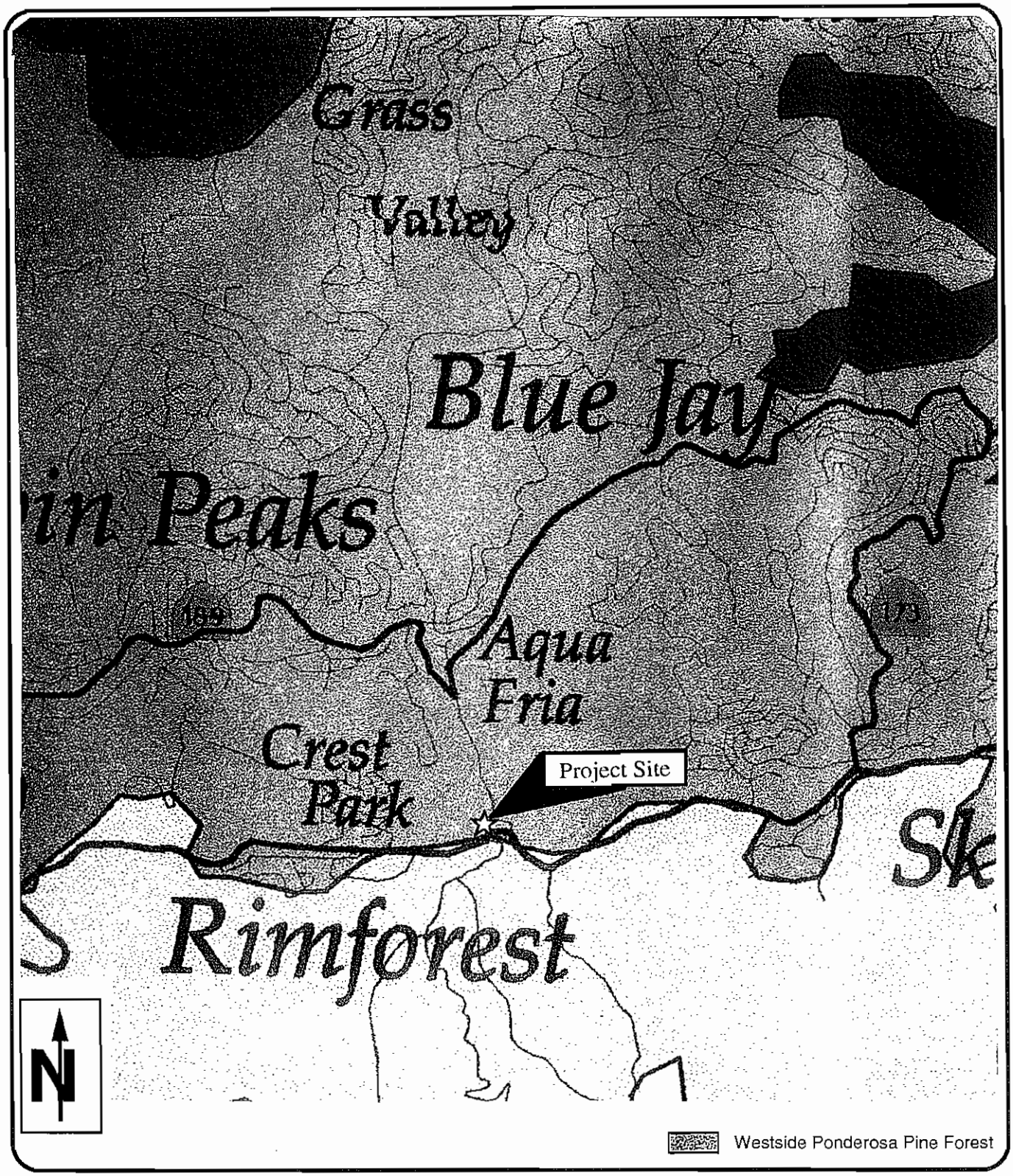
D. Adult Survey Season: AMB adults fly late May to early July (Garth and Tilden 1986; Emmel and Emmel, 1973). Therefore, if necessary focused adult AMB surveys should be conducted at this time of the year. According to Emmel and Emmel (1973) and Stephenson and Calcarone (1999), only two host plants are known for this species: Laguna Mountains Jewel-Flower (*Streptanthus bernardinus*; flowers June-July) and Rock Cress (*Arabis holboellii* var. *pinetorum*; flowers May-July). However, another source states that "the food plants for this butterfly are Slender-petaled Thelypodium (*Thelypodium stenopetalum*; flowers June-July), Parish's Rock-Cress (*Arabis parishii*; flowers April-May) and other native mustards" (Krantz, 1990).

E. Presence Onsite Of Host Plants During Habitat Assessment: No potential food plant species were identified during eight field surveys performed onsite on the following dates: (a) August 26, 2001 by Thomas A. Leslie, Ph.D. and Nadya V. Leslie MS, (b) September 6, 2001 by Mr. Bill La Haye (La Haye, 2001) and (c) 1, 2, 3, 4, 5 and 6 October 2001, by Mr. Philippe Vergne (NRA, 2001). The Appendix A *Floral Compendium* provides a complete list of all plant species identified onsite during the August and October 2001 field surveys. It also documents the absence of potential food plants onsite.

V. PROJECT SITE EXISTING VEGETATIONAL COVER DESCRIPTION

As documented by TLC's September 19, 2001, *biological constraints analysis* report (TLC, 2001), the property is vegetated with Holland's (1986) closed canopied Westside Ponderosa Pine Forest. The pine forest habitat covers "close to 100 percent of the site" (NRA, 2001). The *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property – Westside Ponderosa Pine Forest (Figure 3). Onsite, this forest habitat covers approximately 95%, of the 38± acre property. The predominant plant species of the onsite forest tree canopy, shrub layer, herbaceous understory, and a few, small shady isolated onsite meadows, are briefly described below. A complete list of the plant species identified onsite is provided in the Appendix A *Floral Compendium.*

- **Tree Canopy**: The common species of the onsite tree canopy include Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*) and Black Oak (*Quercus kelloggii*).
- **Shrub Layer**: The shrub layer, of the onsite forest, is primarily composed of Mountain Pink Currant (*Ribes nevadense*) and Mountain Dogwood (*Cornus nuttallii*). A variety of other less predominant shrubs and trees, such as Deer Brush (*Ceanothus integerrimus*) and California Coffeeberry (*Rhamnus californica*) are also scattered beneath the canopies of the forest trees of the property.
- **Herbaceous Understory**: Due to the dense nature, of the closed canopied Westside Ponderosa Pine Forest, the herbaceous understory is primarily absent. The sparse scatter of herbaceous plants observed growing, on the ground beneath the tree and shrub canopies, were non-native herbs and grasses.
- **Small Onsite Meadows**: The few, small meadows of the site are sparsely to moderately vegetated with a mix of grasses and herbs. The Western Bracken (*Pteridium aquilinum* var. *pubescens*) is the most prominent meadow species.



Thomas Leslie Corporation

BIOLOGICAL & CULTURAL
INVESTIGATIONS & MONITORING

Figure 3
Vegetation Map
For APNs 336-101-006 and -007

VI. RESULTS

This section discusses the results of *Pre-Field Survey* and *Field Survey* investigations including results of literature review, results of contacts with San Bernardino National Forest Service staff and AMB) habitat assessment *Pre-Field Survey* and *Field Surveys.*

A. PRE-FIELD SURVEY INVESTIGATIONS

The *Pre-Field Survey* analysis primarily included the following.

- Contact with the San Bernardino National Forest Service to ascertain the need to perform protocol presence or absence surveys for the AMB.
- Review of a current California Department of Fish and Game (CDFG) Natural Diversity Data Base (CNDDB) records search report and velum overlay map, for the 1996 Harrison Mtn., California, U. S. Geological Survey (USGS) topographic quadrangle (CDFG, 2001a, b) to determine if any state records for the AMB are recorded within the boundaries of the property.

A-1. Contact With the San Bernardino National Forest Service Biologist

Mr. Steve Loe, San Bernardino National Forest Service Biologist, was contacted, by telephone, in attempt to obtain information regarding the need to perform the AMB habitat assessment. Mr. Loe stated that AMB habitat assessment must be performed to ascertain the presence or absence of potentially suitable AMB habitat within the boundaries of the property. Therefore, the AMB habitat assessment was performed.

A-2. State Records Search Results for the AMB

Current CDFG Natural Diversity Data Base (CNDDB) record search reports, and quadrangle velum overlay maps for the 1996 Harrison Mtn. and 1996 Lake Arrowhead, California, US Geological Survey (USGS) 7.5 Minute Topographic Quadrangles (USGS, 1996a, b), were analyzed. The results of the records searches and velum map analysis were used to determine if any state records for the AMB occurs on, or in the vicinity immediately surrounding the property (CDFG, 2001a, b, c, d).

- There are no CNDDB records for AMB within the entire Harrison Mountain or Lake Arrowhead quadrangles (CDFG, 2001a, b, c, d). However, a 1998 biological assessment prepared for Tract 15612, a property located northwesterly of TTM 16185 in the vicinity of Grass Valley Road, recorded several sightings of this butterfly (TDA, 1998). Therefore, the nearest location of AMB is approximately 1± mile northwesterly of the property.
- No listed threatened or endangered species, or species candidate for listing, or any other unlisted but sensitive species were identified within the boundaries of the property by CNDDB records (CDFG, 2001a, b, c, d).

B. RESULTS OF THE 2001 AMB HABITAT ASSESSMENT FIELD SURVEYS

AMB habitat assessment field surveys were conducted over the property on August 26, 2001 (TLC, 2001) and September 6, 2001 (La Haye, 2001). The results of the *Field Surveys* are summarized below.

B-1. Purpose of the AMB Habitat Assessment Field Surveys

The *Field Survey* investigations were primarily performed to accomplish the following.

- Search for potential AMB host plants: Parish's Rock-Cress, Laguna Mountains Jewel-Flower, Slender-petaled Thelypodium and Rock Cress.
- Ascertain the presence/absence, of potentially suitable abiotic, physical habitat elements required by the AMB, on the property including: ridgelines and minor summits, sunny flats and open slopes, trails, fields of wildflowers and other similar areas.
- Determine the need to perform additional spring 2002 AMB investigations.

B-2. Results of the Field Surveys

B-2.1. Results Of The Search For Potential AMB Host Plants

- None of the plant species identified as potential AMB host plants (Parish's Rock-Cress, Laguna Mountains Jewel-Flower, Slender-petaled Thelypodium and Rock Cress) were identified onsite during the habitat assessment field surveys performed in August and September 2001.

- "None were located" onsite by Mr. La Haye in September 2001 (La Haye, 2001). According to Mr. La Haye "if the (AMB) host plants occur on this site at all, they are uncommon."

- None of the potential AMB host plants were identified onsite during "field and trapping surveys" performed by Mr. Philippe Vergne between 1 and 6 October 2001 (NRA, 2001).

  NOTE: Other biologists reported that the potential AMB host plants were identifiable elsewhere in the San Bernardino Mountains in August and September 2001. Therefore, it is our opinion that if the potential host plants had been growing on the property, they would have been identifiable in August and September 2001. The *Floral Compendium*, listing all plant species identified onsite during eight 2001 field surveys, documents the absence of potential food species.

B-2.2. Presence/Absence Of Potentially Suitable Abiotic, Physical Habitat Elements Required By The AMB

- Due to the "closed-canopied nature of the forest" covering the property, the abiotic, physical habitat elements required, by the AMB, such as: sunny flats and open slopes, fields of wildflowers and other similar areas, were ***not*** identified onsite. Therefore, "it unlikely that Andrew's marble butterfly occur on this site" (La Haye, 2001).

- No other listed threatened or endangered species, or species candidate for listing, or any other unlisted but sensitive species, were identified onsite during performance of the August and September 2001 AMB habitat assessment field surveys. None were identified in October 2001 by Mr. Philippe Vergne (NRA, 2001).

B-3. The Need for Additional AMB Investigations

- Due to the absence of potential AMB host plants, and the lack of abiotic, physical habitat elements required by the AMB, "no additional field surveys or investigations are recommended (on APN 336-101-006 and APN 336-101-007) for this species" (La Haye, 2001).

Please call me if you have any questions or require additional information regarding this letter.

Respectfully Submitted,
THOMAS LESLIE CORPORATION

T. Leslie

Thomas A. Leslie, Ph.D.,
President/Biologist

TAL/nvl

REFERENCES

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California Department Of Fish And Game (CDFG), August 10, 2001b, Natural Diversity Data Base (NDDB) *Quadrangle Velum Overlay* No. 34117B2 For The 1996, United States Department Of The Interior Geological Survey's (USGS) Harrison Mountain, California, 7.5 minute series Topographic Quadrangle Sheet, Scale 1:24000.

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W. J. McKeever, Inc., August 20, 2001, 1 Inch = 80 Feet Map: "*Preliminary Site Plan*".

APPENDIX A

FLORAL COMPENDIUM

FOR
APN 336-101-006
AND APN 336-101-007

SAN BERNARDINO COUNTY, CALIFORNIA

Non-Native 8/66 = 12%	SCIENTIFIC NAMES	COMMON NAMES (66)	47 Species Identified On August 26, 2001 By Habitat Type	36 Species Identified On October 1-6, 2001	Flowering Period (Munz, 1974)
	KINGDOM PLANTAE	**HIGHER VASCULAR PLANTS**			
	DIVISION PTERIDOPHYTA				
	FAMILY DENNSTAEDTIACEAE	**BRACKEN FAMILY**			
	Pteridium aquilinum var. *pubescens*	Western Bracken	F	X	N/A
	DIVISION CONIFEROPHYTA				
	FAMILY CUPRESSACEAE	**CYPRESS FAMILY**			
	Calocedrus decurrens	Incense Cedar	F	X	N/A
	FAMILY PINACEAE	**PINE FAMILY**			
	Abies concolor	White Fir	F	X	N/A
	Pinus coulteri	Coulter Pine	- - -	X	N/A
	Pinus jeffreyi	Jeffrey Pine	F	X	N/A
	Pinus lambertiana	Sugar Pine	F	X	N/A
	Pinus ponderosa	Ponderosa Pine	F	X	N/A
	DIVISION ANTHOPHYTA	**FLOWERING PLANTS**			
	Class Dicotyledones (Dicots)	**Cotyledons (Seed Leaves) 2**			
	FAMILY APIACEAE	**CARROT FAMILY**			
	Osmorhiza chilensis	Sweet Celery	F	- - -	April-July
	Sanicula graveolens	Montane Yellow-flowered Sanicle	- - -	X	April-June
	FAMILY APOCYNACEAE	**DOGBANE FAMILY**			
X	*Vinca major*	Greater Periwinkle	D	- - -	March-July

	FAMILY ASTERACEAE	**SUNFLOWER FAMILY**			
	Achillea millefolium	White Yarrow	D	- - -	June-September
X	*Ambrosia artemisiifolia*	Common Ragweed	D	- - -	August-November
	Artemisia douglasiana	Mugwort	D	- - -	June-October
	Artemisia dracunculus	Tarragon	D	- - -	August-October
	Erigeron divergens	Common Fleabane Daisy	- - -	X	March-November
	Eriophyllum lanatum	Montane Wooly Daisy	- - -	X	June-July
	Gnaphalium canescens ssp. *beneolens*	Fragrant Everlasting	F	- - -	July-October
	Hemizonia paniculata	Tarplant	D	- - -	May-November
	Hieracium c.f. *albiflorum*	Alpine Hawkweed	F	- - -	June-August
X	*Lactuca serriola*	Prickly Lettuce	D	- - -	May-September
	Malacothrix saxatilis	Cliff-Aster	D	- - -	March-September
	Solidago californica	California Goldenrod	D	X	July-October
X	*Tanacetum parthenium*	Feverfew	D	- - -	June-September
	FAMILY BRASSICACEAE	**MUSTARD FAMILY**			
	Erysimum capitatum	Western Wallflower	F, D	X	March-July
	FAMILY CARYOPHYLLACEAE	**PINK FAMILY**			
	Silene lemmonii	Catchfly	D	- - -	June-August
	FAMILY CONVOLVULACEAE	**MORNING GLORY FAMILY**			
	Calystegia occidentals ssp. *fulcrata*	Sonora Morning Glory	D	- - -	May-August
	FAMILY CORNACEAE	**DOGWOOD FAMILY**			
	Cornus nuttallii	Mountain Dogwood	F, R	- - -	April-July
	FAMILY ERICACEAE	**HEATH FAMILY**			
	Arctostaphylos sp.	Manzanita	- - -	X	January-March
	Pterospora andromedea	Pinedrops	F	- - -	June-August
	FAMILY FABACEAE	**LEGUME FAMILY**			
	Lotus crassifolius	Large-flowered Lotus	- - -	X	May-August
	Lupinus latifolius	Flat-leaved Lupine	- - -	X	April-July
	Lupinus luteolus	Butter Lupine	- - -	X	May-August
	Lupinus microcarpus	Chick Lupine	- - -	X	April-May
	Vicia c.f. *americana*	American Vetch	F	- - -	April-June

	FAMILY FAGACEAE	**OAK FAMILY**			
	Quercus chrysolepis	Canyon Oak	- - -	X	April-May
	Quercus kelloggii	California Black Oak	F	- - -	April-May
	FAMILY HYDROPHYLLACEAE	**WATERLEAF FAMILY**			
	Phacelia sp.	Phacelia	- - -	X	March-May
	FAMILY GROSSULARIACEAE	**GOOSEBERRY FAMILY**			
	Ribes cereum	Squaw currant	- - -	X	June-July
	Ribes c.f. *nevadense*	Mountain Pink Currant	F	- - -	April-June
	FAMILY LAURACEAE	**LAUREL FAMILY**			
	Umbellularia californica	California Bay	F	- - -	December-May
	FAMILY ONAGRACEAE	**EVENING PRIMROSE FAMILY**			
	Clarkia rhomboidea	Rhomboid Clarkia	F	- - -	May-July
	Epilobium brachycarpum	Panicled Willow-Herb	F, R	- - -	June-September
	Epilobium canum	California Fuchsia	F	- - -	August-October
	FAMILY POLEMONIACEAE	**PHLOX FAMILY**			
	Polemonium occidentale	Jacob's Ladder	F, R	- - -	June-August
	FAMILY POLYGONACEAE	**BUCKWHEAT FAMILY**			
	Eriogonum fasciculatum	California Buckwheat	- - -	X	March-October
	Eriogonum saxatile	Montane Buckwheat	- - -	X	May-July
X	*Polygonum convolvulus*	Black Bindweed	D	- - -	May-September
	FAMILY PORTULACACEAE	**PURSLANE FAMILY**			
	Claytonia perfoliata	Miner's lettuce	- - -	X	February-May
	FAMILY RHAMNACEAE	**BUCKTHORN FAMILY**			
	Ceanothus integerrimus	Deer Brush	F	X	May-June
	Rhamnus californica	California Coffeeberry	F	X	May-July
	FAMILY ROSACEAE	**ROSE FAMILY**			
	Potentilla glandulosa	Sticky Cinquefoil	F	X	May-June
	Rubus parviflorus	Thimbleberry	F	- - -	March-August

	FAMILY SALICACEAE	**WILLOW FAMILY**			
	Salix lasiolepis	Arroyo Willow	R	- - -	February-April
	FAMILY SCROPHULARIACEAE	**FIGWORT FAMILY**			
	Castilleja applegatei	Montane Indian Paintbrush	- - -	X	May-July
	Penstemon centranthifolius	Scarlet Bugler	F	- - -	April-July
	Penstemon spectabilis	Chaparral Beard-tongue	- - -	X	April-June
	FAMILY VISCACEAE	**MISTLETOE FAMILY**			
	Phoradendron macrophyllum	Big-leaf Mistletoe	- - -	X	October-March
	Class Monocotyledones (Monocots)	**Cotyledons (Seed Leaf) 1**			
	FAMILY CYPERACEAE	**SEDGE FAMILY**			
	Carex sp.	Sedge	F	- - -	Summer
	FAMILY IRIDACEAE	**IRIS FAMILY**			
	Iris hartwegii ssp. *australis*	Hartweg's Iris	F	X	May-June
	FAMILY LILIACEAE	**LILY FAMILY**			
	Bloomeria crocea	Common Goldenstar	D	- - -	April-June
	Dichelostemma capitatum	Blue Dicks	D	- - -	February-May
	FAMILY POACEAE	**GRASS FAMILY**			
	Bromus carinatus	California Brome	F, D	- - -	April-August
	Bromus ciliatus	Fringed Brome	- - -	X	July-August
X	*Bromus diandrus*	Ripgut Grass	D	- - -	April-June
X	*Bromus tectorum*	Cheat Grass	D	X	May-June
X	*Hordeum murinum*	Hare Barley	D	- - -	April-June

Symbols/Abbreviations:

X = Non-native plant species
sp. = Plant identified to genus only; species not assigned.
c.f. = Indicates the field identified specimen is very closely comparable to, but not certainly identifiable as, the assigned species.
D = Ruderal/Disturbed vegetational association.
F = Westside Ponderosa Pine Forest.
R = Riparian habitat.

Thomas Leslie Corporation

Results of California Spotted Owl Protocol Surveys

November 23, 2001

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
Church of the Woods
c/o: ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

November 23, 2001

SUBJECT: Results of California Spotted Owl Protocol Surveys

Dear Mr. Hopkins:

Thomas Leslie Corporation is pleased to present the results, of a six protocol presence/absence surveys, performed for the California Spotted Owl (*Strix occidentalis occidentalis*). The protocol surveys were conducted within the boundaries of APN 336-101-006 and APN 336-101-007 (project site). The need to perform the protocol California Spotted Owl surveys was identified in TLC's, September 19, 2001, biological constraints analysis (TLC, 2001). The findings of the California Spotted Owl protocol surveys, divided into *Pre-Field Survey* and onsite protocol *Field Surveys*, are provided in this letter report.

I. LOCATION OF PROJECT SITE

The project site is a 38± acre property located in San Bernardino County, California. The Rim of the World Highway (State Highway 18; Hwy 18) provides regional access to the property. The property can be reached by exiting Hwy 18 at Bear Springs or Daley Canyon Roads. The property is situated northwest of the intersection of Hwy 18 and Daley Canyon Road.

- Figure 1 illustrates the approximate boundaries of the property on the 2002 *Thomas Guide* San Bernardino and Riverside Counties Street Guide and Directory on Detail map page 517; map coordinates F-4 and G-4.
- Figure 2 plots the approximate boundaries of the property in the NW quadrant of Section 29, Township 2 North, Range 3 West; of the 1996 Harrison Mountain, California 7.5' United States Geological Survey (USGS) Topographic Quadrangle, San Bernardino Base and Meridian.

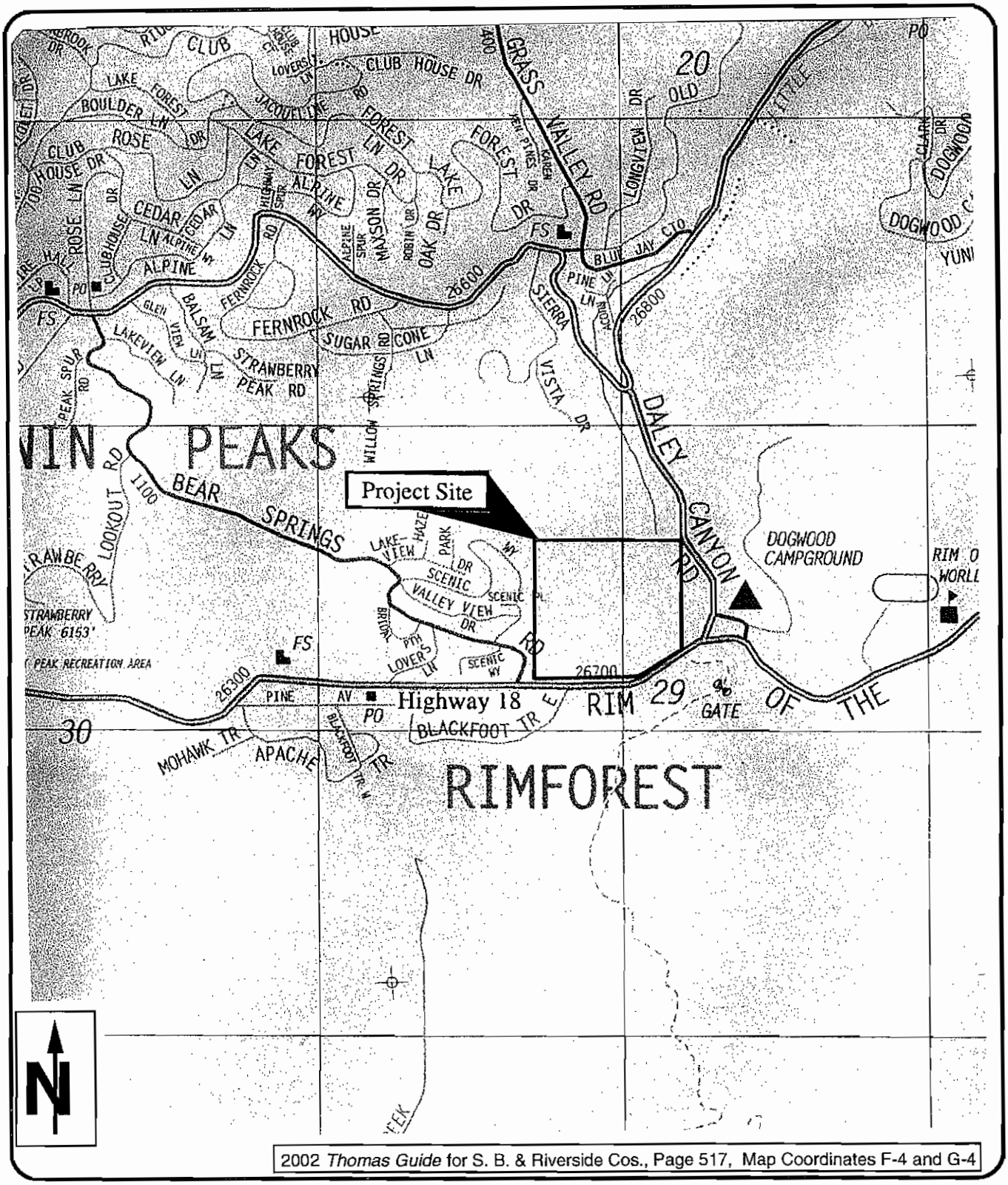
II. PURPOSE OF THE PROTOCOL SURVEYS

The constraints analysis was performed to ascertain the presence/absence of the California Spotted Owl within the boundaries of the project site and make recommendations regarding the need to perform additional California Spotted Owl investigations.

III. PROPOSED PROJECT

As illustrated on W.J. McKeever, Inc., August 20, 2001, 1 inch = 80 feet scale *Preliminary Site Plan,* the project proposed involves construction of a church, private school, storage and residence buildings, a baseball field and associated onsite paved roadways and parking.

P.O. Box 2229 Temecula, CA 92593-2229 Office (909) 296-6232 Fax (909) 296-6233



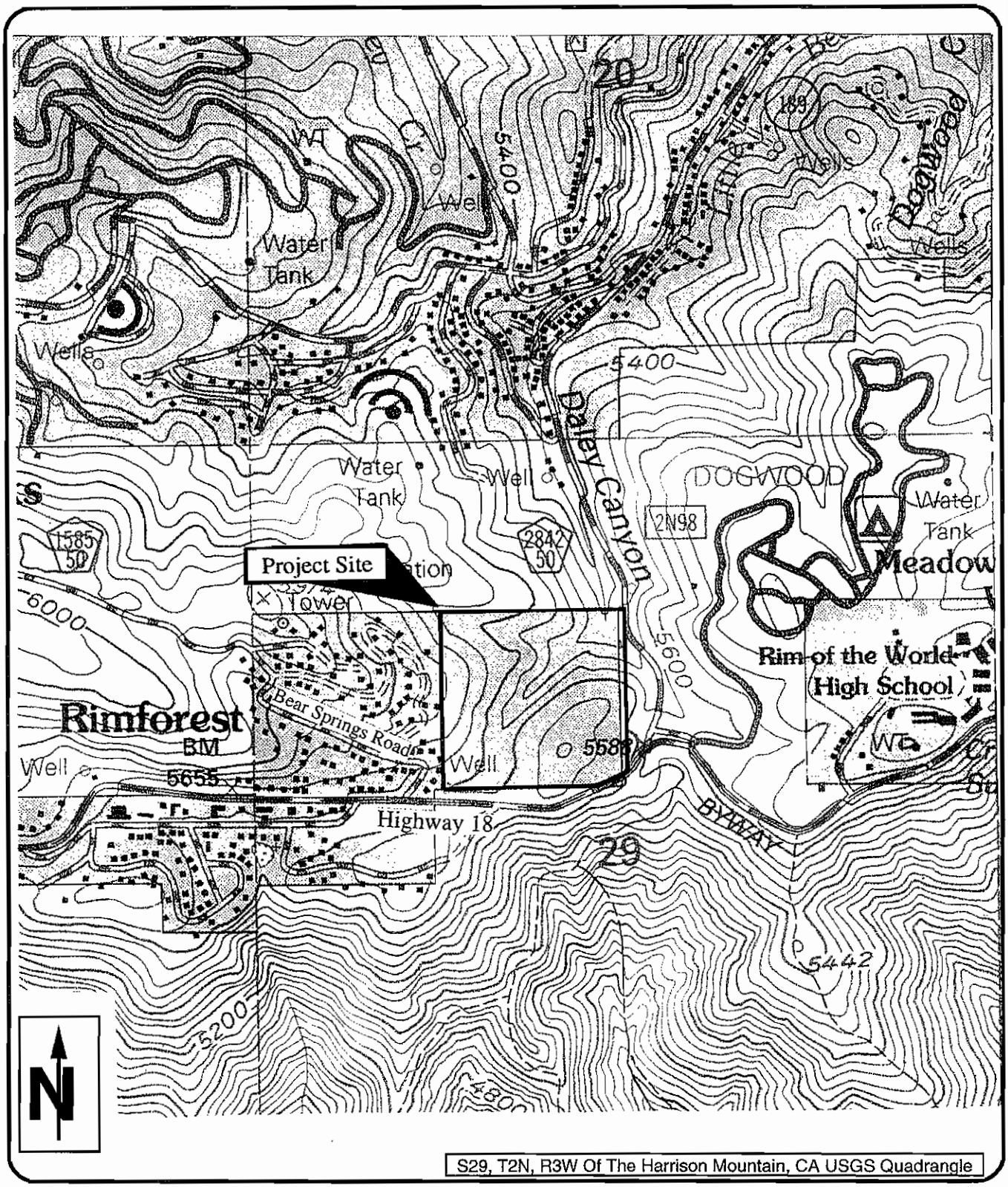
2002 *Thomas Guide* for S. B. & Riverside Cos., Page 517, Map Coordinates F-4 and G-4

Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1
Vicinity Map

Illustrating Approximate Boundaries Of
APNs 336-101-006 and -007



S29, T2N, R3W Of The Harrison Mountain, CA USGS Quadrangle

Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 2

Approximate Boundaries Of APNs 336-101-006 and -007 Plotted On A USGS Quadrangle Map

IV. GENERAL STATUS OF THE CALIFORNIA SPOTTED OWL

A. Listing Status: The California Spotted Owl is a state and federally *unlisted* southern subspecies of the Northern Spotted Owl. However, it is identified by the California Department of Fish and Game (CDFG) as Species of Special Concern (CSC). In addition, the California Spotted Owl is a San Bernardino National Forest sensitive species.

B. Description: The California Spotted Owl is a medium-sized owl whose brown plumage is contrasted with many white spots arranged in crosswise rows. This owl's head is rounded. It has dark eyes and lacks ear tufts.

C. Habitat: California Spotted Owls are known to occur in the majority of the larger mountain ranges in southern California (LaHaye *et al.*, 1994). More specifically, this owl inhabits dense coniferous woodland on steep shady slopes. It nests in **cavities of cliffs or trees**.

The primary habitat types occupied by California Spotted Owl are closed canopied live oak and closed canopied conifer forests (Gutiérrez *et al.*, 1992, LaHaye *et al.*, 1997). These forests primarily occur above approximately 4,000 feet elevation. However, some Spotted Owl occurrences are known at lower elevations in deep canyons and near the coast where similar forests are found. California Spotted Owls are known to occur in the majority of the larger mountain ranges in southern California.

V. PROJECT SITE HABITAT DESCRIPTION

As documented by TLC's September 19, 2001, *biological constraints analysis* report for the project he project site contains potentially suitable California Spotted Owl (TLC, 2001). The project site is vegetated with Holland's (1986) closed canopied Westside Ponderosa Pine Forest. The *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property – Westside Ponderosa Pine Forest Figure 3. Onsite, this forest habitat covers approximately 95%, of the 38± acre property.

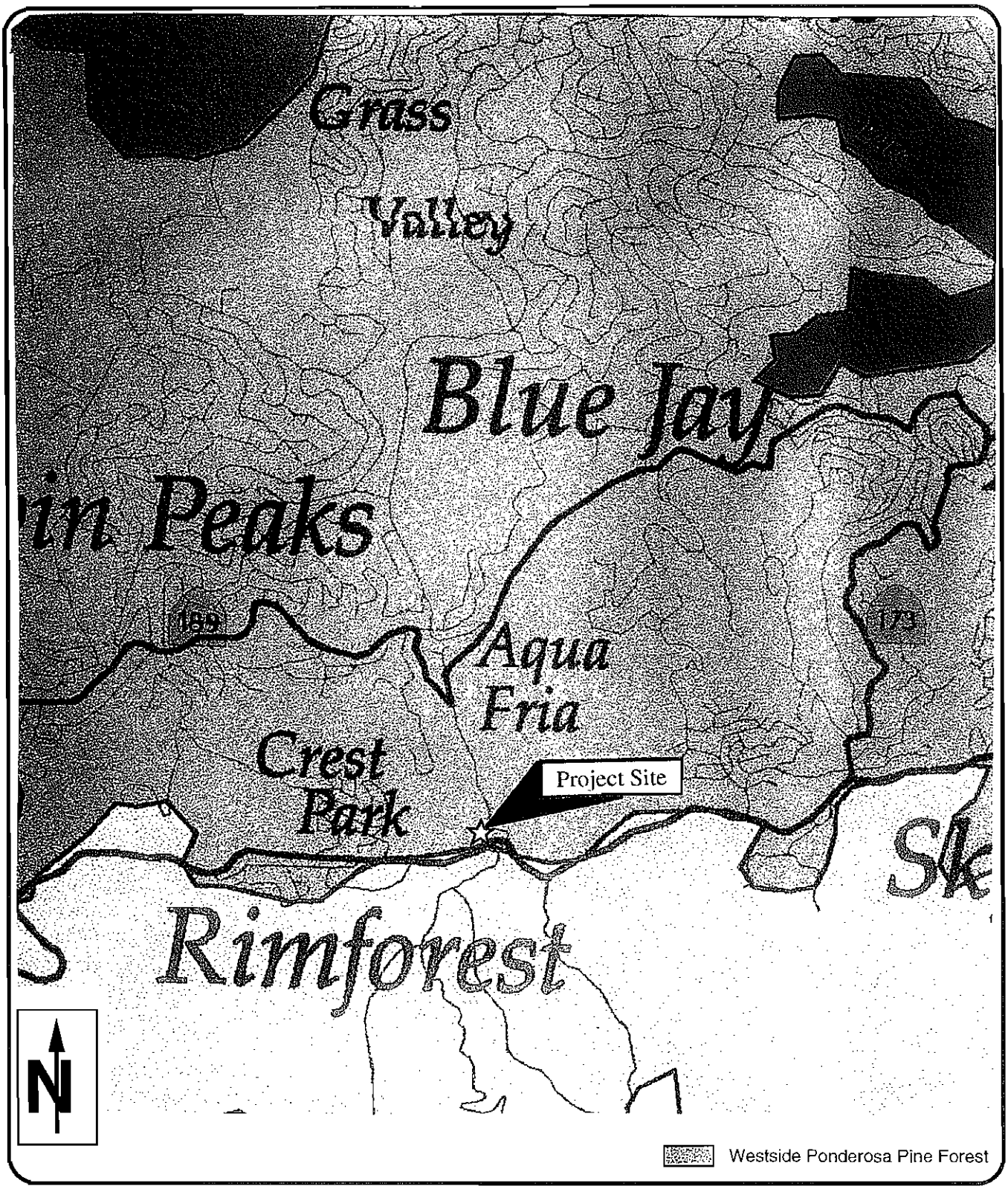
The predominant plant species of the onsite forest tree canopy, shrub layer, herbaceous understory, and a few, small isolated onsite meadows, are briefly described below. A complete list of the plant species identified onsite is provided in the Appendix A *Floral Compendium.*

- **Tree Canopy**: The common tree species of the onsite tree canopy include Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*) and Black Oak (*Quercus kelloggii*).

- **Shrub Layer**: The shrub layer, of the onsite forest, is primarily composed of Mountain Pink Currant (*Ribes nevadense*) and Mountain Dogwood (*Cornus nuttallii*). A variety of other less predominant shrubs and trees, such as Deer Brush (*Ceanothus integerrimus*) and California Coffeeberry (*Rhamnus californica*) are also scattered beneath the canopies of the forest trees of the project site.

- **Herbaceous Understory**: Due to the dense nature, of the closed canopied Westside Ponderosa Pine Forest, the herbaceous understory is primarily absent. The sparse scatter of herbaceous plants observed growing, on the ground beneath the tree and shrub canopies, were non-native herbs and grasses.

- **Small Onsite Meadows**: The few, small meadows of the site are sparsely to moderately vegetated with a mix of grasses and herbs. The Western Bracken (*Pteridium aquilinum* var. *pubescens*) is the most prominent meadow species.



Thomas Leslie Corporation

BIOLOGICAL & CULTURAL
INVESTIGATIONS & MONITORING

Figure 3
Vegetation Map
For APNs 336-101-006 and -007

VI. RESULTS

This section discusses the results of *Pre-Field Survey* and *Field Survey* investigations including results of literature review, results of contacts with Resources Agencies and protocol presence/absence California Spotted Owl surveys.

A. PRE-FIELD SURVEY INVESTIGATIONS

The results of the *Pre-Field Survey* analysis are summarized below.

The *Pre-Field Survey* analysis primarily included the following work tasks.

- Contact with the San Bernardino National Forest Service to ascertain the need to perform protocol presence or absence surveys for the California Spotted Owl.

- Review of a current California Department of Fish and Game (CDFG) Natural Diversity Data Base (CNDDB) records search report and velum overlay map, for the 1996 Harrison Mtn., California, U. S. Geological Survey (USGS) topographic quadrangle (CDFG, 2001a, b) to determine if any state records for the California Spotted Owl are recorded within the boundaries of the property.

A-1. Contact With The San Bernardino National Forest Service Biologist

Mr. Steve Loe, San Bernardino National Forest Service Biologist, was contacted, by telephone, in attempt to obtain information regarding the need to perform the protocol California Spotted Owl surveys. Mr. Loe stated that protocol California Spotted Owl surveys must be required to determine their presence or absence within the boundaries of the project site.

Mr. Loe also provided faxed copies of the Forest Service's 1993 *California Spotted Owl Sierran Province Interim Guidelines Environmental Assessment* (USDA, 1993) and 1992 *The California Spotted Owl: A Technical Assessment of its Current Status* (USDA, 1992). The California Spotted Owl *Interim Guidelines* provides an explanation of Changes to the CEQA Process regarding to the management options for the California Spotted Owl. This information obtained from Mr. Loe was used to schedule field surveys and to prepare this report of findings.

A-2. State Records Search Results For The California Spotted Owl

A current CDFG Natural Diversity Data Base (CNDDB) record search report, and quadrangle velum overlay map for the 1996 Harrison Mtn., California, US Geological Survey (USGS) 7.5 Minute Topographic Quadrangle (CDFG, 2001d), was analyzed. The results of the records search and velum map analysis were used to determine if any state records for the California Spotted Owl are recorded within the boundaries of the property (CDFG, 2001a, b).

A-3. State Records Search Results

- No California Spotted Owl are recorded by the CNDDB within the boundaries of the project site (CDFG, 2001a, b).

- No listed threatened or endangered species, or species candidate for listing, or any other unlisted but sensitive species were identified within the boundaries of the project site by CNDDB records (CDFG, 2001a, b).

B. RESULTS OF THE 2001 *FIELD SURVEY* INVESTIGATIONS

The results of the *Pre-Field Survey* analysis are summarized below.

B-1. PURPOSE OF THE *FIELD SURVEYS*

The *Field Survey* investigations were primarily performed to accomplish the following work tasks.

- Through performance of protocol nocturnal surveys, ascertain the presence or absence of California Spotted Owl within the boundaries of the project site.

- Determine the need to perform additional California Spotted Owl investigations.

B-2. SURVEY PERSONNEL

At the direction, and under the direct supervision of Dr. Leslie, six protocol California Spotted Owl presence/absence surveys were performed within the boundaries of the project site on September 2, 6, 13, 18, 25 and October 3, 2001. As recommended by Mr. Steve Loe, a San Bernardino National Forest Service biologist, the protocol California Spotted Owl surveys were performed by TLC biologist Mr. William S. La Haye.

The protocol California Spotted Owl presence/absence surveys were performed, by Mr. La Haye at the time of year when California Spotted Owl would have been both present and identifiable (CDFG, 2000), if this owl had been present onsite.

B-3. PROTOCOL SPOTTED OWL SURVEY RESULTS

- No Spotted Owls were seen, or responded from the property, during performance of the six protocol surveys between September 2 and October 3, 2001.

- No other listed threatened or endangered species, or species candidate for listing, or any other unlisted but sensitive species, were identified onsite during performance of the six protocol surveys.

B-4. THE NEED FOR ADDITIONAL CALIFORNIA SPOTTED OWL INVESTIGATIONS

No additional surveys are necessary for this species.

Please call me if you have any questions or require additional information regarding this letter.

Respectfully Submitted,
THOMAS LESLIE CORPORATION

T. Leslie

Thomas A. Leslie, Ph.D.
President/Biologist

TAL/bmr

REFERENCES

California Department Of Fish And Game (CDFG), August 10, 2001a, Natural Diversity Data Base (NDDB) *Rare Find Records Search Report* For The 1996, United States Department Of The Interior Geological Survey's (USGS) Harrison Mountain, California, 7.5 minute series Topographic Quadrangle Sheet, Scale 1:24000.

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Gutiérrez, R. J., J. Verner, K. S. McKelvey, B. R. Noon, G. N. Steger, D. R. Call, W. S. LaHaye, B. B. Bingham, and J. S. Senser, 1992, Habitat relations of the California spotted owl. Pages. 79-98. *In* Verner, J., K. McKelvey, B. R Noon, R. J Gutiérrez, G. I. Gould, Jr., and T. W. Beck [eds.].

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LaHaye, W. S., R. J. Gutiérrez, and D. R. Call, 1997, Nest-site selection and reproductive success of California Spotted Owls, Wilson Bulletin 109(1):42-51

LaHaye, W. S., R. J. Gutiérrez, and H. R. Akcakaya, 1994, Spotted owl metapopulation dynamics in southern California. Journal of Animal Ecology 63:775-785.

San Bernardino County (SBC) Valley Region Vegetation by Holland Classification, February 13, 2001, 1 inch = 10,200 feet scale map.

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Thomas Leslie Corporation (TLC), September 19, 2001,Results of A Biological Constraints Analysis of APN 336-101-006 And APN 336-101-007.

United States Department Of Agriculture, Forest Service, Pacific Southwest Research Station (USDA), 1992, The California Spotted Owl: A Technical Assessment of its Current Status.

United States Department Of Agriculture, Forest Service, Pacific Southwest Region (USDA), January 1993, California Spotted Owl Sierran Province Interim Guidelines Environmental Assessment.

United States Department of the Interior Geological Survey (USGS), 1996, State of California Department of Water Resources, Harrison Mountain, California, 7.5 minute series (Quadrangle topographic), Scale 1:24000.

W. J. McKeever, Inc., August 20, 2001, 1 Inch = 80 Feet Map: "*Preliminary Site Plan*".

Thomas Leslie Corporation

Results of a Biological Constraints Analysis of APN 336-101-006

September 19, 2001

Thomas Leslie Corporation

Biological & Cultural Investigations & Monitoring

Mr. Patrick Hopkins
Church of the Woods
c/o: ICON, Inc.
1814 Commercenter West, Suite A
San Bernardino, California 92408

September 19, 2001

SUBJECT: Results of A Biological Constraints Analysis of APN 336-101-006 And APN 336-101-007

Dear Mr. Hopkins:

Thomas Leslie Corporation is pleased to present the results of a biological constraints analysis of APN 336-101-006 and APN 336-101-007 (project site). The findings of the constraints analysis, divided into *Pre-Field Survey* and onsite *Field Survey* investigations, are provided in this letter report. The analysis did not include performance of focused, protocol sensitive or listed plant or wildlife species surveys or performance of a "formal" delineation of onsite jurisdictional elements. However, the constraints analysis letter report does discuss sensitive and listed plant and wildlife species and jurisdictional elements in a general way.

I. LOCATION OF PROJECT SITE

The project site is a 38± acre property located in San Bernardino County, California. The Rim of the World Highway (State Highway 18; Hwy. 18) provides regional access to the property. The property can be reached by exiting Hwy. 18 at Bear Springs or Daley Canyon Roads. The property is situated northwest of the intersection of Hwy 18 and Daley Canyon Road.

Figure 1 illustrates the approximate boundaries of the property on the 2002 *Thomas Guide* San Bernardino and Riverside Counties Street Guide and Directory on Detail map page 517, map coordinates F-4 and G-4.

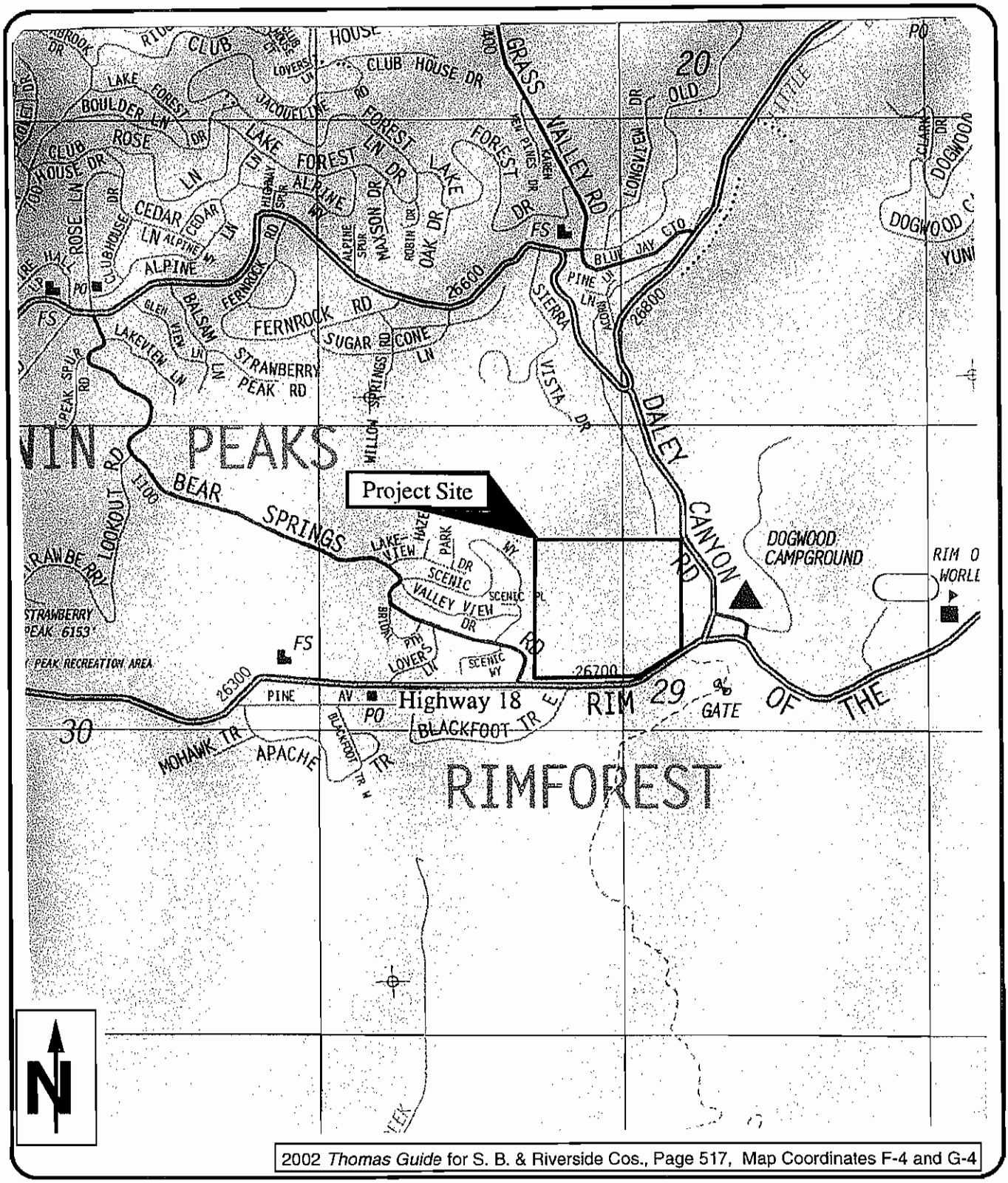
Figure 2 plots the approximate boundaries of the property in the NW quadrant of Section 29, Township 2 North, Range 3 West; of the 1996 Harrison Mountain, California 7.5' United States Geological Survey (USGS) Topographic Quadrangle, San Bernardino Base and Meridian.

II. PURPOSE OF THE ANALYSIS

The constraints analysis was performed to identify biological resources or jurisdictional regulatory elements (waters and associated riparian habitat or wetlands), which could potentially constrain implementation of the land use plan proposed for the project site. The analysis also includes recommendations, regarding the need to perform additional biological or regulatory investigations, within the boundaries of the project site.

III. PRE-FIELD SURVEY INVESTIGATIONS

The *Pre-Field Survey* analysis included reviews of the following records searches and maps, for the project site and the surrounding vicinity, to determine (a) what vegetational types are mapped onsite and (b) if any sensitive biological elements are recorded or mapped on, or could be expected to occur within the boundaries of the property:



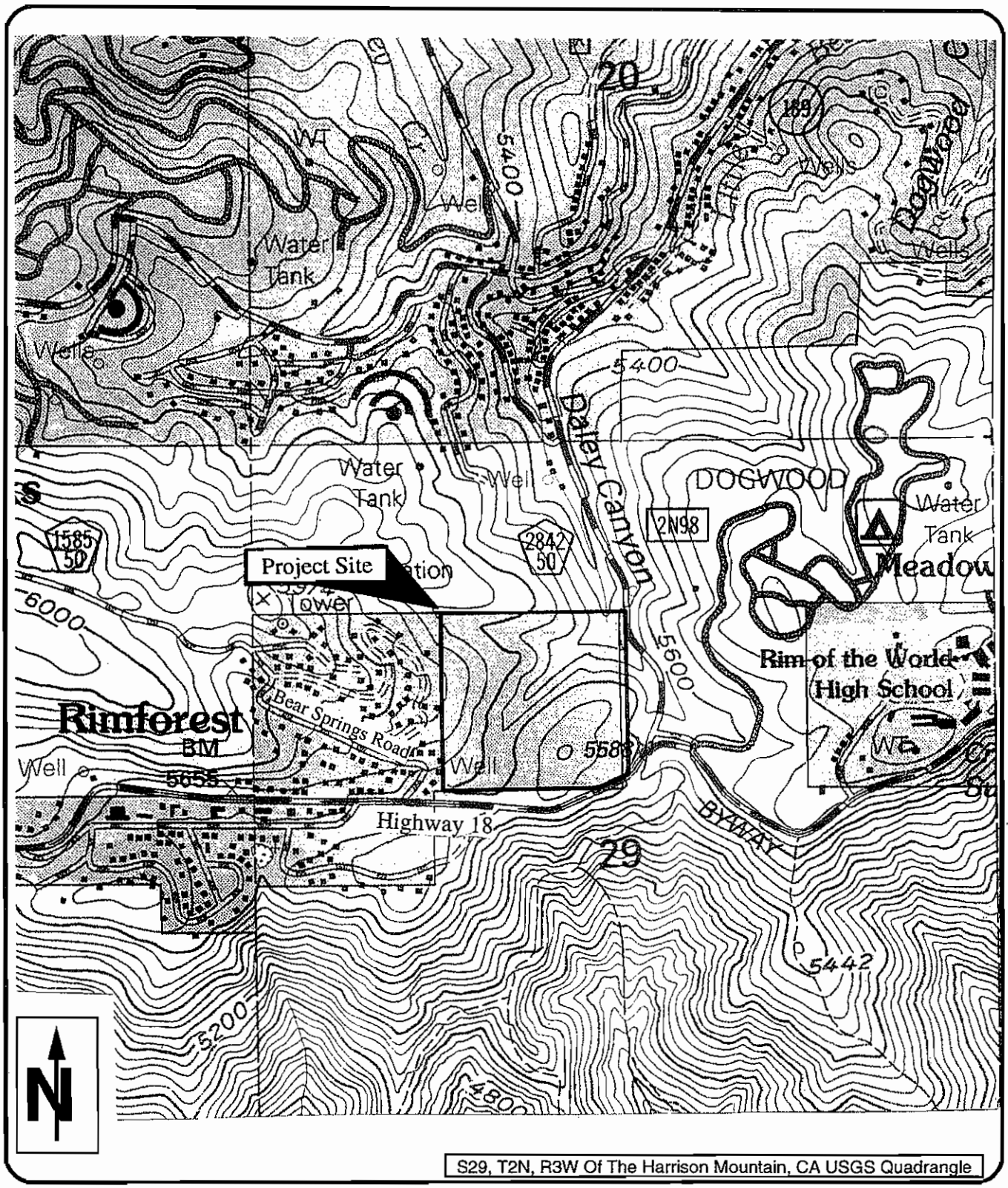
2002 *Thomas Guide* for S. B. & Riverside Cos., Page 517, Map Coordinates F-4 and G-4

Thomas Leslie Corporation

BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 1
Vicinity Map

Illustrating Approximate Boundaries Of
APNs 336-101-006 and -007



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BIOLOGICAL & CULTURAL INVESTIGATIONS & MONITORING

Figure 2

Approximate Boundaries Of APNs 336-101-006 and -007 Plotted On A USGS Quadrangle Map

- San Bernardino County (SBC) Official Land Use Plan. General Plan Biotic Resource Overlay, March 24, 2000, 1 inch = 21,000 feet scale map.
- San Bernardino County (SBC) Valley Region Vegetation by Holland Classification, February 13, 2001, 1 inch = 10,200 feet scale map.
- Records Search: California Department of Fish and Game (CDFG) Natural Diversity Data Base (CNDDB) records search report and velum overlay map, for the 1996 Harrison Mtn., California, U. S. Geological Survey (USGS) topographic quadrangle (CDFG, 2001a, b).

IV. PROPOSED PROJECT

As illustrated on W.J. McKeever, Inc., August 20, 2001, 1 inch = 80 feet scale *Preliminary Site Plan,* the project proposed involves construction of a church, private school, storage and residence buildings, baseball field and associated onsite paved roadways and parking.

V. FIELD SURVEY INVESTIGATIONS

A constraint analysis field survey was performed on August 26, 2001, to accomplish the following:

1. Compile a list of the predominant plant and wildlife species present and identifiable within the boundaries of the project site at the time the constraints analysis field reconnaissance survey was performed.

2. Search the project site for sensitive species (state or federally listed threatened or endangered or candidates for listing) present and identifiable at the time the constraints analysis field reconnaissance survey was performed.

3. Identify the actual habitat types growing onsite and compare it to the habitat type(s) mapped onsite by *San Bernardino County Valley Region Vegetation* map (SBC, 2001).

4. Determine the presence or absence of habitat potentially capable of supporting sensitive plant and wildlife species on the project site.

5. Describe any sensitive biological elements (species or habitat) not recorded on the project site by the 2001 California Department of Fish and Game Natural Diversity Data Base (CDFG, 2001a, b).

6. Identify and evaluate the significance of potential impacts to existing onsite sensitive biological resources (habitat and listed plant or wildlife species or candidates for listing) related to implementation of the proposed land use plan.

7. Ascertain the presence or absence of jurisdictional elements (waters of the US and associated wetlands and/or riparian vegetation) on the project site.

8. Make recommendations regarding the need to perform additional biological and/or regulatory investigations prior to implementation of the proposed project.

The "*Field Survey* RESULTS" portion, of this constraints analysis report, is divided into eight corresponding sections.

VI. FINDINGS OF THE ANALYSIS

A. RESULTS OF THE 2001 *PRE-FIELD SURVEY* INVESTIGATIONS

A-1. Vegetational Types Mapped by *San Bernardino County Valley Region Vegetation* Map

The *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property – Westside Ponderosa Pine Forest (Figure 3).

A-2. Potential for Listed, or Unlisted but Sensitive Animal Species to Occur Onsite

Based on the analysis of CDFG CNDDB records and map information received from the County of San Bernardino and San Bernardino National Forest (SBNF) the following wildlife species could potentially occur onsite:

- Southern Rubber Boa (*Charina bottae umbratica*)
- Mountain Yellow-Legged Frog (*Rana muscosa*)
- California Spotted Owl (*Strix occidentalis occidentalis*)
- San Bernardino Flying Squirrel (*Glaucomys sabrinus californicus*)
- White-eared Pocket Mouse (*Perognathus alticola alticola*)
- Andrew's Marble Butterfly (*Euchloe hyantis andrewsii*)

The potential for these species to occur within the boundaries of thew property are discussed in more detail on Table 1 (*Regionally Sensitive Species*).

A-3. Potential for Listed, or Unlisted but Sensitive, Plant Species to Occur Onsite

Based on the analysis of CNDDB records the following plant species could potentially occur onsite:

- Parish's Yampah (*Perideridia parishii* ssp. *parishii*)
- San Bernardino Mountains Owl's-Clover (*Castilleja lasiorhyncha*).
- Nevin's Barberry (*Berberis nevinii*)

The potential for these species to occur within the boundaries of the property are discussed in more detail on Table 1 (*Regionally Sensitive Species*).

B. RESULTS OF THE 2001 *FIELD SURVEY* INVESTIGATIONS

Using the results of the *Pre-field Survey* investigations, one constraints analysis field survey was performed onsite on August 26, 2001, to "field check" the results of the *Pre-field Survey* investigations and accomplish the eight objectives outlined in Section V, page 4, of this constraints analysis.

The following "*Field Survey* RESULTS", summarizing the results of the *Field Survey* investigations, is presented in the following eight sections.

B-1. Predominant Plant and Wildlife Species of the Property

B-1.1. Predominant Plant Species of the Property

The Appendix A *Floral Compendium* (FC) provides a summary of the types of plant identified during the 2001 constraints analysis field survey. It was compiled using the results of August 26, 2001 field survey performed by TLC. The plant species identified onsite were inventoried by the three habitat types determined to be present onsite at the time the 2001 field survey was performed. Column 4 of the FC contains preliminary indicates the distribution of the plant species identified onsite within three habitat

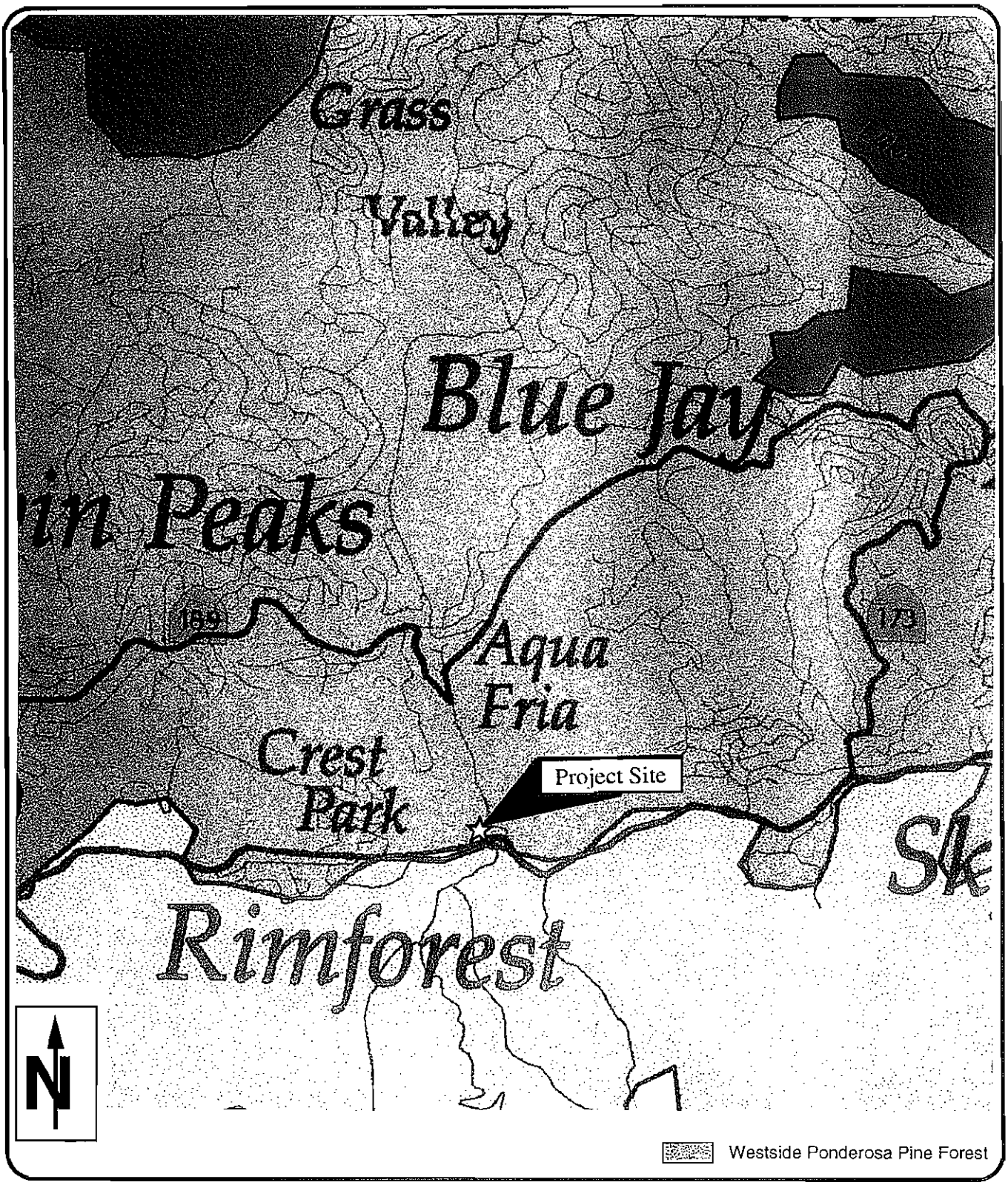

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Figure 3
Vegetation Map
For APNs 336-101-006 and -007

PHOTO PLATE NO. 1

1a. Southwesterly view of an onsite dirt roadway with Ruderal/Disturbed vegetational association. The roadway is bordered by Westside Ponderosa Pine Forest.

1b. Close-up view of the upper end of a jurisdictional stream course located 180± feet northeast of the proposed school site.

PHOTO PLATE NO. 2

Close-up view of a pool of water located in the largest onsite stream course situated in the northeast quadrant of the property.

PHOTO PLATE NO. 3

3a. Onsite rock outcrops provide potential habitat for the Southern Rubber Boa.

3b. Onsite downed wood provides potential habitat for the Southern Rubber Boa.

Table 1: Scientific Name, State and Federal Listing Status, Survey Period and Location of Regionally Sensitive Species

Scientific Name, Survey period and State and Federal Listing Status (-/-)	Location Of Regionally Sensitive Species
A. FEDERALLY AND/OR STATE LISTED SPECIES	
1. Southern Rubber Boa (*Charina bottae umbratica*) Survey Period: April-November Listing Status: Threatened/None.	CNDDB Record Onsite: No. Observed Onsite on August 26, 2001: No. Potential to Occur Onsite: Low to moderate. The *San Bernardino General Plan Biological Resource Overlay* map identifies potentially suitable SRB habitat onsite. Nearest Off-site Location: 0.2± miles N of the property.
2. Nevin's Barberry (*Berberis nevinii*) Survey Period: March-April Listing Status: Endangered / Endangered; CNPS: List 1B	CNDDB Record Onsite: No. Observed Onsite on August 26, 2001: No. Potential to Occur Onsite: Low; although potentially suitable habitat (north-facing slopes) is present onsite, this species has not been observed in the region since 1966 (CDFG, 2001a) Nearest Off-site Location: A single 45 years old historic record is located 1.7± miles W of the NW corner of the property, between Arrowhead Highlands and Rimforest.
B. SPECIES PROPOSED FOR LISTING	
3. Mountain Yellow-Legged Frog (*Rana muscosa*) Survey Period: March-August. Listing Status: None/Proposed Endangered; CDFG: CSC	CNDDB Record Onsite: No. Observed Onsite on August 26, 2001: No. Potential to Occur Onsite: Extremely low. Although potentially suitable habitat (streams, riverbanks, standing water) is present onsite, MYLF is considered to be extirpated in the San Bernardino Mountains (Jennings and Hayes, 1994). Nearest Off-site Location: A 33 years old historic record is located 3.2± miles NE of the NE corner of the property.
C. UNLISTED, BUT SENSITIVE SPECIES	
4. California Spotted Owl (*Strix occidentalis occidentalis*) Survey Period: Year-round. Listing Status: None/None; CDFG: CSC; SBNF: sensitive species.	CNDDB Record Onsite: No. Observed Onsite on August 26, 2001: No. Potential to Occur Onsite: Does not nest onsite. Low to moderate potential that it forages onsite. Nearest Off-site Location: 0.97± miles NE of the property.

Table 1 Continued:

5. San Bernardino Flying Squirrel (*Glaucomys sabrinus californicus*) Survey Period: Year-round. Listing Status: None/None; SBNF: sensitive species.	CNDDB Record Onsite: No. Observed Onsite on August 26, 2001: No. Potential to Occur Onsite: Low. Although, potentially suitable habitat is present onsite, there are no records that this species occurs in the region surrounding the property. Nearest Off-site Location: No CNDDB records for SBFS occur for the entire Harrison Mountain or Lake Arrowhead, California, quadsheets.
6. White-eared Pocket Mouse (*Perognathus alticola alticola*) Survey Period: Spring-Fall. Listing Status: None/None; CDFG: CSC.	CNDDB Record Onsite: No. Observed Onsite on August 26, 2001: No. Potential to Occur Onsite: None. Despite extensive live-trapping investigations, this species has not been observed in the San Bernardino Mountains since 1934. Nearest Off-site Location: 0.9± miles W of the W boundary of the property, on the eastern slope of Strawberry Peak.
7. Andrew's Marble Butterfly (*Euchloe hyantis andrewsii*) Survey Period: June-early July. Listing Status: None/None; SBNF: Sensitive Species.	CNDDB Record Onsite: No. Observed Onsite on August 26, 2001: No. Potential to Occur Onsite: Unknown; potentially food plant species were not identifiable in August 2001. Nearest Off-site Location: 1± mile N of the property.
8. Parish's Yampah (*Perideridia parishii* ssp. *parishii*) Survey Period: June-July. Listing Status: None/None; CNPS: List 2.	CNDDB Record Onsite: No. Observed Onsite on August 26, 2001: No. Potential to Occur Onsite: High to moderate. Potentially suitable habitat (streams) is present onsite. Nearest Off-site Location: 1.1± miles E of the NE corner of the property, at Crest Park
9. San Bernardino Mountains Owl's-Clover (*Castilleja lasiorhyncha*) Survey Period: June-August. Listing Status: None/None; CNPS List 1B.	CNDDB Record Onsite: No. Observed Onsite on August 26, 2001: No. Potential to Occur Onsite: High to moderate. Potentially suitable habitat (streams, vernally wet areas) is present onsite. Nearest Off-site Location: 1.4± miles W of the NW corner of the property, in Strawberry Valley.

types. Column 4 will be refined during subsequent field studies). The flowering period of the species identified onsite are listed in Column 5 of the FC.

The FC was compiled to (a) inventory onsite botanical resources and (b) determine the presence or absence of sensitive plant species identifiable, within the boundaries of the property, at the time the survey were performed. It only lists those plant species actually observed within the boundaries of the project site during the August 26, 2001 diurnal survey. It does not include a list of "expected but not observed" species. The FC is not intended to be an all inclusive list because some species growing on the property may have been undetectable or overlooked during the field survey because they were not obviously present, visible or identifiable (e.g., had not germinated, were not flowering, had not developed or had lost the morphological structures necessary for identification to species at this time of the year, etc.). An analysis of the FC showed the following:

- A total of 47 plant species were identified within the boundaries of the property in 2001.
- The plant species identified within the boundaries of the property are locally common species characteristically associated with Westside Ponderosa Pine Forest and Riparian habitat types and Ruderal/Disturbed non-habitat vegetational associations.
- As indicated by the "X's" in column one, of the Appendix A *Floral Compendium*, 8 non-native species were identified within the boundaries of the property in 2001. This represents 17% (8/47) of the 47 plant types identified onsite. The low number of non-native species indicates relatively undisturbed character of the vegetation within the boundaries of the property.

B-1.2. Predominant Wildlife Species of the Property

The Appendix B *Wildlife Compendium* (WC) provides a summary of the wildlife species identified during the 2001 constraints analysis field survey.

The WC lists only those wildlife species actually observed within the project boundaries during the August 26, 2001 field survey. It does not include a listing of "expected but not observed" species. It is likely that species, not listed in the 2001 WC, could be expected to be present seasonally within the boundaries of the property. Some species may have been undetectable or overlooked during the field survey because they were not obviously present, visible or identifiable (e.g., had migrated out of the area, were secreted in subterranean boroughs, are nocturnal, were foraging off-site during the survey, etc.). It is likely that additional small mammal species would be identified during nocturnal live-trapping studies and spring 2002 field surveys.

An analysis of the WC showed the following:

- 10 animal species were identified within the boundaries of the property in 2001, including 3 bird, 2 mammal and 5 insect species.
- The animal species identified within the boundaries of the property, are locally common species characteristically associated with the Westside Ponderosa Pine Forest and Riparian habitat types and Ruderal/Disturbed non-habitat vegetational associations.

B-2. Search the Property for Sensitive Species

No listed plant or wildlife species, were observed within the boundaries of the property during the August 26, 2001 field survey. However, focused botanical and wildlife survey, and nocturnal wildlife studies were not performed because they were beyond the scope of work of the constraints analysis. The recommendations section at the end of this constraints analysis letter report provides a list of focused botanical and wildlife surveys that should be performed and documented in 2001 and/or 2002.

B-3. Onsite Habitat Types Compared to Those Mapped by *San Bernardino County Valley Region Vegetation* Map

As previously discussed above, and illustrated on Figure 3, the *San Bernardino County Valley Region Vegetation* map (SBC, 2001) illustrates only one type of vegetation within the boundaries of the property – Westside Ponderosa Pine Forest. However, the following three vegetational types were identified onsite during the August 26, 2001 field survey:

- Westside Ponderosa Pine Forest
- Riparian Habitat
- Ruderal/Disturbed non-habitat vegetational association

Photo Plate Nos. 1, 2 and 3, located in Appendix C, provide representative views of the three vegetational types. Each vegetational type is briefly discussed below.

1. Westside Ponderosa Pine Forest

This vegetation type, according to Holland (1986), is an "open, park-like forest of coniferous evergreens", characteristically dominated by Ponderosa Pine (*Pinus ponderosa*). The understory is sparse, consisting of scattered shrubs and young trees. Considerable accumulation of needle litter and pine cones is present on the ground.

According to the most current literature, *A Manual of California Vegetation*, Westside Ponderosa Pine Forest can also be best described as Ponderosa Pine Series (Sawyer and Keeler-Wolf, 1995, pg.289).

Onsite Status: Westside Ponderosa Pine Forest is the major habitat type of the project site. It covers approximately 95% of 38± acre property. The other common tree species of this forest include Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), Incense Cedar (*Calocedrus decurrens*) and Black Oak (*Quercus kelloggii*). Shrub layer is represented by Mountain Pink Currant (*Ribes nevadense*), Mountain Dogwood (*Cornus nuttallii*), Deer Brush (*Ceanothus integerrimus*) and California Coffeeberry (*Rhamnus californica*). Scattered Western Bracken (*Pteridium aquilinum* var. *pubescens*) occurs in the herb layer.

2. Riparian Habitat

This habitat type occurs onsite along streams with flowing water. The dominant tree is Arroyo Willow (*Salix lasiolepis*). The shrub layer is represented by Mountain Dogwood (*Cornus nuttallii*).

3. Ruderal/Disturbed

Neither Holland (1986) nor Sawyer and Keeler-Wolf (1995) describe Ruderal/Disturbed vegetational associations as a plant community (habitat). No dominant plant species are associated with Ruderal/Developed areas in California; therefore, they are not identifiable by characteristic species. Instead, the species composition of onsite Ruderal/Developed areas varies greatly reflecting edaphic factors, degree and frequency of disturbance (e.g., logging activities, dirt and paved road construction and use, hiking, off-road vehicle impacts, etc.), slope aspect, water availability, weed seed sources of the surrounding local vicinity, landscape species planted by surrounding property owners, etc.

Plant species commonly occurring within the Ruderal/Disturbed areas include non-native weeds and native but "weedy" herbs.

Onsite Status: The density and diversity of "weedy" species on the property is relatively low. Onsite Ruderal/Disturbed areas are comprised of a sparse variety of annual, locally common non-native grasses and forbs, and hardy native species, growing like weeds, occur along the old logging roads and skid trails. Plant species commonly occurring within the Ruderal/Disturbed areas of the property include non-native

weeds such as Common Ragweed (*Ambrosia artemisiifolia*), Prickly Lettuce (*Lactuca serriola*), Black Bindweed (*Polygonum convolvulus*), Cheat Grass (*Bromus tectorum*), Ripgut Grass (*Bromus diandrus*) and native White Yarrow (*Achillea millefolium*), Tarplant (*Hemizonia paniculata*), Morning Glory (*Calystegia occidentalis*) and California Goldenrod (*Solidago californica*).

B-4. Determine the Presence or Absence of Habitat Potentially Capable of Supporting Sensitive Plant and Wildlife Species Onsite

As indicated on Table 1, potentially suitable habitat types for at least three sensitive plants species and three sensitive wildlife species is present onsite. The presence or absence of these sensitive species could be ascertained by performing field search for them during the appropriate Survey Period listed on Table 1.

B-5. Ascertain the Presence of Sensitive Biological Elements (Plant or Wildlife Species or Habitat) Not Recorded by CDFG

No sensitive plant or wildlife species, or sensitive habitat, not recorded by CDFG were identified anywhere, within the boundaries of the property, during the single diurnal August 26, 2001 field survey. However, some species, potentially present onsite due to the suitable habitat, would not have been present or identifiable on 26 August. For example, species flowering in the spring would not have been identifiable in August.

B-6. Identify and Evaluate the Significance of Potential Impacts to Existing Onsite Sensitive Biological Resources (Habitat and Plant and Wildlife Species) Related to Implementation of the Land Use Plan Proposed for the Property

Implementation of land use plan proposed could potentially directly, indirectly and/or cumulatively impact the following sensitive biological and regulatory elements.

- Sensitive (listed and unlisted) plant and wildlife species potentially occurring onsite due to the presence of suitable habitat.
- Habitat potentially capable of supporting sensitive plant and wildlife species within the boundaries of the property.
- Jurisdictional elements (waters and associated riparian habitat and wetlands) associated with jurisdictional stream courses.
- Raptor foraging and nesting habitat.

B-7. Ascertain the Location And Nature Of Any Onsite Jurisdictional Elements (Waters Of The US And Associated Wetlands and/or Riparian Vegetation)

At least three jurisdictional stream courses occur onsite. In addition, riparian vegetation and wetlands associated with the largest onsite stream course.

B-8. The Need for Additional Biological or Regulatory Investigations

B-8.1 Biological Investigations

- The following focused wildlife surveys are being performed in **2001**:

  September: California Spotted Owl (six nocturnal surveys, in progress)

  September: San Bernardino Flying Squirrel (six nocturnal surveys, in progress)

  October: White-Eared Pocket Mouse (five surveys, to be performed)

- The following focused wildlife surveys should be performed in **2002**:

  15 March-15 May: Southern Rubber Boa

  March-August: Mountain Yellow-Legged Frog

  June-July: Andrew's Marble Butterfly

- The following diurnal focused botanical surveys should be performed in **2002**:

  March: Nevin's Barberry.

  April: Nevin's Barberry.

  June: Parish's Yampah and San Bernardino Mountains Owl's-Clover.

  July: Parish's Yampah and San Bernardino Mountains Owl's-Clover.

  August: San Bernardino Mountains Owl's-Clover.

B-8.2. Regulatory Investigations

- A jurisdictional delineation must be performed onsite to map the location of any jurisdictional waters and associated riparian habitats and wetlands. The delineation would also describe the nature of and determine the acreages of jurisdictional elements.
- The results of the jurisdictional delineation would be used to ascertain which, *if any*, state or federal regulatory approvals listed below would be required to authorize impacts to any jurisdictional element proposed by any land use plan prepared for the property.
- If impacts to all onsite jurisdictional elements are avoided no further regulatory investigations are necessary.

Please call me if you have any questions or require additional information regarding this letter.

Respectfully Submitted,

THOMAS LESLIE CORPORATION

A. Leslie

Thomas A. Leslie, Ph.D., President/Biologist

TAL/nvl

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W. J. McKeever, Inc., August 20, 2001, 1 Inch = 80 Feet Map: "*Preliminary Site Plan*".

APPENDIX A

FLORAL COMPENDIUM

FOR
APNs 336-101-006
AND 336-101-007

SAN BERNARDINO COUNTY, CALIFORNIA

Non-Native 8/47 = 17%	SCIENTIFIC NAMES	COMMON NAMES (47)	Habitat Type	Flowering Period (Munz, 1974)
	KINGDOM PLANTAE	**HIGHER VASCULAR PLANTS**		
	DIVISION PTERIDOPHYTA			
	FAMILY DENNSTAEDTIACEAE	**BRACKEN FAMILY**		
	Pteridium aquilinum var. *pubescens*	Western Bracken	F	N/A
	DIVISION CONIFEROPHYTA			
	FAMILY CUPRESSACEAE	**CYPRESS FAMILY**		
	Calocedrus decurrens	Incense Cedar	F	N/A
	FAMILY PINACEAE	**PINE FAMILY**		
	Abies concolor	White Fir	F	N/A
	Pinus jeffreyi	Jeffrey Pine	F	N/A
	Pinus lambertiana	Sugar Pine	F	N/A
	Pinus ponderosa	Ponderosa Pine	F	N/A
	DIVISION ANTHOPHYTA	**FLOWERING PLANTS**		
	Class Dicotyledones (Dicots)	**Cotyledons 2 Seed Leaves**		
	FAMILY APIACEAE	**CARROT FAMILY**		
	Osmorhiza chilensis	Sweet Celery	F	April-July
	FAMILY APOCYNACEAE	**DOGBANE FAMILY**		
X	*Vinca major*	Greater Periwinkle	D	March-July
	FAMILY ASTERACEAE	**SUNFLOWER FAMILY**		
	Achillea millefolium	White Yarrow	D	June-September
X	*Ambrosia artemisiifolia*	Common Ragweed	D	August-November
	Artemisia douglasiana	Mugwort	D	June-October
	Artemisia dracunculus	Tarragon	D	August-October
	Gnaphalium canescens ssp. *beneolens*	Fragrant Everlasting	F	July-October
	Hemizonia paniculata	Tarplant	D	May-November
	Hieracium c.f. *albiflorum*	Alpine Hawkweed	F	June-August
X	*Lactuca serriola*	Prickly Lettuce	D	May-September
	Malacothrix saxatilis	Cliff-Aster	D	March-September
	Solidago californica	California Goldenrod	D	July-October
X	*Tanacetum parthenium*	Feverfew	D	June-September
	FAMILY BRASSICACEAE	**MUSTARD FAMILY**		
	Erysimum capitatum	Western Wallflower	F, D	March-July

	FAMILY CARYOPHYLLACEAE	**PINK FAMILY**		
	Silene lemmonii	Catchfly	D	June-August
	FAMILY CONVOLVULACEAE	**MORNING GLORY FAMILY**		
	Calystegia occidentals ssp. *fulcrata*	Sonora Morning Glory	D	May-August
	FAMILY CORNACEAE	**DOGWOOD FAMILY**		
	Cornus nuttallii	Mountain Dogwood	F, R	April-July
	FAMILY ERICACEAE	**HEATH FAMILY**		
	Pterospora andromedea	Pinedrops	F	June-August
	FAMILY FABACEAE	**LEGUME FAMILY**		
	Vicia c.f. *americana*	American Vetch	F	April-June
	FAMILY FAGACEAE	**OAK FAMILY**		
	Quercus kelloggii	California Black Oak	F	April-May
	FAMILY GROSSULARIACEAE	**GOOSEBERRY FAMILY**		
	Ribes c.f. *nevadense*	Mountain Pink Currant	F	April-June
	FAMILY LAURACEAE	**LAUREL FAMILY**		
	Umbellularia californica	California Bay	F	December-May
	FAMILY ONAGRACEAE	**EVENING PRIMROSE FAMILY**		
	Clarkia rhomboidea	Rhomboid Clarkia	F	May-July
	Epilobium brachycarpum	Panicled Willow-Herb	F, R	June-September
	Epilobium canum	California Fuchsia	F	August-October
	FAMILY POLEMONIACEAE	**PHLOX FAMILY**		
	Polemonium occidentale	Jacob's Ladder	F, R	June-August
	FAMILY POLYGONACEAE	**BUCKWHEAT FAMILY**		
X	*Polygonum convolvulus*	Black Bindweed	D	May-September
	FAMILY RHAMNACEAE	**BUCKTHORN FAMILY**		
	Ceanothus integerrimus	Deer Brush	F	May-June
	Rhamnus californica	California Coffeeberry	F	May-July
	FAMILY ROSACEAE	**ROSE FAMILY**		
	Potentilla glandulosa	Sticky Cinquefoil	F	May-June
	Rubus parviflorus	Thimbleberry	F	March-August
	FAMILY SALICACEAE	**WILLOW FAMILY**		
	Salix lasiolepis	Arroyo Willow	R	February-April

	FAMILY SCROPHULARIACEAE	**FIGWORT FAMILY**		
	Penstemon centranthifolius	Scarlet Bugler	F	April-July
	Class Monocotyledones (Monocots)	**Cotyledons 1 Seed Leaf**		
	FAMILY CYPERACEAE	**SEDGE FAMILY**		
	Carex sp.	Sedge	F	Summer
	FAMILY IRIDACEAE	**IRIS FAMILY**		
	Iris hartwegii ssp. *australis*	Hartweg's Iris	F	May-June
	FAMILY LILIACEAE	**LILY FAMILY**		
	Bloomeria crocea	Common Goldenstar	D	April-June
	Dichelostemma capitatum	Blue Dicks	D	February-May
	FAMILY POACEAE	**GRASS FAMILY**		
	Bromus carinatus	California Brome	F, D	April-August
X	*Bromus diandrus*	Ripgut Grass	D	April-June
X	*Bromus tectorum*	Cheat Grass	D	May-June
X	*Hordeum murinum*	Hare Barley	D	April-June

Revised: 082701

Symbols/Abbreviations:

X = Non-native plant species
sp. = Plant identified to genus only; species not assigned.
c.f. = Indicates the field identified specimen is very closely comparable to, but not certainly identifiable as, the assigned species.
D = Ruderal/Disturbed vegetational association.
F = Westside Ponderosa Pine Forest.
R = Riparian habitat.

APPENDIX B

WILDLIFE COMPENDIUM

FOR
APNs 336-101-006
AND 336-101-007

SAN BERNARDINO COUNTY, CALIFORNIA

SCIENTIFIC NAMES	COMMON NAMES (10)
CLASS AVES	**BIRDS (3)**
FAMILY CORVIDAE	**JAYS, MAGPIES, AND CROWS**
Cyanocitta stelleri	Steller's Jay
FAMILY PARIDAE	**CHIKADEES**
Poecile gambeli	Mountain Chickadee
FAMILY EMBERIZIDAE	**SPARROWS**
Junco hyemalis	Dark-Eyed Junco
CLASS MAMMALIA	**MAMMALS (2)**
FAMILY SCIURIDAE	**SQUIRRELS**
Sciurus griseus	Western Gray Squirrel
FAMILY GEOMYDAE	**POCKET GOPHERS**
Thomomys bottae	Southern Pocket Gopher
CLASS INSECTA	**INSECTS (5)**
Apis mellifera	Honey Bee
Chrysoperla sp.	Lacewing
Culex sp.	Mosquitos
Formica c.f. *fusca*	Brown Ant
Polites sabuleti	Sandhill Skipper

Revised: 082701

Symbols/Abbreviations:

c.f. = Indicates the field identified specimen is very closely comparable to, but not certainly identifiable as, the assigned species.

sp. = Animal identified to genus only; species not assigned.

APPENDIX C

PHOTO PLATE NOS. 1, 2 AND 3

FOR
APNs 336-101-006
AND 336-101-007

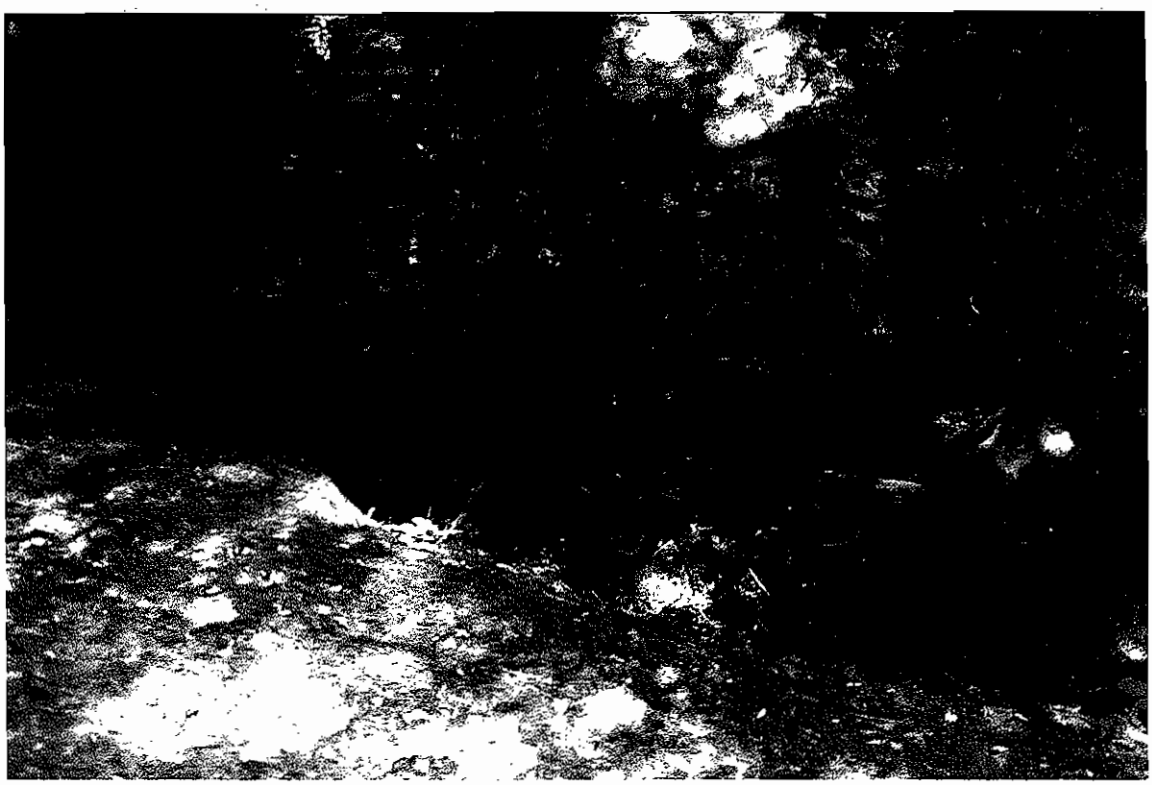
SAN BERNARDINO COUNTY, CALIFORNIA

PHOTO PLATE NO. 1

1a. Southwesterly view of an onsite dirt roadway with Ruderal/Disturbed vegetational association. The roadway is bordered by Westside Ponderosa Pine Forest.

1b. Close-up view of the upper end of a jurisdictional stream course located 180± feet northeast of the proposed school site.

PHOTO PLATE NO. 2



Close-up view of a pool of water located in the largest onsite stream course situated in the northeast quadrant of the property.

PHOTO PLATE NO. 3

3a. Onsite rock outcrops provide potential habitat for the Southern Rubber Boa.

3b. Onsite downed wood provides potential habitat for the Southern Rubber Boa.

Appendix D

Engineering Geology and Soils Engineering Investigation and Supplemental Correspondence

Supplemental Correspondence from LOR Geological Group, Inc.
and County of San Bernardino, Land Uses Services Department,
Building and Safety Division

LOR GEOTECHNICAL GROUP, INC.
Soil Engineering ▲ Geology ▲ Environmental

June 16, 2005

ICON
1814 Commercenter West, Suite A
San Bernardino, California 92408

Project No. 51497.13

Attention: Mr. Patrick Hopkins

Subject: PCR Services Incorporated, Memorandum by Mr. Jay Ziff, RE Review of Technical Reports for Church of the Woods Property, letter dated April 21, 2005.

References: Engineering Geology and Soils Engineering Investigation, Church of the Woods, Rimforest Area, San Bernardino County, California, dated November 27, 2001, Project No. 51497.1

At the request of Mr. Patrick Hopkins of Icon General Contractors we have reviewed the documented entitled "Memorandum" that was forwarded to "Matthew Slowik, Senior Associate Planner", by Mr. Jay Ziff of PCR Services Incorporated. In the heading the memorandum states that it is regarding a "Review of Technical Reports for Church of the Woods Property".

On page 8 of this memo, the memo states that "Upon review of the November 27, 2001 Engineering Geology and Soils Engineering Investigation, prepared by LOR Geotechnical Group for use in the Environmental Impact Report, PCR submits the following questions and comments:" and follows with 6 questions and comments for additional information. At the request of Mr. Pat Hopkins of Icon Construction, we are therefore providing the following responses to the PCR memo.

PCR Comment Number 1:

At the time the study was prepared, precise development plans were not available. Now that plans have been better defined, the study should state the volume of materials to be graded, removed, imported, or re-engineered on site. An exhibit illustrating the extent of grading should also be provided.

LOR Response:

At the time that we were supplied with this memo by PCR, we also received an updated set of development plans prepared by W.J. McKeever, Inc., dated September 9, 2004. This plan illustrates the extent of grading proposed for the site, including existing topography, proposed fills, and pad elevations. While the volume of materials to be graded, removed, imported, or "re-engineered on site" are not listed we anticipated that they could be calculated from this map. However, the calculations of such are the purview of the project design engineer.

PCR Comment Number 2:

Please confirm the absence of groundwater from the project site.

LOR Response:

Groundwater is typically defined as the part of subsurface water within the saturated zone, or generally, water located below the surface. By this definition our report on page 8 documents the potential for the presence of groundwater at the site. However, on page 9 of the same report it is noted that groundwater was not observed in any our explorations at the site and the local water company abandoned their onsite well due to insufficient supplies. Therefore, it was our opinion that the groundwater at the site is anticipated to consist of insignificant amounts of perched water and some located within fractures of the bedrock.

PCR Comment Number 3:

If the assessment of groundwater hydrology is revised then conditions related to secondary seismic hazards would also need to be revised.

LOR Response:

The only secondary seismic hazards related shallow groundwater noted on page 12 is liquefaction. On this page it is stated that the possibility of liquefaction across the majority of the site is nil due to the presence of crystalline bedrock under the site. Conditions for liquefaction may be met along the upper portion of the small valley.

However, as stated in the report, the grading recommendations will most likely mitigate these conditions.

PCR Comment Number 4:

The study recognizes the presence of the existing sewer line, yet there is no mention of this depth beneath the project site. Please describe the proposed relocation of this sewer line in the discussion.

LOR Response:

Details on this line, including plans if any for relocations, have not been made available to this firm. As the majority of this line lies along the central canyon area which is to remain un-developed, this line may be left in-place. However, this decision is not one that would be determined by the soils engineer.

PCR Comment Number 5:

In regards to the indicated landslide area on site, the study states, "...structures along the southeastern rim of the site should not be planned unless additional studies are conducted to determine the stability of the area and/or determine mitigation measures." This statement is in conflict with the September 9, 2004 site plan that shows a concentration of structures within this area. Therefore, additional studies and/or mitigation measures should be included in the report. The report should provide specific details about the extent of the slide area and appropriate setbacks from the areas that are safe to build on need to be discussed.

LOR Response:

The extent of the slide area and the appropriate setbacks are illustrated on our Plate 1, shown on the map as Qls which is listed under the units explanation as "recent slide materials" and illustrated on our profile B-B', Enclosure A-5 within Appendix A of the report. The setbacks for this feature have been illustrated on the referenced site development plan by W.J. McKeever, which indicates no structures are to be located on this area which is to be used as a playground area containing only a

basketball court and a portions of a volleyball court. These features should be verified by the engineer as "non-structural".

PCR Comment Number 6:

Please provide a copy of the LOR Geotechnical Group report dated August 28, 2003, which included responses to the County's review of the November 27, 2001 report.

LOR Response:

Attached.

We hope this letter has adequately provided the clarification requested. If you have any questions please do not hesitate to call us. This letter should be made part of and attached to the referenced report.

Respectfully,
LOR Geotechnical Group, Inc.

John P. Leuer, GE 2030
President

Jeffrey J. Johnston, CEG 1893
Engineering Geologist

JJJ:JPL:qab

Distribution: Addressee (2)
County of San Bernardino (2)
Dennis Stafford, W.J. McKeever, Inc. (2)

REGISTERED PROFESSIONAL ENGINEER
JOHN P. LEUER
NO. 2030
EXPIRATION DATE
09/30/05
GEOTECHNICAL
STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST
JEFFREY J. JOHNSTON
No. 1893
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

LAND USE SERVICES DEPARTMENT

COUNTY OF SAN BERNARDINO
ECONOMIC DEVELOPMENT
AND PUBLIC SERVICES GROUP

BUILDING AND SAFETY DIVISION
385 North Arrowhead Avenue • San Bernardino, CA 92415-0181 • (909) 387-8311
Fax (909) 387-4301

MICHAEL E. HAYS
Director

September 4, 2003

Church of the Woods
Attn: Rod Akins
1814 Commercenter West
San Bernardino, California 92408

SUBJECT: RESPONSE REPORT, GEOLOGIC FEASIBILITY STUDY, CHURCH OF THE WOODS (APN 0336-101-06), RIMFOREST, COUNTY REVIEW NO. 1108.1

The following report prepared by LOR Geotechnical Group, Inc. dated August 28, 2003 was submitted for review:

> *Response to County of San Bernardino Land Use Services Department, County Review Letter, dated April 8, 2003, County Review No. 1108.*

As the title indicates, the report was submitted in response to our review of the November 27, 2001 Geologic Feasibility Study (County Review No. 1108, dated April 8, 2003). The response report is signed and sealed by Jeffrey J. Johnson, Certified Engineering Geologist.

The response report addresses all of the items included in our previous review. The response report in conjunction with the 2001 report, are approved this date as a geologic feasibility study.

The 2001 study postulated the extension of a suspected large, ancient landslide eastward on to the site. The response report states *"our study concluded that we noted several vague lines of evidence which suggested that it may be possible that the site is underlain by a large ancient landslide underlying the bulk of the site"*. No strong evidence for the existence of this landslide as far east as the site was apparently found. The report further states *"the evidence indicates this postulated landslide, if present, is considered to be grossly stable"*. Therefore, because of its age and apparent stability, the report indicates that the landslide is not a constraint to the proposed development.

It is important to note that the State previously mapped the postulated landslide west of the site, occupying most of the developed portion of Rimforest (California Geological Survey, Landslide Hazard Identification Map No. 15, 1989). However, the mapping was cursory and a detailed analysis of the landslide has not been completed. Such an analysis is well beyond the scope of this site feasibility study.

The 2001 study identified and mapped a much smaller and younger landslide within the southeast portion of the project immediately upslope of Highway 18. The response report indicates that no structures are currently proposed within 40 feet of the mapped landslide. Additional slope stability studies will be required if development is proposed within or immediately adjacent to this landslide.

Additional engineering geology and geotechnical studies may also be required prior to issuance of grading or building permits depending upon the nature and volume of grading proposed.

Sincerely,

WESSLY A. REEDER, County Geologist
Building and Safety Division
Land Use Services Department
Economic Development and Public Services Group
(909) 387-4240

WAR:ljg

cc: LOR Geotechnical Group, Inc.
David Wallace, Regional Supervisor
Heidi Duron, Planner I
Geology File
APN File

LOR GEOTECHNICAL GROUP, INC.
Soil Engineering ▲ Geology ▲ Environmental

August 28, 2003

ICON
1814 Commercenter West, Suite A
San Bernardino, California 92408

Project No. 51497.12

Attention: Mr. Patrick Hopkins

Subject: Response to County of San Bernardino Land Use Services Department, County Review Letter, dated April 8, 2003, County Review No. 1108

References: Engineering Geology and Soils Engineering Investigation, Church of the Woods, Rimforest Area, San Bernardino County, California, dated November 27, 2001, Project No. 51497.1

This letter is in response to the review letter by the County of San Bernardino Land Use Services Department, County Review Letter, dated April 8, 2003, County Review No. 1108, of our above-referenced report. The review letter requested clarification on six items. These are listed, along with our clarification comments, below.

Item No. 1. The report states that there is *some evidence* to suggest that the site may be situated upon a very large landslide. Page 9 of the report indicates that if a suspected backscarp of a postulated landslide west of the site were projected east, it would extend onto the site. It is unclear what specific evidence there is for extending this landslide onto the site.

Response:

The steep mountain face, which lies predominately west of the site, is known to be prone to slope unstabilities. This was previously suggested in the study by Tan (1989) that concluded the area around the site is at, or near the stability limits. An additional study by Hansen, Frisk, Rasmussen and Reeder, (1989), indicates that a large area of the Rimforest area is underlain by a large deep-seated landslide, the upper boundary approximately coinciding with the level bench along Highway 18, see our attached USGS topographic map attached to this letter. The attached cross section, A-A',

shows the profile across this suspected slide and illustrates the slump morphology which may be associated with this feature. The subject site lies along this same mountain face, just to the east. When a similar cross section is drawn, section B-B', it is noted that it also may have a slight slumping morphology. When the site is viewed in aerial photographs, there is a slight hint of a slump feature due to the curvature of the large valley which cuts the subject site in two. Therefore, as noted in our report, it is conceivable that the Rimforest slide extends to the east and onto the site. However, unlike the Rimforest slide to the west, there is no sharply defined backscarp and this valley could simply be the result of southward erosion of Daley Canyon. We did excavate three trenches into the area where the slide plan was suspected to reach the surface, T-6 through T-8, down to the bedrock. While the bedrock materials were highly decomposed in T-6 and T-7 and slightly fractured in T-8, they were generally noted to be massive with no evidence of oriented discontinuities. In addition, the materials interpreted as older alluvium overlying the weathered bedrock unit in T-7 were not significantly fractured, however, there were tiny argillic fill stringers. It seems unlikely that recent movement of this slide would occur without significantly fracturing these units in some noticeable manner.

We should note here that at the current level of the industry, it is often not possible to completely rule out the potential for various geologic hazards to occur. Earthquake intensities are one example, where probabilities of exceeds are, therefore, utilized. This is the reason that the California Building Code requires the soil engineer and engineering geologist to provide an opinion on the level of hazard and does not require the consultant to provide absolute proof.

Therefore, our study concluded that we noted several vague lines of evidence which suggested that it may be possible that the site is underlain by large ancient landslide underlying the bulk of the site. However, the evidence was highly subjective. We also conclude that it would be very difficult, if not impossible, to completely rule out this possibility, or in the same manner to prove the existence of such a feature. It is our opinion that the evidence indicates this postulated slide, if present, is considered to be grossly stable.

Item No. 2. The geologic cross-sections (Enclosures A-3 and A4) do not match the geologic map (Plate 1). Both cross-sections show the postulated ancient landslide plane. The geologic map should show the same feature, at least as a postulated, buried boundary.

Response:

It has been our position that a geologic map and geologic cross sections are related but separate entities. A geologic map is the documentation of the surface, or very near surface, conditions that have been mapped in the field or are anticipated to be buried based on very good or convincing evidence, such as borings, geophysical, or other indirect evidence. However, geologic cross sections are interpretative. In most cases, cross sections require inference about subsurface structure, and, therefore, many potential models of a subsurface which fit the same mapped surface features can exist. This is why our geologic map attempts to illustrates what is known about the site, while cross sections are included to indicate conditions which may exist, such as buried faults, landslides, etc. This is why our illustration of the postulated base of ancient complex on these profiles is required, and it should be noted that dictionaries typically define the word postulated as meaning to assume with little or no proof.

Item No. 3. Cross-section B-B′ (Enclosure A-4) shows the slide plan terminating below the ground surface without reaching the top of the quartz monzonite. This is impossible and, therefore, must be a drafting error.

Response:

This answer is similar in nature to response number 2. In addition, the postulated base of the ancient complex was not noted in our trenches T-6 and T-7. However, these trenches encountered a highly weathered bedrock, which was in-place in almost a soil-like condition. This is why a question mark was placed at the postulated location of the slide complex which is to indicate that if this exists, it is unclear as to where it extends past this point. Perhaps it does not exist, or perhaps the highly decomposed nature of the bedrock has masked the appearance or perhaps this weathered unit is slumping as a unit.

Item No. 4. The report indicates that the large landslide postulated on the site is ancient and, therefore, stable. However, a discussion of the potential for sympathetic movement along the buried slide plane during a large earthquake is warranted. Repeated sympathetic movement may not be expressed geomorphically but could seriously damage structures if the movement or differential settlement is greater than several inches.

Response:

In our trench T-7, the age of the unfractured older alluvium materials is not known. However, based on the buildup of argillic filled stringers, these units are thought to be on the order of several thousands years old or older. While estimates vary greatly, the USGS estimates that over the last 1400 to 1500 years the San Andreas fault, the closest major feature to the site, has experienced a large earthquake every 100 to 200 years. This would indicate that the subject site has not experienced significant sympathetic movement during the last 7 to 15 major earthquakes. This dramatically lowers the probability for the occurrence of significant sympathetic motion in the future.

Item No. 5. The report indicates that a young, potentially unstable landslide was identified in the southern portion of the site adjacent to Highway 18. The report recommends *structures along the southeastern rim of the site should not be planned unless additional studies are conducted* . It is unclear what the extent of the recommended restricted area is. A setback, restricted use zone or special study zone associated with this landslide needs to be shown on the geologic map (Plate 1 of the report). How close can structures be built adjacent to this landslide without additional studies?

Response:

On the geologic map, Plate 1 within the report, we indicated the area of the small recent landslide. The area effected by this is shown on our attached Plate 1. It is our recommendation that no structures should be place in this area without additional studies. In the latest site drawings supplied to us by the project Civil Engineer, W.J. McKeever, Inc., dated 4-22-2003, this line was transferred onto the project plans and

was considered in the design of the project. As shown on the attached portion of this map, the nearest structure is on the order of 40 feet. This layout appears to be adequate, but must be field verified to meet minimum CBC slop setback requirements. In addition due to the anticipated orientation of this failure, the cutting down of the site will move this boundary southward, thus increasing the distance from the structure to the unstable mass. It should be noted by the facility owner that while the cutting down of the site will reduce the mass of the slide, it is still possible that this portion of the parking lot could experience significant damage if this feature is not entirely removed or stabilized.

Item No. 6. When discussing recent landsliding in the southern portion of Rimforest, the report incorrectly refers to these failures as rockfalls . All of the slope failures documented thus far have been attributed to translation/rotational landsliding and severe erosion. No homes have been destroyed by rockfalls.

Response:

We concur

We hope this letter has adequately provided the clarification requested. If you have any questions please do not hesitate to call us. This letter should be made part of and attached to the referenced report.

Respectfully,
LOR Geotechnical Group, Inc.

John P. Leuer, GE 2030
President

Jeffrey J. Johnston, CEG 1893
Engineering Geologist

JJJ:JPL:mmm

Distribution: Addressee (2)
County of San Bernardino (2)
Dennis Stafford, W.J. McKeever, Inc. (2)

LAND USE SERVICES DEPARTMENT

COUNTY OF SAN BERNARDINO
ECONOMIC DEVELOPMENT
AND PUBLIC SERVICES GROUP

BUILDING AND SAFETY DIVISION
385 North Arrowhead Avenue • San Bernardino, CA 92415-0181 • (909) 387-8311
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MICHAEL E. HAYS
Director

April 8, 2003

Church of the Woods
Attn: Rod Akins
1814 Commercenter West
San Bernardino, California 92408

SUBJECT: REVIEW OF GEOLOGIC FEASIBILITY STUDY, CHURCH OF THE WOODS (APN 0336-101-06), RIMFOREST, COUNTY REVIEW NO. 1108.

The following report prepared by LOR Geotechnical Group, Inc., dated November 27, 2001 was submitted for review:

Engineering Geology and Soils Engineering Investigation, Church of the Woods, Rimforest Area, San Bernardino County, California, Project No. 51497.1.

The report is signed and sealed by Jeffrey J. Johnston, Certified Engineering Geologist.

The report indicates that the 30-acre site may be developed with a church, a private school, a coffee house and bookstore building, a residential and storage building, an athletic field, a playground, a large parking lot and various interior access roads. Cuts approximately 30 to 35 feet and fills approximately 20 feet deep are anticipated. With the exception of a buried sewer line, which bisects the site, the site is essentially undeveloped.

Although no groundwater was encountered during the field investigation, a lush growth of reeds was noted in the center and southwest corner of the site. Sediments in this area are described as olive green with reddish brown mottling implying a history of shallow groundwater and wet conditions at or near the ground surface.

The report was reviewed as a geologic feasibility investigation. This development will require approval and conditioning from the Planning Division. More detailed or updated geology and/or geotechnical evaluations may be required depending upon the extent and type of development ultimately proposed.

Although the report appears to meet the requirements for a geologic feasibility investigation, several items need clarification and/or additional input. The following items must be addressed by the Project Engineering Geologist (LOR Geotechnical):

1. The report states that there is "*some evidence*" to suggest that the site may be situated upon a very large landslide. Page 9 of the report indicates that <u>if</u> a suspected backscarp of a postulated landslide west of the site were projected east, it would extend on to the site. It is unclear what specific evidence there is for extending this landslide on to the site.

2. The geologic cross sections (Enclosures A-3 and A-4) do not match the geologic map (Plate 1). Both cross sections show the postulated ancient landslide plane. The geologic map should show the same feature, at least as a postulated, buried boundary.

3. Cross section B-B' (Enclosure A-4) shows the slide plane terminating below the ground surface without reaching the top of the quartz monzonite. This is impossible and therefore, must be a drafting error.

4. The report indicates that the large landslide postulated on the site is ancient and therefore stable. However, a discussion of the potential for sympathetic movement along the buried slide plane during a large earthquake is warranted. Repeated sympathetic movement may not be expressed geomorphically but could seriously damage structures if the movement or differential settlement is greater than several inches.

5. The report indicates that a young, potentially unstable landslide was identified in the southern portion of the site adjacent to Highway 18. The report recommends "*structures along the southeastern rim of the site should not be planned unless additional studies are conducted*". It is unclear what the extent of the recommended restricted area is. A setback, restricted use zone or special study zone associated with this landslide needs to be shown on the geologic map (Plate 1 of the report). How close can structures be built adjacent to this landslide without additional studies?

6. When discussing recent landsliding in the southern portion of Rimforest, the report incorrectly refers to these failures as "rockfalls". All of the slope failures documented thus far have been attributed to translation/rotational landsliding and severe erosion. No homes have been destroyed by rockfalls.

Sincerely,

WESSLY A. REEDER, County Geologist
Building and Safety Division
Land Use Services Department
Economic Development and Public Services Group
(909) 387-4240

WAR:ljg

cc: LOR Geotechnical Group, Inc.
David Wallace, Regional Supervisor
Geology File
APN File

LOR Geotechnical Group , Inc.

Engineering Geology and Soils Engineering Investigation
Church of the Woods, Rimforest Area

November 27, 2001

LOR GEOTECHNICAL GROUP, INC.
Soil Engineering ▲ Geology ▲ Environmental

ENGINEERING GEOLOGY AND SOILS ENGINEERING INVESTIGATION CHURCH OF THE WOODS RIMFOREST AREA SAN BERNARDINO COUNTY, CALIFORNIA

PROJECT NO. 51497.1
NOVEMBER 27, 2001

Prepared For:

ICON
1814 Commercenter West, Suite A
San Bernardino, California 92408

Attention: Mr. Patrick Hopkins

6121 Quail Valley Court ▲ Riverside, CA 92507 ▲ (909) 653-1760 ▲ Fax (909) 653-1741

LOR GEOTECHNICAL GROUP, INC.
Soil Engineering ▲ Geology ▲ Environmental

November 27, 2001

ICON
1814 Commercenter West, Suite A
San Bernardino, California 92408

Attention: Mr. Patrick Hopkins

Subject: Church of the Woods, Rimforest, California.

LOR Geotechnical Group, Inc. is pleased to present this report summarizing our geotechnical investigation for the Church of the Woods proposed school site to be located in the unincorporated Rimforest area of San Bernardino County, California. This report was based upon a scope of services generally outlines in our Work Authorization Agreement, dated June 28, 2001 and other written and verbal communications.

This investigation provides a broad overview of the geotechnical and geologic factors which are expected to influence future site planning and development. On the basis of our field investigation and testing program, it is the opinion of LOR Geotechnical Group, Inc. that the proposed development is feasible from a geotechnical standpoint, provided the recommendations presented in this report are incorporated into design and implemented during grading and construction.

The subject site is covered by a relatively thick layer of materials rich in organic debris, not suitable for the support of structures. We recommend that these materials be completely removed from all structural fill areas and a compacted fill mat be constructed beneath footings and slabs. The materials underlying these surficial layers are composed of igneous crystalline bedrock. These materials appear to be rippable using standard earth moving equipment to a depth of at least 30 feet. The existing slope stabilities in this region are reported to be very near their limit of safe stability. In addition, a small failure was noted along the far southeast corner of the site. Therefore, the final grading plans, as well as all excavations during grading, should be reviewed by the project engineering geologist.

LOR Geotechnical Group, Inc.

6121 Quail Valley Court ▲ Riverside, CA 92507 ▲ (909) 653-1760 ▲ Fax (909) 653-1741

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Plate 1 - Project Base Map

INTRODUCTION

During September and October of 2001, an Engineering Geology and Soils Engineering Investigation was performed by LOR Geotechnical Group, Inc. for the Church of the Woods. The project consists of a 30 acre site located north of State Highway 18 and west of Daley Canyon Road in the unincorporated Rimforest area of San Bernardino County, California.

The purpose of this investigation was to provide a technical evaluation of the geologic setting of the site and to provide geotechnical design recommendations for the proposed development. The scope of our services included:

- Review of available pertinent geologic and geotechnical literature, reports, maps, and agency information pertinent to the study area;
- Interpretation of stereo aerial photograph pairs taken of the site and surrounding regions at various dates ranging from 1953 through 2001;
- Geologic field reconnaissance mapping to verify the areal distribution of earth units and significance of surficial features as compiled from documents, literature and reports reviewed;
- Perform a geophysical survey using non-destruction seismic methods;
- A subsurface field investigation consisting of the excavation, sampling, and logging of a total of eight backhoe trenches;
- Laboratory testing of selected soil samples obtained during the field investigation;
- Development of geotechnical recommendations for site mass grading, utilities construction, and preliminary foundation and pavement designs; and
- Preparation of this report summarizing our findings, and providing conclusions and recommendations for site master planning and development.

The approximate location of the site is shown on the attached Index Map, Enclosure A-1, within Appendix A.

An 80-scale Site Boundary and Topographic Map showing the property boundary and existing site topography was prepared by W.J. McKeever, Inc., dated August 20, 2001. This map is included as the Project Base Map, Plate I, in the pocket at the back of this report.

PROJECT CONSIDERATIONS

At the time of our report precise development plans were not available. However, it is our understanding that conceptually the site is to be developed with a church and private school complex. This would involve the construction of a large, two-story, church building, located in the southeastern corner of the site, and a large, two story, school building in the southwest corner. Along with these two larger buildings, a smaller combination storage and residence building would be located just east of the church building and a combination coffee house and bookstore would be located near the south-center portion of the site. The development of the site may also include the construction of an athletic field and/or playground along the far north-central portion of the site. Other additions to the site would include a large parking lot around the church building and in front of the school building, as well as various interior access roads.

Based on the topography of the site, cuts on the order of 30 to 35 feet would be required to create a level pad for the church building, while cuts on the order of 20 feet are anticipated for the school building. The parking area in front of the proposed school building appears to require fill on the order of 20 feet.

The type of construction of the buildings, such as wood or steel frame, is not known at this time. However, moderate to heavy foundation loads are anticipated for these buildings, while the residence, bookstore, and restroom buildings are anticipated to have light foundation loads.

EXISTING SITE CONDITIONS

The regional topography of the site and surrounding region is illustrated on the site Index Map, Enclosure A-1, within Appendix A. As noted on this map, the site is located southwest of Lake Arrowhead, along the rim of the San Bernardino Mountains, overlooking the San Bernardino Valley to the south. South of the site the topography drops off very steeply several thousand feet along the face of the San Bernardino Mountains. To the north the topography generally falls gently towards Lake Arrowhead. At the site the topography is dominated by a northeasterly trending valley that runs along the center of the site and falls to the northeast. This valley starts out in the northeastern corner of the site as a relatively deep depression with steep sides. This gradient becomes less to the southwest, and gradually fills in along the southeastern corner of the site. The area on the site located southeast of this valley rises upward to a small ridgeline, which forms the southern half of the site. The area to the northwest of the valley rises upwards at a moderate gradient to the property limits.

The entire site is covered with a relatively thick growth of trees, predominately pine with some fir and oak. Most of the ground contains a thin to thick covering of pine needles and other organic debris. Along the upper portion of the valley, in the center and southwest corner of the site, there is lush growth of brush and reeds.

Access around much of the site is provided by a small dirt road which enters the site near the mid-southern portion, off of Highway 18. The road then runs across the southern portion of the site, up onto the small ridgeline to exit out onto Daley Canyon, and to the west, turning to follow the valley. However, at the time of our visit the road was ~~rutted and overgrown and not entirely~~ passable. A sewer line was noted by the presence of a series of man-holes, running down the center of the valley. A small dirt lane runs along the sewer line, although it was also overgrown and rutted. No other structures or improvements were noted at the site.

SUBSURFACE FIELD INVESTIGATION

Our subsurface field exploration program was conducted on September 25, 2001 and consisted of excavating of total of eight exploratory trenches with a rubber-tired backhoe equipped with a 18-inch bucket. The trenches were excavated to depths of

5 to 15 feet below the existing ground surface. The approximate locations of our exploratory trenches are presented on the attached Project Base Map, Plate 1, in the pocket at the back of this report.

Logs of the subsurface conditions encountered in the exploratory trenches were maintained by a geologist from this firm. In-place density samples were taken at various locations utilizing the Nuclear Density Method (ASTM D 2922-91). Bulk samples were obtained from the trenches and returned to the laboratory in sealed containers for further testing and evaluation. A detailed description of the field exploration program and the trench logs are presented in Appendix B.

LABORATORY TESTING PROGRAM

Selected soil samples obtained during the field investigation were subjected to laboratory testing to evaluate their physical and engineering properties. Laboratory testing included moisture content, dry density, laboratory compaction, and soluble sulfate content. A detailed description of the laboratory testing program and the test results are presented in Appendix C.

SEISMIC REFRACTION SURVEY

On September 27, 2001, a Seismic Refraction Survey was performed for the site as part of this investigation. The purpose of this survey was to evaluate the general rippability characteristics of the site in relation to the proposed development.

Field Procedures

Two seismic refraction lines, S-1 and S-2, were placed across the site. Seismic Line S-1 was placed across the general proposed location of the two-story main church structure. Seismic Line S-2 was placed across the general proposed location of the two-story school building. Each line consisted of a total of twelve, 14-Hz, geophones (with 60% damping), spaced at 10 foot intervals along the lines to detect both the direct and refracted waves. A 20-pound sledge-hammer was used as an energy source to produce the seismic waves. Five shot points were utilized along each seismic line spread using forward, reverse and intermediate locations, in order to obtain sufficient data for velocity analysis and depth modeling purposes. The seismic waves were

recorded on a 12-channel Geometrics SmartSeis® model signal enhancement refraction/reflection seismograph. During acquisition, the seismograph provides both a hard copy and screen display of the seismic wave arrival times. These seismic wave arrival times are digitally recorded on the in-board seismograph computer and subsequently transferred to a disk. The data disk was then downloaded into our office computer for further processing, analyzing and printing. The approximate locations of our survey lines were transferred onto field maps and are shown on the accompanying Plate 1.

Data Reduction

Two methods were utilized to analyze the recorded data. The first method represents an average of seismic velocities within any given layer ("average weighted velocity") while the second method illustrates the subsurface in discrete velocity cells rather than assigning velocity layers with sharp boundaries. A description of the two methods is given below.

The first method was utilizing the computer program SIP (Seismic refraction Interpretation Program) developed by Rimrock Geophysics (1995), Lakewood, Colorado. This method assumes the subsurface is composed of distinct layers, or beds, each with differing seismic velocities which increase with depth. This method works very well with geologic units which have sharp, distinct, boundaries such as bedded sedimentary rocks, or igneous granitic rocks with sharp, weathered boundaries. Therefore, the data obtained during the SIP analyzation represents an average of seismic velocities within any given layer ("average weighted velocity"). For example, high seismic velocity boulders or other lithologic bedrock characteristics may be isolated within a low velocity matrix, thus yielding an average medium velocity for that layer. Therefore, in any given layer, a range of velocities could be anticipated, which can also result in a wide range of excavation characteristics. Based on the surficial exposures of boulder outcrops and dikes, this condition at depth is expected.

The second method was using the SeisOpt™@2D Program. This program is sometimes better suited for evaluating granitic bedrock as it delegates the subsurface in discrete velocity cells rather than assigning velocity layers with sharp contact boundaries. This method allows for the interpretation of units which may gradually increase hardness with depth without assigning a discrete layered boundary.

It should be noted that the seismic velocities obtained within bedrock materials for both programs are greatly influenced by the nature and character of the localized major structural discontinuities (i.e. foliation, bedding, jointing, faulting, fracturing, etc.). Generally, it is expected that higher (truer) velocities will be obtained when the seismic waves propagate along the direction of the dominant structure (strike), with a damping effect when the seismic waves travel in a perpendicular direction to the strike. Therefore, the seismic velocities obtained during our field study at the subject site should be considered minimum velocities at this time, as the structure of the bedrock locally is not known.

Seismic Survey Results

The SIP program results for the seismic refraction line S-1 were approximated by using a two layer model within the upper 30 feet. This case was utilized due to a single break in velocities noted on each shot. This most likely represents a homogenous bedrock unit which has a surficial layer which is highly weathered. This uppermost weathered layer had an average velocity of about 1000 feet per second and ranged in depth from about 5-feet to nearly 20 feet at the south end of the line. The average velocity of the underlying bedrock below this weathered unit was about 2000 feet per second.

Similarly, the SIP program results for the seismic refraction line S-2were approximated by using a two layer model within the upper 30 feet. This case was again utilized due to a single break in velocities noted on each shot. As in S-1, this most likely represents a homogenous bedrock unit which has a surficial layer which is highly weathered. This uppermost weathered layer also had an average velocity of about 1000 feet per second. However, the depth of this layer was more consistent with an average depth of about 5-feet. The average velocity of the underlying bedrock below this weathered unit was also about 2000 feet per second. The results from SeisOpt are very similar. The Seismic Refraction Survey lines are presented on Enclosures D-1 through D-4, within Appendix D.

The location of the Seismic Refraction Survey lines are presented on the Project Base Map, Plate 1, in the pocket at the back of this report.

GEOLOGIC CONDITIONS

Regional Geologic Setting

The subject site is located within the San Bernardino Mountains, which in turn are situated within a geomorphic province in southern California known as the Transverse Ranges. The Transverse Ranges consist of a set of easterly trending mountains and geologic structures that extend in an east-west direction from the little San Bernardino Mountains near Joshua Tree to the Channel Islands, west of Santa Barbara. The San Bernardino Mountains make up the mid-eastern portion of the ranges and are about 55 miles long and 20 miles wide.

The distribution of rocks in the San Bernardino Mountains is highly varied, containing igneous intrusive rocks and older metamorphic rocks of gneiss. Previous regional mapping of the San Bernardino North Quadrangle by the U.S. Geological Survey indicates the Rimforest area is underlain by crystalline granitic rock comprised of Quartz Monzonite (Dibblee, 1968), as shown on the attached Regional Geologic Map, Enclosure A-2, within Appendix A (symbol qm). These rocks are thought to have been pushed up, forming the mountains, by compressional tectonic activity resulting between the San Andreas fault zone and the North Frontal fault zone, which borders the southern and northern flanks of the mountains, respectively. The geomorphology of this region of the San Bernardino Mountains indicates that the range is very young, from a geologic standpoint, most likely having been uplifted tectonically during the last one or two million years. Current tectonic activity suggest that this compression may still be uplifting the mountains (Norris and Webb 1990).

The uplifting along the south flank of the San Bernardino Mountains has resulted in intense fracturing of the rocks in this region. This tends to lower the stability of these units, while the rapid uplift over-steepens the slopes. This combination leads to numerous rock falls and large slides along the southern flanks. In 1993 a moderately large rock fall destroyed several cabins and a small stretch of Blackfoot Trail East, just southwest of the site. While the overall stability of this region has never been satisfactorily determined, some authors believe these minor failures are part of a much larger ancient complex which incorporates much of the Rimforest region.

Site Geologic Conditions

The site is predominately underlain by granitic bedrock overlain by a thick layer of colluvial and topsoil materials. The depths of colluvium thicken along the canyon in the center of the site. In addition some units of older alluvium were noted overlying the bedrock within this canyon, and one small landslide was noted along the far southeastern portion of the site.

Bedrock was noted at the surface only on one small outcrop along the far western portion of the site. However, it was exposed at relatively shallow depths within all of our backhoe trenches. In these trenches the bedrock typically consisted of a medium grained quartz monzonite. These were typically soft and highly weathered at the surface and while refusal was not noted, became slightly less weathered and harder with depth. Typically the bedrock was covered by several feet of colluvial soils. These units represent the portions of the bedrock which have weathered to a homogeneous incoherent mass of soil material and rock fragments and are subject to downslope movement by rainwash and creep. These tend to thicken at the base of the slopes. The bulk of the site is covered by a moderately thick organic topsoil layer. At the surface this layer is composed of pine needles, leaves, and bark. With depth these materials decay and mix with the underlying colluvial materials.

In our trenches within the small canyon, the colluvial materials were noted to thicken and various amounts of fills have also been placed in this area. In some of these trenches the bedrock was noted to be overlain by up to 15 feet of relatively loose fills, colluvium, and older alluvial materials. In our trench number T-7, at a depth of 7 to 14 feet the rock was overlain by a relatively dense silty sand layer. This unit was dense and the overall color was an olive yellow, with reddish brown mottling. This material was interpreted to be an older alluvium.

Groundwater Hydrology

Groundwater was not encountered in any of our trenches at the site, nor were any seeps noted. In addition the hard, non-porous nature of the underlying bedrock at the site tends to minimize groundwater, except for within fractures. However, along the upper portion of the valley in the center of the site the lush vegetation and reeds tend

to indicate the presence of shallow groundwater. This area may therefore have some groundwater perched over the bedrock or within the fractures.

As noted on Enclosure A-1, the USGS topographic map notes the presence of a groundwater well in the small valley near the far southwestern portion of the site. This well was reportedly drilled as an exploratory well by Southern California Water Company in the late 70's or early 80's. The rights to this well were then purchased by Big Bear Municipal Water District, BBMWD. According to Mr. Biff Snyder of the BBMWD, most of the records to this well have been lost. However he believes that while groundwater was encountered at a relatively shallow depth it was not sufficient for production. The well was abandoned and capped at a depth of 5 feet below the ground in the early 1980's.

Mass Movement

As previously noted, the subject site is situated along the southern rim of the San Bernardino Mountains where the tectonic uplifting has fractured the rock and over-steepened the slopes. These factors combine to make shallow and deep seated landslides a relatively common phenomena in the Rimforest area. As previously mentioned, rockfalls have occurred just southwest of the site damaging several cabins, located off Blackfoot Trail East.

The main "downtown" portion of Rimforest is located just west of the subject site on a long narrow bench situated just below the main plateau edge. Above this to the northwest is a relatively steep slope to Strawberry Peak. In addition, the bedrock units exposed below the town are highly fractured. Some past authors have suggested that to account for these geomorphic and geologic features it is likely that the town is located on top of a large, deep seated ancient landslide (Hanson et al 1989). In this view the active rock falls along the southern margin of Rimforest represent a reactivation of the frontal portion of a much larger older landslide. If the "backscarp" area located north of Rimforest is projected to the east, it would extend around to the central valley of the site. If this interpretation is correct then the valley of the site would represent the backscarp to a large deep seated ancient landslide.

A study conducted by the State of California, Division of Mines and Geology, rated the landslide potential in the Lake Arrowhead region on a 1-4 rating system with 1 as least and 4 as most susceptible to landslides. The majority of the site, along with most of

the Rimforest area, was rated a 3, or "generally susceptible" to landslides (Tan 1989). This is an area were the slopes are at or near the stability limits. These materials can be expected to fail when modified. The south portion of the site was rated a 4, or most susceptible. In addition, this area was a "hatchered 4" area, which was listed as:

> "Edge of most susceptible slopes..Land in this vicinity is highly susceptible to damaging headward erosion, slope retreat due to raveling, rock falls, soil creep, landslides and other forms of slope failure."

Trench number T-3 was placed in this area on an area that was suspected to contain a small landslide based on aerial photographs and a study of the geomorphology of the site. In this trench the bedrock was highly weathered and fractured down to a depth of 12 feet. In addition several thin, vertical, soil filled fractures were noted. Below this depth the bedrock was harder, however, it was still highly fractured, breaking out in 3 to 4-inch angular fragments. The limits of this feature are illustrated on Plate 1, while the extent is estimated on our Profile B-B', Enclosure A-4 and A-5, within Appendix A.

Faulting

There are no known active faults that traverse the site, nor were there any indications of faulting or fault-related features observed at the site during our field investigation. In addition, the site is not located within a State of California "Alquist-Priolo Earthquake Fault Zone" for fault rupture hazard (Hart, 1994). The nearest mapped fault, shown on Enclosure A-2 within Appendix A, is located approximately 1 km (0.6 miles) to the south. This fault is an un-named fault with very little data. The mapping by Dibble (1968) on this fault indicated that it was a south dipping fault with the south block down.

Running along the base of the mountains to the south is the San Andreas fault complex. The San Andreas fault is the largest fault in the region, based on slip rates and anticipated magnitude. In addition, the San Andreas fault is considered to be the major tectonic feature of California, separating, the Pacific Plate from the North American Plate. According to the DMG 96-08, the San Andreas fault is generally thought to have an average slip rate on the order of 24 mm per year and capable of generating large magnitude events on the order of 7.5 or greater. The main break of

the San Andreas fault lies approximately 8 km (5-miles) southwest of the site. However there is a north branch of this fault which lies approximately 7 km (4-miles) southwest of the site. Another known active fault system is the North Frontal fault system located approximately 10 km (6-miles) northwest. The North Frontal fault zone consists of numerous fault segments which bound the northwestern portion of the San Bernardino Mountains. The primary sense of slip is south dipping thrust. According to the DMG 96-08, the North Frontal fault zone has an average slip rate of approximately 1 mm/year and is capable of producing an earthquake magnitude on the order of 6.0 to 7.1 or greater.

Past standards of practice included a discussion of all potential earthquake sources within a 100 kilometer (62 mile) radius. However, while there are other large earthquake faults within a 100 kilometer (62 mile) radius of the site, none of these are considered as relevant to the site as the faults described above, due to their closer distance and larger anticipated magnitudes.

Historical Seismicity

In order to obtain a general perspective of the historical seismicity of the site and surrounding region a search was conducted for seismic events at and around the area within various radii. This search was conducted utilizing the historical seismic search program by EPI Software, Inc (EPI 2000). This program conducts a search of a user selected cataloged seismic events database, within a specified radius and selected magnitudes, and then plots the events onto an overlay map of known faults. For this investigation the database of seismic events utilized by the EPI program was obtained from the Southern California Seismic Network (SCSN) available from the Southern California Earthquake Center. At the time of our search the data base contained data from January, 1932 through March, 2001.

In our first search the general seismicity of the region was analyzed by selecting an epicenter map listing all events of magnitude 5.0 and greater, recorded since 1932, within a 100 kilometer (62 mile)radius of the site, in accordance with guidelines of the California Division of Mines and Geology. This map illustrates the regional seismic history of moderate to large events. As noted on Enclosure A-6, within Appendix A, the site lies within a relatively active region lying in between the San Andreas fault to the south and the North Frontal fault system to the north. During this time period numerous events were noted in the region. Of these events, the closest was a

magnitude 4.8 located approximately 12.0 kilometers (7.5 miles) to the southeast of the site.

In the second search, the seismicity of the nearby area, lying within a 10 kilometer (6.2 mile) radius of the site, was examined by selecting an epicenter map listing events on the order of 0.0 and greater since 1976. To enhance the accuracy of the map only the "A" events, or most accurate events were selected. Caltech indicates the accuracy of the "A" events to be approximately 1 km. The results of this search is a map that presents the seismic history around the area of the site with much greater detail, not permitted on the larger map. The reason for limiting the events to the last 25 years on the detail map is also to enhance the accuracy of the map. Events recorded prior the mid 1970's are generally considered to be less accurate due to advancements in technology. As noted on this map, Enclosure A-7, there are numerous small earthquakes occurring south of the site along the San Andreas and San Jacinto faults, while the immediate region around the site is relatively quite.

In summary, the historical seismicity of the site includes numerous small to medium magnitude earthquake events, the source of which are poorly understood. The historical seismicity data demonstrates that moderate to large seismic events could occur at or very near the site in the future and should be anticipated.

Secondary Seismic Hazards

Other secondary seismic hazards generally associated with severe ground shaking during an earthquake include liquefaction, seiches and tsunamis, earthquake induced flooding, landsliding and rockfalls, and seismic-induced settlement. These secondary seismic hazards are discussed in the following paragraphs:

Liquefaction. The potential for liquefaction generally occurs during strong ground shaking within fine grained loose sediments where the groundwater is usually less than 50 feet. Based on the expected geologic site characteristics (i.e., shallow granitic bedrock and the absence of shallow groundwater conditions), the possibility of liquefaction across the majority of the site is nil. These conditions may be met along the upper portion of the small valley. However, the grading recommendations will most likely mitigate these conditions.

Seiches/Tsunamis.
The potential for the site to be effected by a seiche or Tsunamis (earthquake generated wave) is considered nil due to absence of any large bodies of water near the site.

Flooding (Water Storage Facility Failure). Since no water storage facility (water tank) is located above the site, the potential for flooding, caused by water storage facility failure, is considered nil.

Seismically-Induced Landsliding. The small landslides noted at the site may be subject to downslope movement or re-activation during a large scale seismic event. These features were previously discussed under the Mass Movement portion of this report.

Rockfalls. No large, exposed, loose or unrooted boulders appear to be present, adjacent to, or along the northeasterly cut slopes that would affect the integrity of the site.

Seismically-Induced Settlement. Settlement generally occurs within areas of loose, unsaturated, granular soils with relatively low density during intense ground shaking. Since the majority of the site underlain by granitic bedrock at very shallow depths the potential for secondary seismic settlement along these areas is considered nil. There may be a potential for seismically induced settlement to occur within the loose fills and thickened colluvial materials within the valley area. However, the grading requirements are anticipated to mitigate this potential.

SOILS AND SEISMIC DESIGN CRITERIA (Uniform Building Code)

Design requirements for structures can be found within Chapter 16 of the 1997 Uniform Building Code (UBC) based on building type, use and/or occupancy. The classification of use and occupancy of all proposed structures at the site, and thus design requirements, shall be the responsibility of the structural engineer and the building official. For structures at the site to be designed in accordance with the provisions of Chapter 16, the subject site specific soils and seismic criteria are provided in the following sections.

UBC Divisions IV; Earthquake Design Criteria Selection

Procedure and limitations for the earthquake design of applicable structures can be obtained from Division IV of Chapter 16 of the 1997 Uniform Building Code (UBC). However, it should be noted that the building code requires the minimum design to allow a structure to remain standing after a seismic event, in order to allow for safe evacuation. As stated in section 1626.1,"The purpose of the earthquake provisions herein is primarily to safeguard against major structural failures and loss of life, not to limit damage or maintain function." Therefore a structure built to UBC code may still sustain damage which might ultimately result in the demolishing of the structure.

The UBC Division IV requires that all sites, unless exempted, be assigned a soil profile type and a regional seismic zone. The criteria for the selection of a site soil profile can be found in the 1997 UBC Division V, discussed in later sections.

UBC Division V; Soil Profile

As noted in our excavations and seismic refraction survey at the site and previously published literature, the subject site is underlain by a soft bedrock which becomes harder with depth. This would typically correlate to a soil profile type of S_C. However our measured seismic velocities were on the order of 1000 to 2000 feet per second in the upper 30 feet for direct arrival waves, which are on the order of almost twice as fast as the shear waves. This would require a soil profile of S_D. Therefore, the soil profile type of S_D should be used for the subject site unless additional data justifies the use of a different soil type.

Seismic Zone As shown on Figure 16-2 within Chapter 16 of the 1997 UBC, the site is located in Seismic Zone 4. Section 1629.4.2 of the 1997 UBC directs that all sites in Seismic Zone 4, unless exempted, shall have a near source factor determined.

Near Source Factor. Near source factors are determined based on the distance to the nearest type A, or B seismic source (earthquake fault). Once these are determined near source values can be obtained, dependent on structure type, from tables 16-S or 16-T within the 1997 UBC. Seismic source types are classified as A, B, or C, based on description, maximum anticipated magnitude, and slip rate. Type C sources are not considered as they do not increase the standard near source factor value of 1.0. The following table lists the seismic source type requirements.

Table 16-U Seismic Source Type[1]

Seismic Source Type	Seismic Source Description	Seismic Source Definitions	
		Maximum Magnitude	Slip Rate (mm/yr)
A	Faults capable of large magnitude events, and have a high rate of seismic activity.	M≥7.0	SR ≥5
B	All faults other than A and C.	M≥7.0 M<7.0 M≥6.5	SR <5 SR >5 SR <2
C	Faults that are not capable of producing large magnitude earthquakes and that have a relatively low rate of seismic activity.	M<6.5	SR ≤2

[1]Source 1997 UBC

Specific parameters for earthquake faults within the State of California can be obtained form the State of California Division of Mines and Geology Open File Report 96-08 (DMG 1996). As noted in our Faulting section of this report, the nearest known active fault to the site is the San Andreas fault located approximately 7 kilometers (4 miles) to the southwest. According to the DMG Open File Report 96-08, the San Andreas fault has a slip rate of 24 mm/year, ±6, and an estimated magnitude event of 7.3 or greater.

UBC Earthquake Design Summary

As determined in the previous sections, the following earthquake design criteria have been formulated for the site. However, these values should be reviewed and the final design should be performed by a qualified structural engineer familiar with the region.

SEISMIC AND SOIL CRITERIA Seismic Zone 4, = Factor 0.40, Soil Type = S_D						
Nearest Source Type	Fault Name	Distance (km)*	N_a	N_v	C_a ($0.44N_a$)	C_v ($0.64N_v$)
A	San Andreas	7	1.1	1.4	0.48	0.90
B	North Frontal	10	1.0	1.0	0.44	0.64

$T_s = C_v/2.4C_a = 0.78$
$T_o = 0.2T_s = 0.16$
* Distance rounded to the nearest 0.5 km

CONCLUSIONS

This investigation provides a broad overview of the geotechnical and geologic factors which are expected to influence future site planning and development. On the basis of our field investigation and testing program, it is the opinion of LOR Geotechnical Group, Inc. that the proposed development is feasible from a geotechnical standpoint, provided the recommendations presented in this report are incorporated into design and implemented during grading and construction.

No precise grading plans were available at the time of this report. Once such plans are prepared a final grading plan review should be conducted by the geotechnical consultant prior to grading. The review of the precise grading plan may alter some of the recommendations presented in this report.

The subsurface conditions encountered in our exploratory trenches are indicative of the locations explored. The subsurface conditions presented here are not to be construed as being present the same everywhere on the site. If conditions are encountered during the construction of the project which differ significantly from those presented in this report than this firm should be notified immediately so we may assess the impact to the recommendations provided in this report.

Geologic Conditions

The granitic bedrock underlying the subject site is covered by a relatively thick layer of organic topsoils averaging on the order of 1 to 3 feet. These materials are not suitable for the support of structures, structural fills, or re-use as fill materials. Underlying these materials are various depths of older alluvium, colluvium, and some fills. The underlying bedrock appears rippable using standard earth moving equipment to a depth of at least 30 feet.

There is some evidence to suggest that the site, along with the entire town of Rimforest, may be situated upon a very large, deep seated, ancient landslide complex. The small valley of the site may be the back scarp of such a feature. However, based on the lack of recent geomorphic features and the presence of unfractured older alluvium overlying the bedrock in this valley, it does not seem likely that this slide has moved during Holocene time. This would suggest that the climatic and geomorphic conditions that existed during the time when this feature may have been active has altered. However, the southern edge of the site does appear to have some instabilities which may indicate localized reactivation. Due to the unstable nature of the materials along the far southeastern portion of the site, structures along the southeastern rim of the site should not be planned unless additional studies are conducted to determine the stability of the area and/or determine mitigation measures. This area includes the region just above Highway 18 along the southeastern portion of the site, as shown on Plate 1.

Strong ground motions as a result of earthquake activity should be anticipated for any structures at the site. The effects of ground shaking anticipated at the subject site should be mitigated by the seismic design requirements and procedures outlined in Chapter 16 of the Uniform Building Code. However, it should be noted that the current building code requires the minimum design to allow a structure to remain standing after a seismic event, in order to allow for safe evacuation. A structure built to code may still sustain damage which might ultimately result in the demolishing of the structure.

Foundation Support

Based upon our field investigation and test data, it is our opinion that the thin layers of topsoil, colluvium, and fill found across the site, will not, in the present condition, provide uniform and/or adequate support for the future structures.

Therefore, to provide adequate support for the proposed structures, we recommend that these materials be completely removed from all structural fill areas and a compacted fill mat be constructed beneath footings and slabs. This compacted fill mat will provide a dense, high strength, soil layer to uniformly distribute the anticipated foundation loads.

If the final grade of a particular building site includes deep cuts into the existing materials so as the entire building would be placed on competent bedrock materials, then the construction of a fill mat may not be required.

In addition, care should be exercised along any removals in the southwest portion of the site where the capped water well is believed to exist. If this structure is encountered it may need to be recapped.

Conventional spread foundations, either individual spread footings and/or continuous wall footings, will provide adequate support for the anticipated downward and lateral loads when utilized in conjunction with the recommended fill mat.

RECOMMENDATIONS

General Site Grading

It is imperative that no clearing and/or grading operations be performed without the presence of a certified geotechnical engineer and certified engineering geologist. An on-site, pre-job meeting with the owner, contractor, geotechnical engineer, and engineering geologist, should occur prior to all grading related operations.

Grading of the subject site should be performed in accordance with the following recommendations as well as applicable portions of Appendix Chapter 33 of the Uniform Building Code, and/or applicable local ordinances.

All excavations at the site should be inspected by the project engineering geologist and soils engineer to ensure that the encountered conditions are in conformance with anticipated conditions stated within this report. The soils engineer should provide sufficient observation during grading to ensure that the work is being conducted in accordance with the conditions of the report.

Initial Site Preparation

All previously existing topsoil, loose colluvial, and fills should be removed from all structural areas or areas to receive engineered compacted fill, cleaned of significant deleterious materials, and may be reused as compacted fill. However, the highly organic portions of the topsoil materials (1 to 2 feet) are not considered to be suitable for re-use as engineered fill. The data developed during this investigation indicates that moderate removals on the order of 3 to16 feet will be required within the anticipated structural areas. The actual depths of removal should be verified during the grading operation by observation and in-place density testing.

Preparation of Fill Areas

Cavities created by removal of subsurface obstructions should be thoroughly cleaned of loose soil, organic matter and other deleterious materials, shaped to provide access for construction equipment, and backfilled as recommended in the following Engineered Compacted Fill section of this report.

Prior to placing fill, the surfaces of all areas to receive fill should be scarified to a depth of at least 6 inches. The scarified soil should be brought to near optimum moisture content and recompacted to a relative compaction of at least 90 percent (ASTM D 1557).

Preparation of Foundation Areas

All footings should rest entirely upon competent bedrock materials or entirely upon at least 18 inches of properly compacted fill material. In areas where the required thickness is not accomplished by site rough grading, the footing areas should be further subexcavated to a depth of at least 18 inches below the proposed footing base grade, with the subexcavation extending at least 5-feet beyond the footing lines. The

bottom of this excavation should then be scarified to a depth of at least 6 inches, brought to near optimum moisture content, and recompacted to at least 90 percent relative compaction (ASTM D 1557) prior to refilling the excavation to grade as properly compacted fill.

Engineered Compacted Fill

Except for the topsoil materials, the on-site soils should provide adequate quality fill material, provided they are free from trash, organic matter, and/or other deleterious materials. Unless approved by the geotechnical engineer, rock or similar irreducible material with a maximum dimension greater than 6-inches should not be buried or placed in fills.

Import fill is not anticipated at this time. However if any fills are imported they should be inorganic, non-expansive granular soils free from rocks or lumps greater than 6-inches in maximum dimension. Sources for import fill should be approved by the geotechnical engineer prior to their use.

Fill should be spread in maximum 8 inch loose lifts, each lift brought to near optimum moisture content, and compacted to a relative compaction of at least 90 percent in accordance with ASTM D 1557.

Based upon the relative compaction of the near surface soils determined during this investigation and the relative compaction anticipated for compacted fill soil, we estimate that the compaction shrinkage will vary widely, perhaps ranging from approximately 10 to 20 percent. Deeper excavations encountering competent bedrock should be expected to yield lesser shrinkage values on the order of 0 to 5 percent. In addition, we would anticipate subsidence of approximately 0.10 feet. These values are for estimating purposes only, and are exclusive of losses due to stripping or the removal of subsurface obstructions. These values may vary due to differing conditions within the project boundaries and the limitations of this investigation. Shrinkage should be monitored during construction. If percentages vary, provisions should be made to revise final grades or adjust quantities of borrow or export.

Short Term Excavations

Following the California Occupational and Safety Health Act (CAL-OSHA) requirements, excavations deeper than 5 feet should be sloped or shored. All excavations and shoring should conform to CAL-OSHA requirements.

Short term excavation greater than 5-feet deep shall conform to Title 8 of the California Code of Regulations, Construction Safety Orders, Section 1504 and 1539 through 1547. Based on our exploratory trenches it appears that Type C soils are the predominant type of soil on the project and all short term excavation should be based on this type of soil. Deviation from the standard short term slopes are permitted using option 4, designed by a Registered Professional Engineer (Section 1541.1).

Slope Construction

Preliminary data indicates that cut and fill slopes should be constructed no steeper than one and one-half horizontal to one vertical (1½h:1v) and two horizontal to one vertical (2h:1v), respectively. The construction of all cut slopes should be monitored by a certified engineering geologist. When filling over natural ground steeper than five horizontal to one vertical (5h:1v), keying and benching techniques should be utilized. Typical keying and benching techniques are shown on the attached Geotechnical Sketch, Enclosure E-1, within Appendix E.

Fill slopes should be overfilled during construction and then cut back to expose fully compacted soil. A suitable alternative would be to compact the slopes during construction, then roll the final slopes to provide dense, erosion-resistant surfaces.

Slope Protection

Since the native materials are susceptible to erosion by running water, measures should be provided to prevent surface water from flowing over slope faces. Slopes at the project should be planted with a deep rooted ground cover as soon as possible after completion. The use of succulent ground covers such as iceplant or sedum is not recommended. If watering is necessary to sustain plant growth on slopes, then the watering operation should be monitored to assure proper operation of the irrigation system and to prevent over watering.

Soil Expansiveness

The upper materials encountered during this investigation were granular and considered to have a very low expansion potential. Therefore, specialized construction procedures to specifically resist expansive soil activity are not anticipated at this time. In order to verify this, additional evaluation of on-site and imported soils for their expansion potential should be conducted following completion of the grading operation.

Preliminary Foundation Design

If the site is prepared as recommended, the future structures may be safely founded on conventional spread foundations, either individual spread footings and/or continuous wall footings, bearing either on a minimum of 18 inches of engineered compacted fill or bearing entirely on competent bedrock materials. All foundations should have a minimum width of 12 inches and should be established a minimum of 12 inches below lowest adjacent grade.

For the minimum width and depth, footings may be designed using a maximum soil bearing pressure of 1500 pounds per square foot (psf) for dead plus live loads. This bearing pressure may be increased by 250 psf for each one foot increase in footing depth and by 150 psf for each one foot increase in footing width to a maximum soil bearing pressure of 3000 (psf) for dead plus live loads.

The recommended pressures apply for the total of dead plus frequently applied live loads, and incorporate a factor of safety of at least 3.0. The allowable bearing pressures may be increased by one-third for temporary wind or seismic loading.

Resistance to lateral loads will be provided by passive earth pressure and base friction. For footings bearing against compacted fill, passive earth pressure may be considered to be developed at a rate of 300 pounds per square foot per foot of depth. Base friction may be computed at 0.30 times the normal load. Base friction and passive earth pressure may be combined without reduction. These values are for dead load plus live load and may be increased by 1/3 for wind or seismic.

Foundations should be set back from slopes in accordance with Figure 18-I-1 of the Uniform Building Code.

The above designed should be verified during specific foundation investigation studies conducted after specific development plans have been made.

Settlement

Total settlement of individual foundations will vary depending on the width of the foundation and the actual load supported. Maximum settlement of shallow foundations designed and constructed in accordance with the preceding recommendations are estimated to be on the order of 0.5 inch. Differential settlements between adjacent footings should be about one-half of the total settlement. Settlement of all foundations is expected to occur rapidly, primarily as a result of elastic compression of supporting soils as the loads are applied, and should be essentially completed shortly after initial application of the loads.

Slabs-On-Grade

To provide adequate support, concrete slabs-on-grade should bear on a minimum of 12 inches of compacted soil. The final pad surfaces should be rolled to provide smooth, dense surfaces upon which to place the concrete.

Slabs to receive moisture-sensitive coverings should be provided with a moisture vapor barrier. This barrier may consist of an impermeable membrane. Two inches of sand over the membrane will reduce punctures and aid in obtaining a satisfactory concrete cure. The sand should be moistened just prior to placing of concrete.

The slabs should be protected from rapid and excessive moisture loss which could result in slab curling. Careful attention should be given to slab curing procedures, as the site area is subject to large temperature extremes, humidity, and strong winds.

Wall Pressures

The design of footings for walls below grade (basement or retaining structures) should be performed in accordance with the recommendations described earlier under Preparation of Foundation Areas and Preliminary Foundation Design. For design of retaining wall footings, the resultant of the applied loads should act in the middle one-

third of the footing, and the maximum edge pressure should not exceed the basic allowable value without increase.

For design of retaining walls unrestrained against movement at the top, we recommend an equivalent fluid pressure of 55 pounds per cubic foot (pcf) be used. This assumes level backfill consisting of recompacted native soils placed against the structures and within the back cut slope extending upward from the base of the stem at 35 degrees from the vertical or flatter.

To avoid over stressing or excessive tilting during placement of backfill behind walls, heavy compaction equipment should not be allowed within the zone delineated by a 45 degree line extending from the base of the wall to the fill surface. The backfill directly behind the walls should be compacted using light equipment such as hand operated vibrating plates and rollers. No material larger than three inches in diameter should be placed in direct contact with the wall.

Wall pressures should be verified prior to construction, when the actual backfill materials and conditions have been determined. Recommended pressures are applicable only to level, properly drained backfill (with no additional surcharge loadings). If inclined backfills are proposed, this firm should be contacted to develop appropriate active earth pressure parameters. Toe bearing pressure for non-structural walls on soils, not prepared as described earlier under Preparation of Foundation Areas, should not exceed Uniform Building Code values, (UBC Table 18-1-A).

Sulfate Protection

The results of the sulfate tests conducted on selected subgrade soils expected to be encountered at foundation levels are presented in Appendix C.

Based on the test results the sulfate exposures of on site soils is considered negligible by the UBC. Therefore, no specific recommendations are given for concrete elements to be in contact with the on-site soils.

Well Abandonment

If the water well located in the far southwestern portion of the site is in an area of planned grading, it should be abandoned in accordance with County of San Bernardino, Department of Environmental Health Guidelines.

Construction Monitoring

Post investigative services will be an important and necessary continuation of this investigation. Project plans and specifications should be reviewed prior to construction to confirm that the intent of the recommendations presented herein have been incorporated into the design. Additional expansion testing and testing for on-site (street) pavement design should be performed after the site is rough graded.

During construction, sufficient and timely geotechnical observation and testing should be provided to correlate the findings of this investigation with the actual subsurface conditions exposed during construction. Items requiring observation and testing include, but are not necessarily limited to, the following:

1. Final grading plan review.

2. Site preparation-stripping and removals.

3. Excavations, including approval of the bottom of excavation prior to backfilling.

4. Construction of any cut slopes.

5. Scarifying and recompacting prior to fill placement.

6. Subgrade preparation for pavements and slabs-on-grade.

7. Placement of engineered compacted fill and backfill, including approval of fill materials and the performance of sufficient density tests to evaluate the degree of compaction being achieved.

LIMITATIONS

This report contains geotechnical conclusions and recommendations developed solely for use by ICON and their design consultants, for the purposes described earlier. It may not contain sufficient information for other uses or the purposes of other parties. The contents should not be extrapolated to other areas or used for other facilities without consulting LOR Geotechnical Group, Inc.

The recommendations are based on interpretations of the subsurface conditions concluded from information gained from subsurface explorations, and a surficial site reconnaissance. The interpretations may differ from actual subsurface conditions, which can vary horizontally and vertically across the site. Due to possible subsurface variations, all aspects of field construction addressed in this report should be observed and tested by the project geotechnical consultant.

If parties other than LOR Geotechnical Group, Inc. provide construction monitoring services, they must be notified that they will be required to assume responsibility for the geotechnical phase of the project being completed by concurring with the recommendations provided in this report or by providing alternative recommendations.

The report was prepared using generally accepted geotechnical engineering practices under the direction of a state licensed geotechnical engineer. No warranty, expressed or implied, is made as to conclusions and professional advice included in this report. Any persons using this report for bidding or construction purposes should perform such independent investigations as deemed necessary to satisfy themselves as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project.

CLOSURE

It has been a pleasure to assist you with this project. We look forward to being of further assistance to you as construction begins. Should conditions be encountered during construction that appear to be different than indicated by this report, please contact this office immediately in order that we might evaluate their effect.

Should you have any questions regarding this report, please contact us.

Respectfully submitted,
LOR Geotechnical Group, Inc.

Jeffrey J. Johnston, CEG 1893
Engineering Geologist

John P. Leuer, GE 2030
President

JJJ:JPL:sjp

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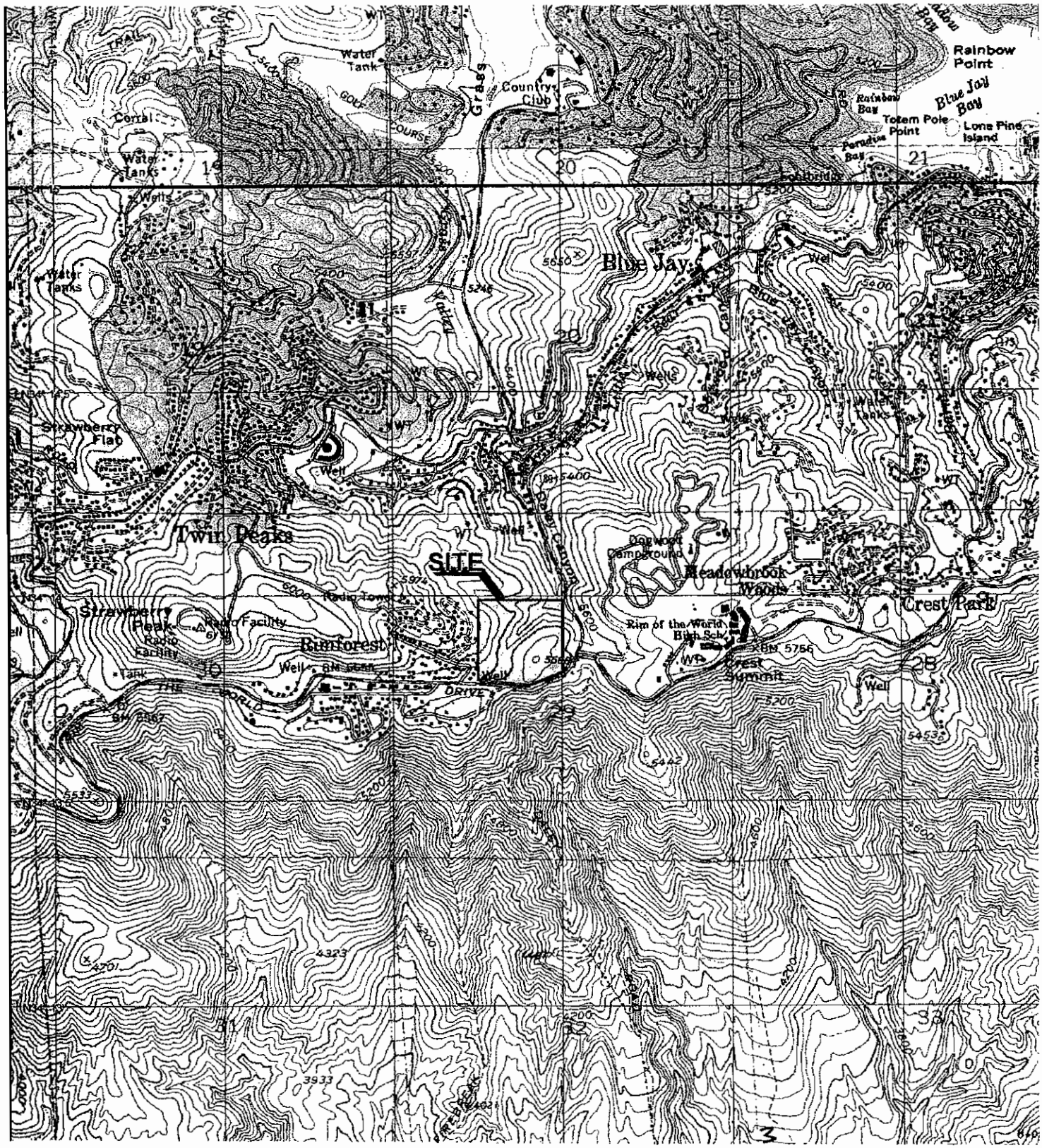
AERIAL PHOTOGRAPHS REVIEWED
SOURCE: SAN BERNARDINO COUNTY FLOOD CONTROL

Date	Flight #	Photo	Scale
January 15, 1953	AXL-28K	176, 177	1"=1667'
August 22, 1968	AXL-11JJ	95, 96	1"=1667'
May 15, 1979	C-285	19	1"=1000'
June 9, 1992	C-492	35, 36, 37	1"=1000'
May 9, 1995	C-524	1-5, 1-6	1"=360'
June 13, 1995	C-527	1-5, 1-6, 2-5, 2-6	1"=300'
June 15, 2001	C-541	254	1"=2000'

APPENDIX A

INDEX MAP
PROFILES A-A′ AND B-B′
HISTORICAL SEISMICITY MAPS

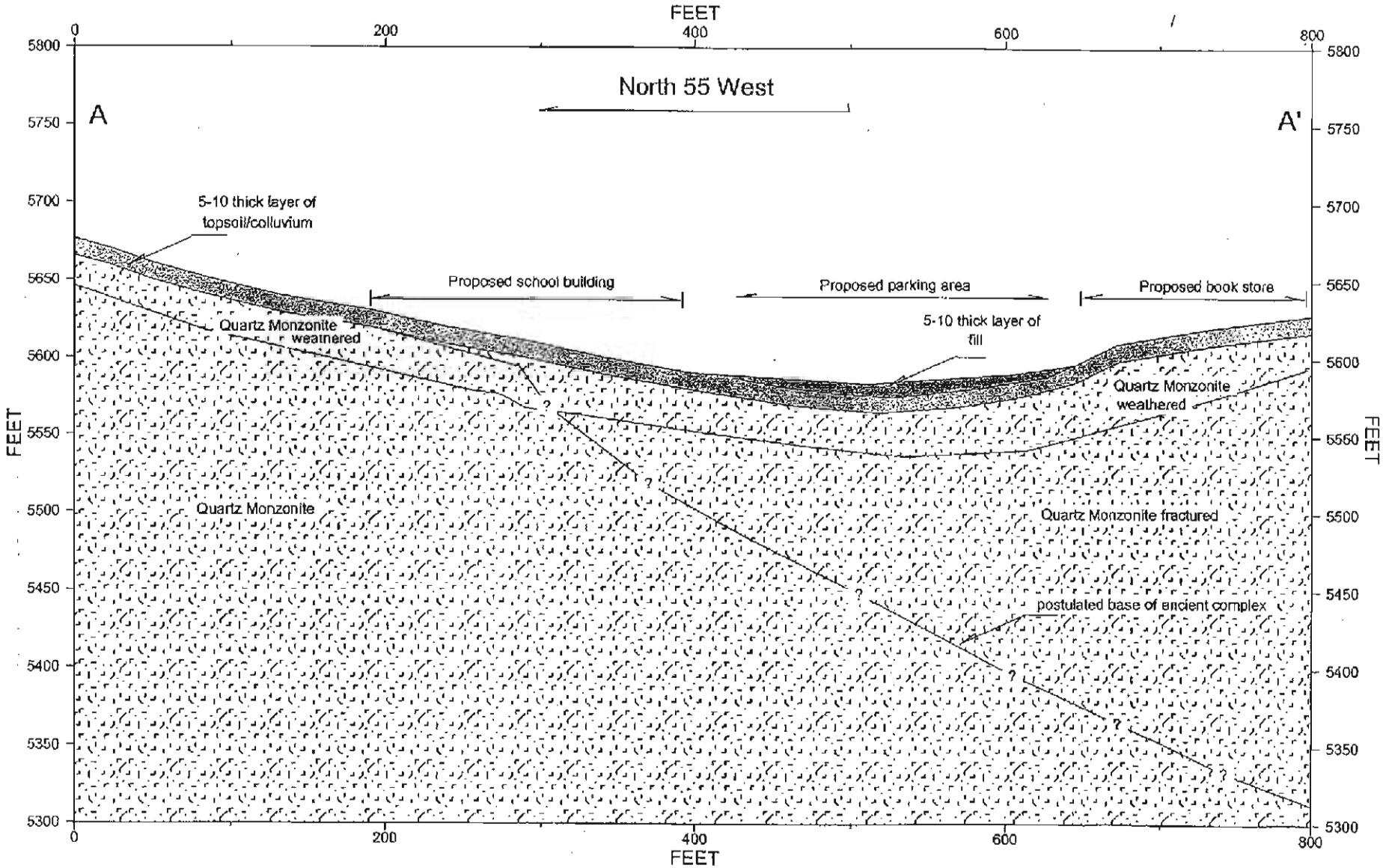


SITE INDEX MAP

PROJECT: CHURCH OF THE WOODS, RIMFOREST AREA, SAN BERN. COUNTY, CA	PROJECT NO.: 51497.1
CLIENT: ICON	ENCLOSURE: A-1
LOR Geotechnical Group, Inc.	DATE: NOVEMBER, 2001
	SCALE: 1"= 2,000'

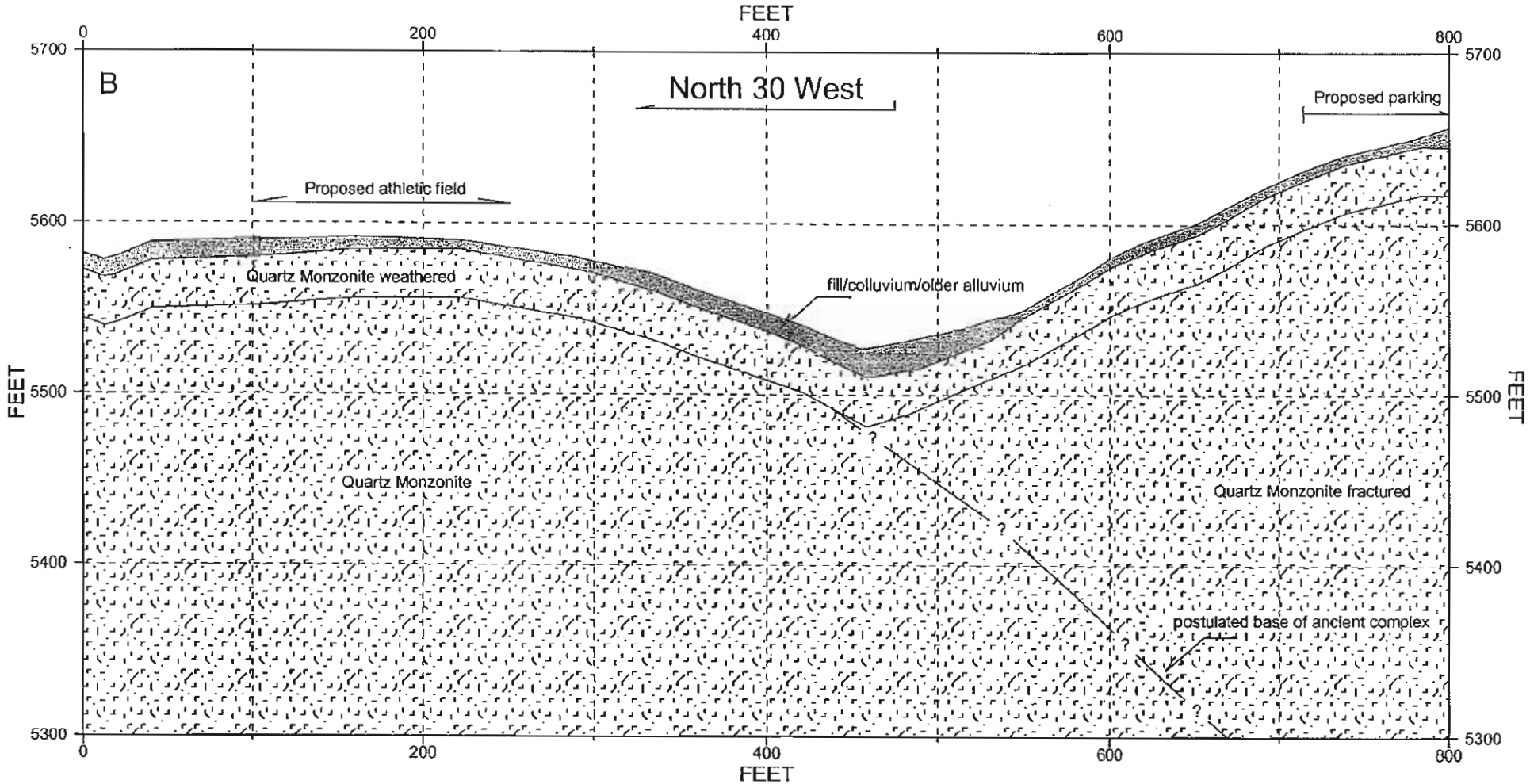
REGIONAL GEOLOGIC MAP

PROJECT:	DIBBLEE 1968	PROJECT NO.:	51497.1
CLIENT:	ICON	ENCLOSURE NO.:	A-2
LOR Geotechnical Group, Inc.		DATE:	NOVEMBER, 2001
		SCALE:	1:62,500



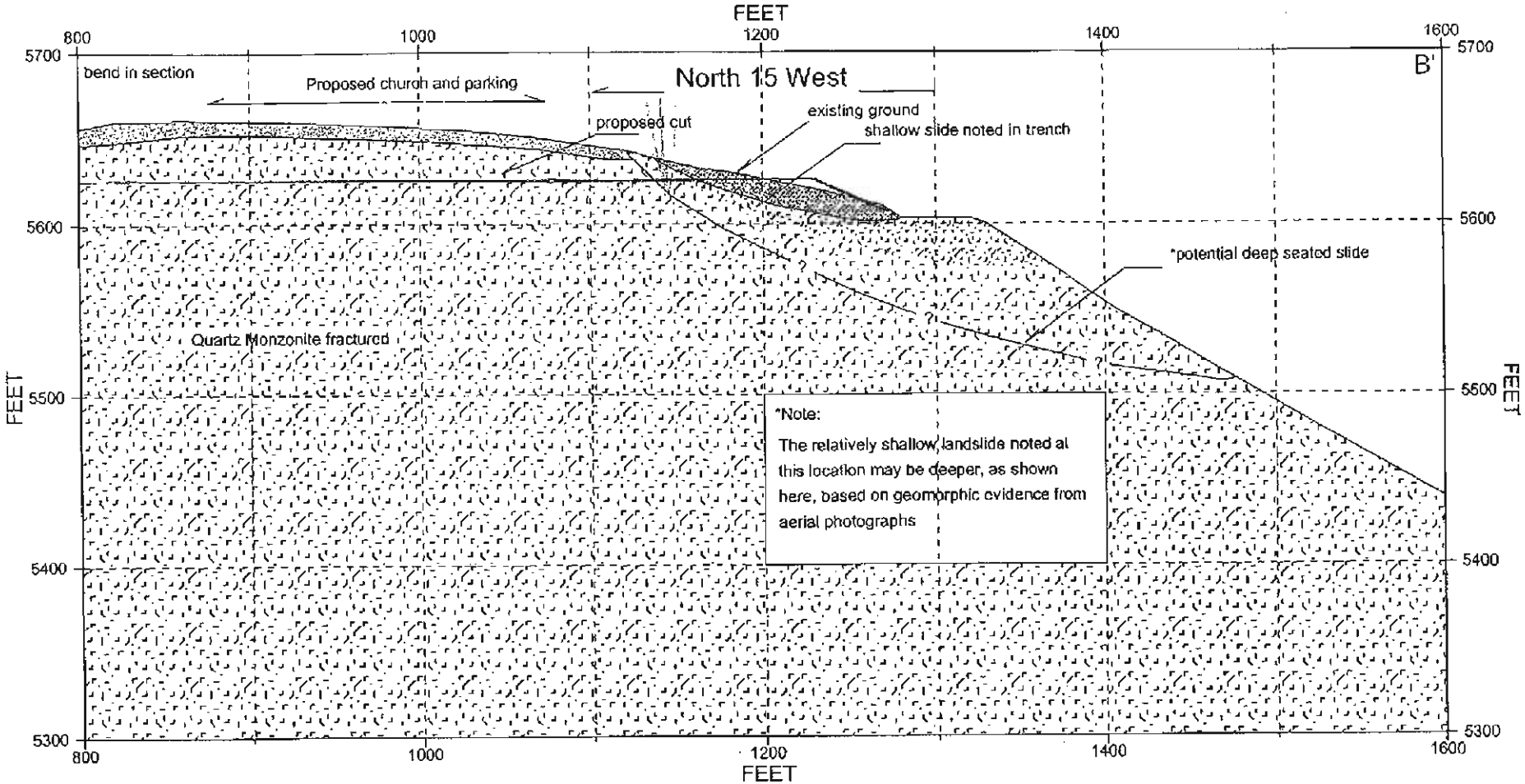
PROFILE A-A'

PROJECT: CHURCH OF THE WOODS, RIMFOREST AREA, SAN BERN. COUNTY, CA	PROJECT NO.: 51497.1
CLIENT: ICON	ENCLOSURE: A-3
LOR Geotechnical Group, Inc.	DATE: NOVEMBER, 2001
	SCALE: 1" = 80'



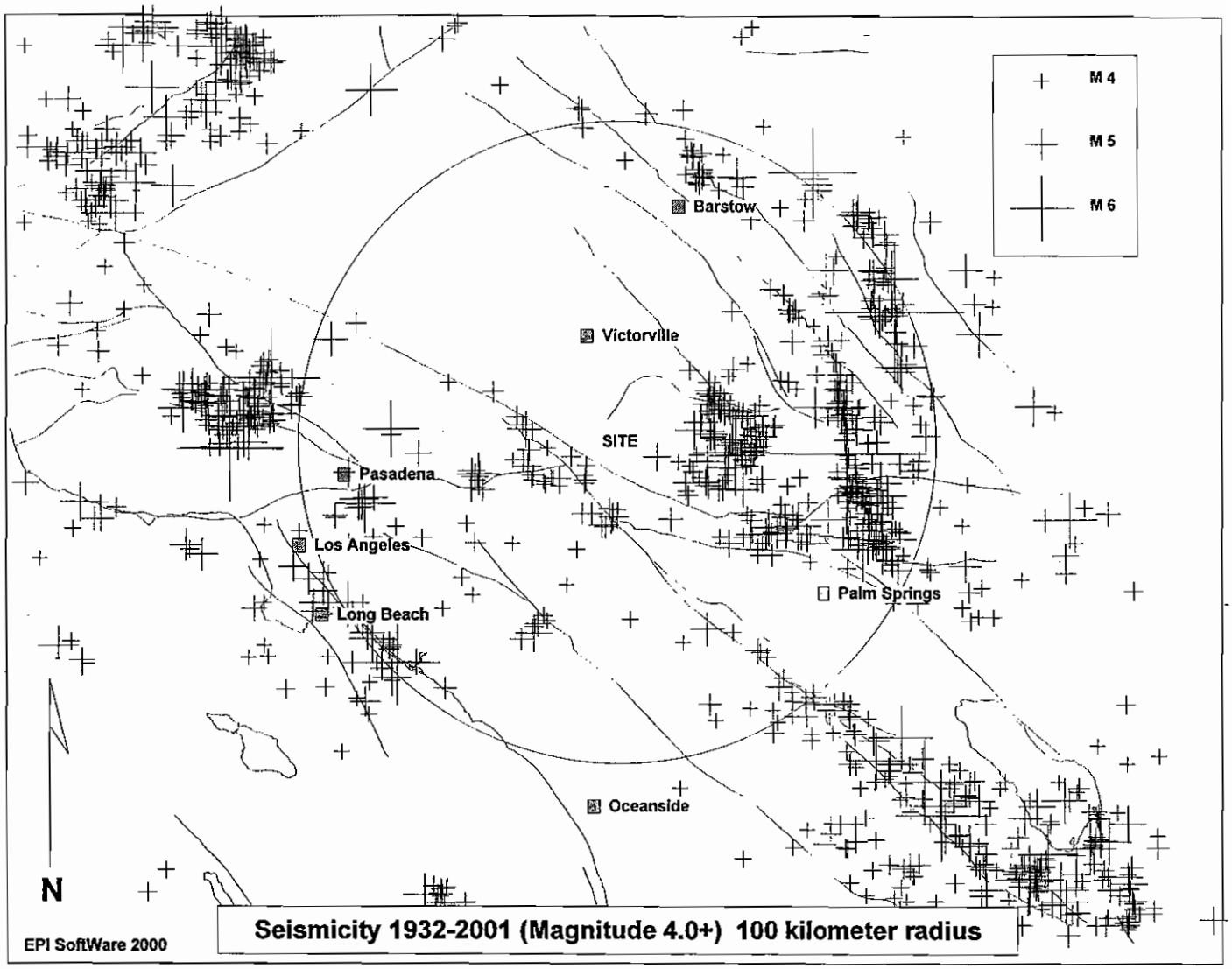
PROFILE B-bend

PROJECT: CHURCH OF THE WOODS, RIMFOREST AREA, SAN BERN. COUNTY, CA	PROJECT NO.: 51497.1
CLIENT: ICON	ENCLOSURE: A-4
LOR Geotechnical Group, Inc.	DATE: NOVEMBER, 2001
	SCALE: 1" = 80'



PROFILE B-B'

PROJECT: CHURCH OF THE WOODS, RIMFOREST AREA, SAN BERN. COUNTY, CA	PROJECT NO.: 51497.1
CLIENT: ICON	ENCLOSURE NO.: A-5
LOR Geotechnical Group, Inc.	DATE: NOVEMBER, 2001
	SCALE: 1" = 80'



SITE LOCATION: 34.23 LAT. -117.22 LONG.

MINIMUM LOCATION QUALITY: C

TOTAL # OF EVENTS ON PLOT: 1507

TOTAL # OF EVENTS WITHIN SEARCH RADIUS: 648

0 50 100
KILOMETERS

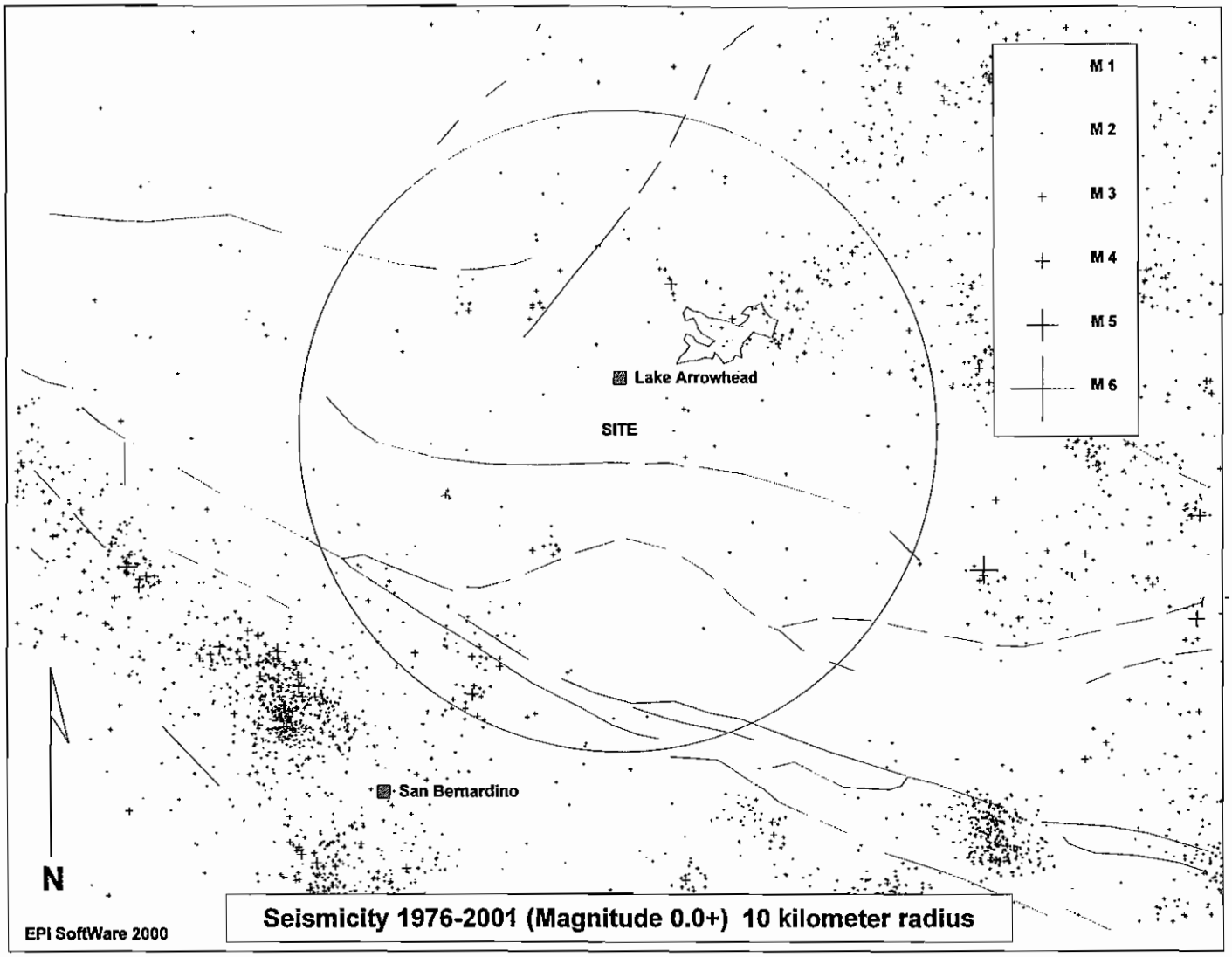
MAGNITUDE DISTRIBUTION OF SEARCH RADIUS EVENTS:

4.0- 4.9 : 589
5.0- 5.9 : 53
6.0- 6.9 : 4
7.0- 7.9 : 2
8.0- 8.9 : 0

CLOSEST EVENT: 4.8 ON WEDNESDAY, APRIL 06, 1994 LOCATED APPROX. 12 KILOMETERS SOUTHEAST OF THE SITE

LARGEST 5 EVENTS:

7.3 ON SUNDAY, JUNE 28, 1992 LOCATED APPROX. 72 KILOMETERS EAST OF THE SITE
7.1 ON SATURDAY, OCTOBER 16, 1999 LOCATED APPROX. 95 KILOMETERS NORTHEAST OF THE SITE
6.4 ON SUNDAY, JUNE 28, 1992 LOCATED APPROX. 36 KILOMETERS EAST OF THE SITE
6.4 ON SATURDAY, MARCH 11, 1933 LOCATED APPROX. 97 KILOMETERS SOUTHWEST OF THE SITE
6.1 ON THURSDAY, APRIL 23, 1992 LOCATED APPROX. 88 KILOMETERS EAST OF THE SITE



SITE LOCATION: 34.23 LAT. -117.22 LONG.

MINIMUM LOCATION QUALITY: C

TOTAL # OF EVENTS ON PLOT: 3109

TOTAL # OF EVENTS WITHIN SEARCH RADIUS: 286

0 5 10
KILOMETERS

MAGNITUDE DISTRIBUTION OF SEARCH RADIUS EVENTS:

0.0- .9 : 51
1.0- 1.9 : 160
2.0- 2.9 : 72
3.0- 3.9 : 3
4.0- 4.9 : 0
5.0- 5.9 : 0
6.0- 6.9 : 0
7.0- 7.9 : 0
8.0- 8.9 : 0

CLOSEST EVENT: 1.1 ON FRIDAY, JANUARY 12, 1996 LOCATED APPROX. 1.7 KILOMETERS EAST OF THE SITE

LARGEST 5 EVENTS:

3.6 ON SATURDAY, SEPTEMBER 12, 1981 LOCATED APPROX. 9 KILOMETERS SOUTHWEST OF THE SITE
3.5 ON MONDAY, AUGUST 17, 1998 LOCATED APPROX. 4 KILOMETERS NORTH OF THE SITE
3.0 ON FRIDAY, JUNE 24, 1983 LOCATED APPROX. 9 KILOMETERS SOUTHWEST OF THE SITE
2.9 ON WEDNESDAY, SEPTEMBER 16, 1981 LOCATED APPROX. 8 KILOMETERS SOUTHWEST OF THE SITE
2.8 ON THURSDAY, JUNE 01, 1989 LOCATED APPROX. 6 KILOMETERS NORTHWEST OF THE SITE

APPENDIX B

FIELD INVESTIGATION PROGRAM
TRENCH LOGS

CONSISTENCY OF SOILS

SANDS

SPT BLOWS	CONSISTENCY
0 - 4	Very loose
4 - 10	Loose
10 - 30	Medium dense
30 - 50	Dense
Over 50	Very dense

COHESIVE SOILS

SPT BLOWS	CONSISTENCY
0 - 2	Very soft
2 - 4	Soft
4 - 8	Medium
8 - 15	Stiff
15 - 30	Very stiff
30 - 60	Hard
Over 60	Very Hard

MAJOR DIVISIONS			LITHOLOGY	U.S. C.S.	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GARVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SAND, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF RICH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS AND MANURE WITH HIGH ORGANIC MATERIALS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS.

SAMPLING KEY

Symbol	Description
	- INDICATES CALIFORNIA SPLIT SPOON SOIL SAMPLE
	- INDICATES SAND CONE OR NUCLEAR DENSITY TEST
	- INDICATES BAG SAMPLE
	- INDICATES STANDARD PENETRATION TEST (SPT) SOIL SAMPLE

PARTICLE SIZE LIMITS

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" ¾" No. 4 No. 10 No. 40 200

(U.S. STANDARD SIEVE SIZE)

SAMPLING KEY

PROJECT: CHURCH OF THE WOODS, RIMFOREST AREA, SAN BERN. CNTY, CA	PROJECT NO.: 51497.1
CLIENT: ICON	ENCLOSURE NO.: B
LOR Geotechnical Group, Inc.	DATE: NOVEMBER, 2001
	SCALE: NO SCALE

LOG OF TRENCH T-1

DEPTH IN FEET		ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0							SM	TOPSOIL: SILTY SAND with very high percentage of organics, composed of approximately 40% wood, pine needles, and roots, 5% gravel, 5% coarse grained sand, 10% medium grained sand, 20% fine grained sand, 20% silty fines, very dark brown, (10YR 5/8), dry, very loose, porous.
		73	4.5	87.1			SM	@ 3 feet COLLUVIUM: SILTY SAND, approximately 5% coarse grained sand, 15% medium grained sand, 50% fine grained sand, 30% silty fines, yellowish brown, (10YR 5/8), dry, very loose, abundant roots to 4 inches.
5		79	4.0	93.5				@ 5 feet slightly denser.
								@ 7 feet WEATHERED BEDROCK: recovers as silty sand, crushes easily to silt size, slightly damp, white to tan.
								@ 8 feet slightly less weathered bedrock composed of Quartz Monzonite, medium grained with approximately 10% mafics, 15% quartz, and 75% weathered feldspars, soft, damp.
								@ 9 feet slightly firmer.
10								END OF TRENCH No fill No caving No groundwater Bedrock 7-10'
15								

PROJECT:	Rimforest Church	PROJECT NUMBER:	51497.1
CLIENT:	ICON		5630
		DATE EXCAVATED:	September 25, 2001
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	JCB 3CX
		BUCKET W.: 18"	ENCLOSURE: B-1

LOG OF TRENCH T-2

DEPTH IN FEET		ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0							SM	TOPSOIL: SILTY SAND with high percentage of organics, composed of approximately 25% wood, pine needles, roots, etc., 5% coarse grained sand, 15% medium grained sand, 30% fine grained sand, 25% silty fines, brown, (10YR 4/3), dry, very loose.
								@ 3 FEET WEATHERED BEDROCK: recovers as silty sand which crushes easily, tan, damp, loose.
5								@ 5 feet BEDROCK: less weathered, Quartz Monzonite, composed of approximately 5% mafics, 70% feldspars, 25% quartz, moderately hard, fractured into small 3 to 4 inch blocks.
								END OF TRENCH No fill No caving No groundwater Bedrock 3-6'
10								
15								

PROJECT:	Rimforest Church	PROJECT NUMBER:	51497.1
CLIENT:	ICON		5606
LOR GEOTECHNICAL GROUP INC.		DATE EXCAVATED:	September 25, 2001
		EQUIPMENT:	JCB 3CX
		BUCKET W.: 18"	ENCLOSURE: B-2

LOG OF TRENCH T-3

DEPTH IN FEET			ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
			TEST DATA						
0								SM	TOPSOIL/COLLUVIUM: SILTY SAND, with high percentage of organics, approximately 30% wood, pine needles, and roots, 10% medium grained sand, 30% fine grained sand, 30% silty fines, very dark grayish brown, (10yr 3/2), dry, loose, very porous.
									@ 3 feet HIGHLY WEATHERED BEDROCK: brown to tan, slightly damp, soft, recovers as silty sand, of approximately 60% fine grained sand, 40% silty fines, several faint soil filled fractures with soil from overlying horizon, still soft and porous, may be landslide debris.
5									@ 8 feet slightly less weathered, Quartz Monzonite, several near vertical soil filled fractures noted up to 1/2 inch thick, still very porous.
10									@ 11 feet slight increase in number of soil fractures.
									@ 12 feet BEDROCK: less weathered, composed of fractured Quartz Monzonite, approximately 20% quartz, 80% feldspars, coarse grained to medium grained, fractured in 3 to 4 inch angular blocks which were hard.
15									END OF TRENCH No fill No caving No groundwater Bedrock 3-15'

PROJECT:	Rimforest Church	PROJECT NUMBER:	51497.1
CLIENT:	ICON		5630
		DATE EXCAVATED:	September 25, 2001
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	JCB 3CX
		BUCKET W.: 18"	ENCLOSURE: B-3

LOG OF TRENCH T-4

DEPTH IN FEET		ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0			3.0				SM	TOPSOIL: SILTY SAND, with high percentage of organics, composed of approximately 30% wood, leaves, pine needles, 10% coarse grained sand, 10% medium grained sand, 30% fine grained sand, 20% silty fines, very dark grayish brown, (10yr 3/2), dry, very loose.
		78	3.6	92.2			SM	@ 3 feet COLLUVIUM: SILTY SAND, approximately 10% coarse grained sand, 15% medium grained sand, 45% fine grained sand, 30% silty fines, brownish yellow, (10YR 6/6), damp, loose, some roots.
5		88	5.3	104.2				@ 5 feet slightly denser.
								@ 6 feet WEATHERED BEDROCK: Quartz Monzonite, composed of medium to coarse grained crystals of approximately 20% quartz, 80% feldspars, pink, massive, damp, moderately fractured, no over direction, moderately weathered, easily crushes with slight pressure to coarse sand.
10								@ 11 feet becomes hard, still fractnred, but recovers to 4 to 5 inch cobbles.
								END OF TRENCH No fill No caving No groundwater Bedrock 6-12'
15								

PROJECT:	Rimforest Church	PROJECT NUMBER:	51497.1
CLIENT:	ICON		5634
		DATE EXCAVATED:	September 25, 2001
		EQUIPMENT:	JCB 3CX
		BUCKET W.: 18"	ENCLOSURE: B-4

LOR GEOTECHNICAL GROUP INC.

LOG OF TRENCH T-5

DEPTH IN FEET		ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0							SM	TOPSOIL: SILTY SAND with very high percentage of loose decaying organics, approximately 40% leaves, pine needles, roots, etc., 5% coarse grained sand, 10% medium grained sand, 25% fine grained sand, 20% silty fines, very dark grayish brown, (10YR 3/2), dry, very loose.
								@ 2 feet HIGHLY WEATHERED BEDROCK: nearly totally decomposed, recovers as silty sand, approximately 5% coarse grained sand, 15% medium grained sand, 50% fine grained sand, 30% silty fines, tan, soft, damp.
5								
								@ 8 feet BEDROCK: slightly less weathered, composed of Quartz Monzonite, medium grained, approximately 15% quartz, 80% feldspars, 5% mafics, tan, soft, damp, digs easily. @ 9 feet becomes moderately hard, still fractures into 3 to 4 inch angular to subangular clasts or blocks.
10								END OF TRENCH No fill No caving No groundwater Bedrock 2-12'
15								

PROJECT:	Rimforest Church	PROJECT NUMBER:	51497.1
CLIENT:	ICON		5650
		DATE EXCAVATED:	September 25, 2001
		EQUIPMENT:	JCB 3CX
		BUCKET W.: 18"	ENCLOSURE: B-5

LOR GEOTECHNICAL GROUP INC.

LOG OF TRENCH T-6

DEPTH IN FEET		ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0			4.1				SM	FILL: Loose runoff from road with organic debris, approximately 30% pine needles and roots, 10% coarse grained sand, 10% medium grained sand, 35% fine grained sand, 15% silty fines, very loose, dry, very dark grayish brown, (10YR 3/2), some trash.
								@ 2 feet thin lenses of coarse to medium sand and silty sand, some "lava" rock in lenses, caving.
		64	1.2	76.4				
								@ 4 feet bag noted.
5		74	1.1	88.4				@ 5 feet duct tape noted.
							SM	@ 7 feet TOPSOIL: SILTY SAND, approximately 5% coarse grained sand, 15% medium grained sand, 50% fine grained sand, 30% silty fines, dark grayish brown (10YR 4/2), dry, loose.
								@ 9 feet slightly denser, slightly damp, some small boulders up to 12 inches diameter.
10							SM	@ 10 feet COLLUVIUM: SILTY SAND, approximately 5% Quartz Monzonite cobbles, 10% gravel, 10% coarse grained sand, 15% medium grained sand, 35% fine grained sand, 25% silty fines, yellowish brown, (5YR 4/6), damp.
15								@ 15 feet WEATHERED BEDROCK: Highly decomposed, recovers as a silty sand, damp, greenish yellowish tan.

END OF TRENCH

Fill 0-7'
Caving 0-7'
No groundwater
Bedrock 15-15.5'

PROJECT:	Rimforest Church	PROJECT NUMBER:	51497.1
CLIENT:	ICON		5590
		DATE EXCAVATED:	September 25, 2001
		EQUIPMENT:	JCB 3CX
		BUCKET W.: 18"	ENCLOSURE: B-6

LOR GEOTECHNICAL GROUP INC.

LOG OF TRENCH T-7

DEPTH IN FEET	TEST DATA: ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0						SM	FILL: SILTY SAND, approximately 5% coarse grained sand, 10% medium grained sand, 55% fine grained sand, 30% silty fines, dark brown, (7.5YR 3/2), dry, loose, some trash, moderate amount of organics.
						SM	@ 4 feet COLLUVIUM: SILTY SAND, approximately 5% coarse grained sand, 15% medium grained sand, 40% fine grained sand, 40% silty fines, gray, dry, loose, porous.
5							@ 6 feet slightly denser, less porosity, color changes to yellow, (10YR 7/6).
							@ 7 feet large percentage of cobbles and small boulders.
10						SM	@ 10 feet OLDER ALLUVIUM: SILTY SAND, approximately 5% gravel, 10% coarse grained sand of quartz, 30% medium grained sand, 25% fine grained sand, 30% silty fines, some as secondary fillings of silts in pores, olive yellow (2.5YR 6/8) with reddish brown mottled stringers which may be tiny argillic filed fractures.
							@ 11 feet paleosoil silty sand with some clay, olive gray, (5YR 4/2), damp.
							@ 11.4 feet similar to above.
							@ 14 feet BEDROCK: Highly weathered, composed of medinm grained Quartz Monzonite, approximately 30% mafics, 15% quartz, 55% feldspars, soft, damp.
15							END OF TRENCH
							Fill 0-4' No caving No groundwater Bedrock 14-15'

PROJECT:	Rimforest Church	PROJECT NUMBER:	51497.1
CLIENT:	ICON		5580
LOR GEOTECHNICAL GROUP INC.		DATE EXCAVATED:	September 25, 2001
		EQUIPMENT:	JCB 3CX
		BUCKET W.: 18"	ENCLOSURE: B-7

LOG OF TRENCH T-8

DEPTH IN FEET	TEST DATA: ESTIMATED COMPACTION (%)	MOISTURE CONTENT (%)	DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S	DESCRIPTION
0						SM	TOPSOIL: SILTY SAND, with very high percentage or organics, approximately 50% pine needles, roots, etc., 30% fine grained sand, 20% silty fines, dark brown, (10YR 3/3), dry, very loose.
						SM	Colluvium: Silty Sand, composed of about 5% coarse grained sand, 15% medium grained sand, 50% fine grained sand, 30% silty fines, brown, dry, loose.
5							
10							@ 10 feet BEDROCK: Weathered Quartz Monzonite with approximately 5% mafic minerals, 75% feldspars, 20% quartz, medium grained, bard, slightly fractured, some veins of "graphic granite" that are composed of intergrowths of quartz and feldspar.
							END OF TRENCH No fill No caving No groundwater Bedrock 10-12'
15							

PROJECT:	Rimforest Church	PROJECT NUMBER:	51497.1
CLIENT:	ICON		5610
		DATE EXCAVATED:	September 25, 2001
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	JCB 3CX
		BUCKET W.: 18"	ENCLOSURE: B-8

APPENDIX C

LABORATORY TESTING PROGRAM
TEST RESULTS

APPENDIX C
LABORATORY TESTING

General

Selected soil samples obtained from the trenches were tested in our laboratory to evaluate the physical properties of the soils affecting foundation design and construction procedures. The laboratory testing program performed in conjunction with our investigation included moisture content, dry density, laboratory compaction, wash 200, and soluble sulfate tests. Descriptions of the laboratory tests are presented in the following paragraphs.

Moisture-Density Tests

The moisture content and dry density information provides an indirect measure of soil consistency for each stratum, and can also provide a correlation between soils on this site. The dry unit weight and field moisture content were determined for selected soil samples, and the results are shown on the trench logs, Enclosures B-1 through B-8, for convenient correlation with the soil profile.

Laboratory Compaction

Selected soil samples were tested in the laboratory to determine compaction characteristics using the ASTM D 1557-91 compaction test method. The results are presented in the following table:

LABORATORY COMPACTION				
Trench Number	Sample Depth (feet)	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture Content (percent)
T-1	3	(SM-SP) SILTY SAND	118.0	12.0
T-7	5	(SM) SILTY SAND, fill	129.0	9.5

Soluble Sulfate Content Tests

The soluble sulfate content of selected subgrade soils were evaluated. The concentration of soluble sulfates in the soils was determined by measuring the optical density of a barium sulfate precipitate. The precipitate results from a reaction of barium chloride with water extractions from the soil samples. The measured optical density is correlated with readings on precipitates of known sulfate concentrations. The test results are presented on the following table:

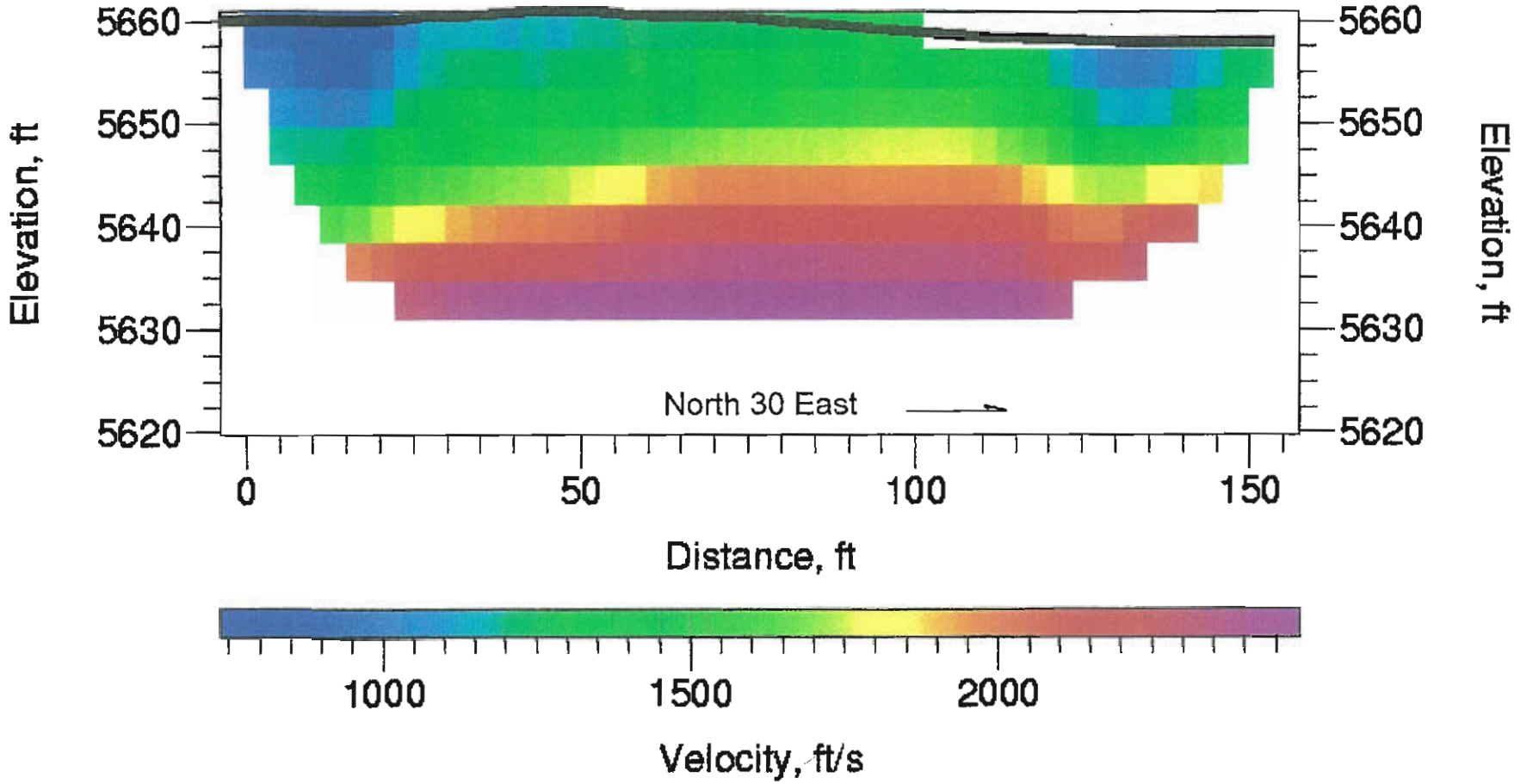
SOLUBLE SULFATE CONTENT TESTS			
Trench Number	**Sample Depth (feet)**	**Soil Description**	**Sulfate Content (ppm)**
T-1	SURFACE	(SM) SILTY SAND	< 50
T-4	SURFACE	(SM) SILTY SAND	<50
T-7	SURFACE	(SM) SILTY SAND	<50

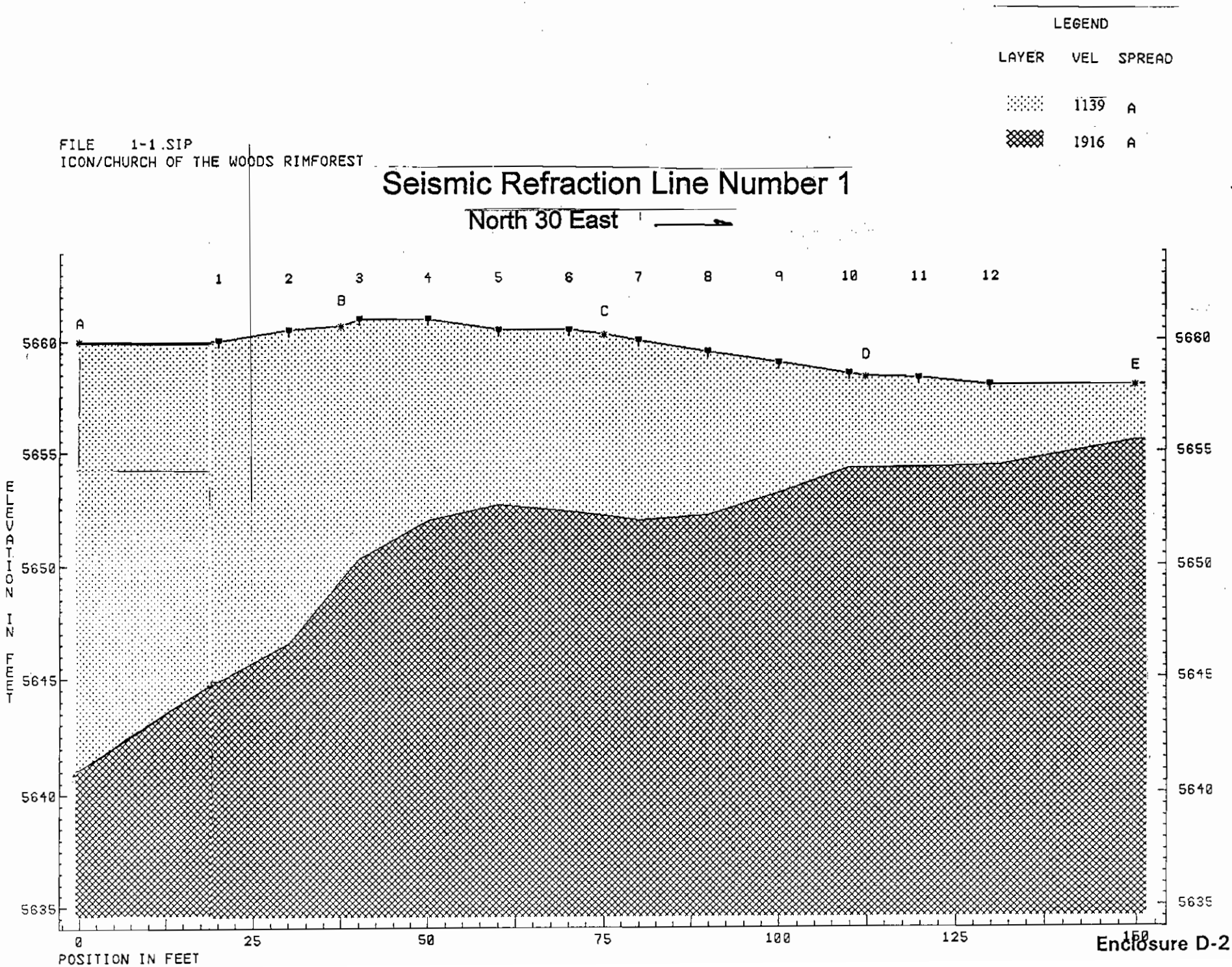
APPENDIX D

SEISMIC REFRACTION SURVEY RESULTS

Seismic Refraction Line Number 1

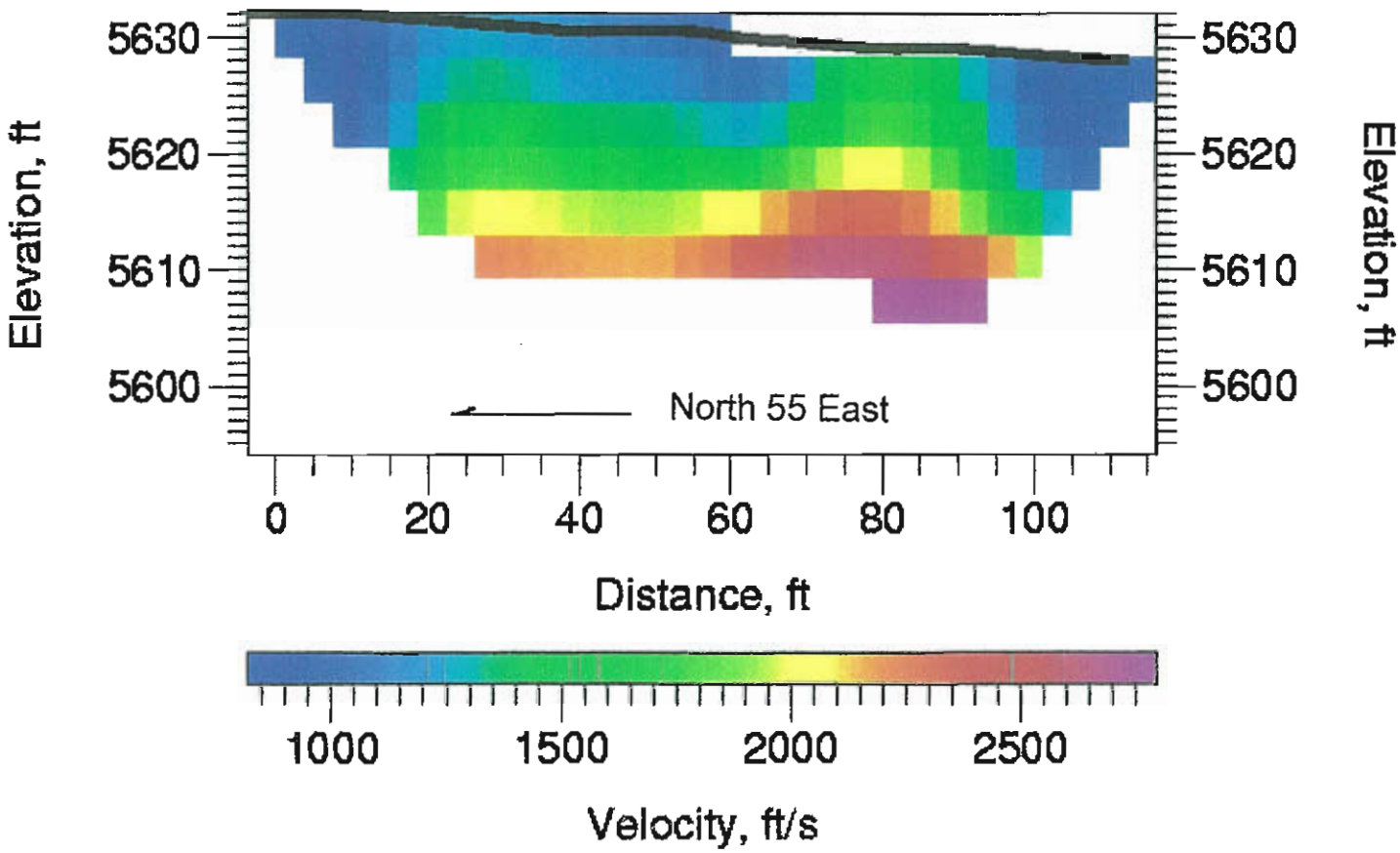
Velocity Gradient Model





Enclosure D-2

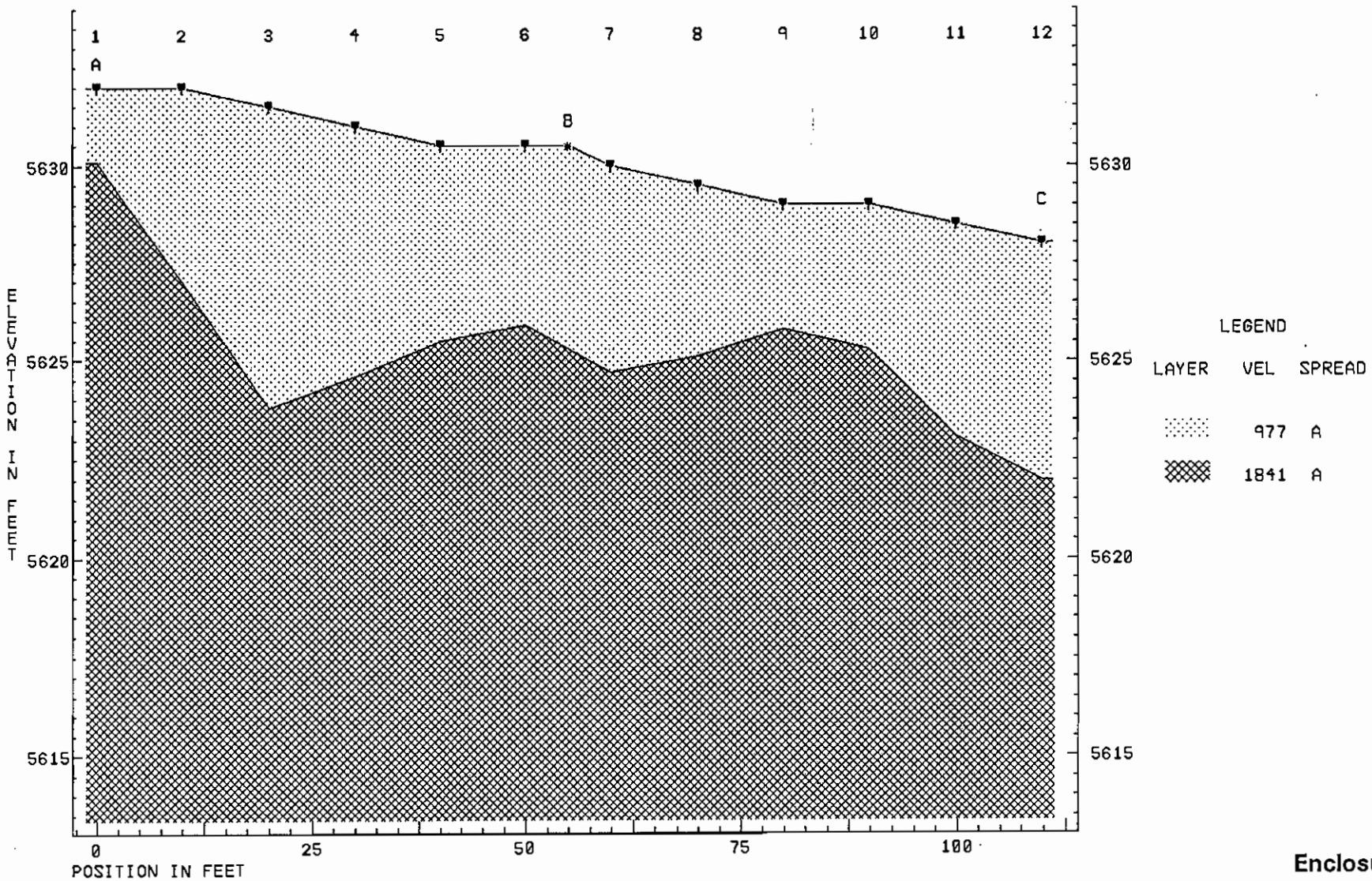
Seismic Refraction Line Number 2
Velocity Gradient Model



FILE 2-1.SIP
ICON/CHURCH OF THE WOODS RIMFOREST

Seismic Refraction Line Number 2

North 55 East

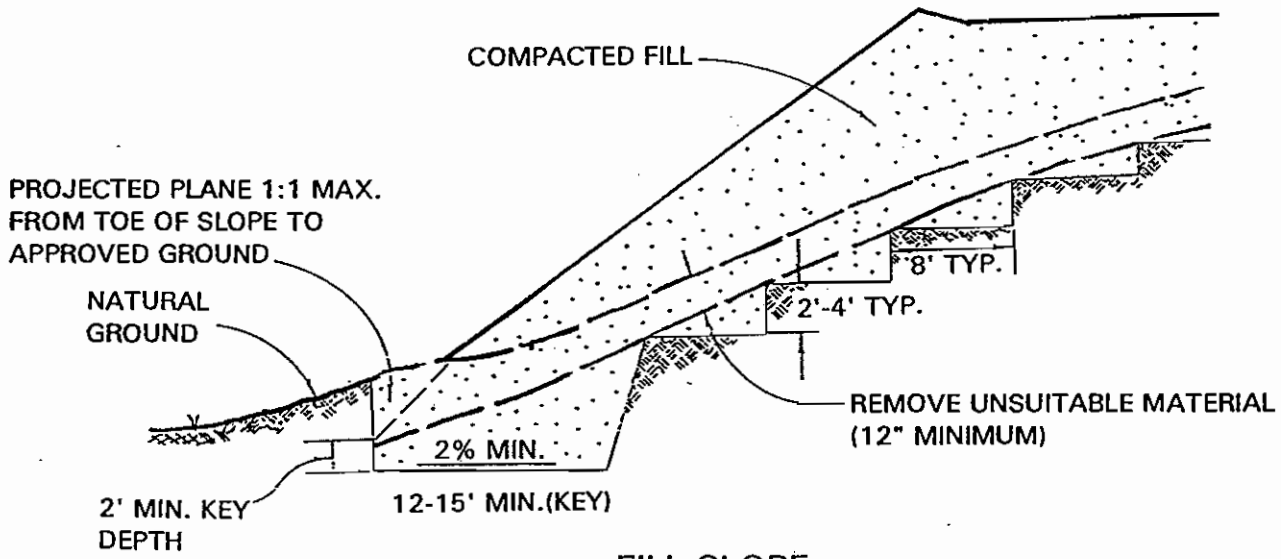


Enclosure D-4

APPENDIX E

GEOTECHNICAL SKETCH

TYPICAL KEYING AND BENCHING DETAIL



FILL SLOPE

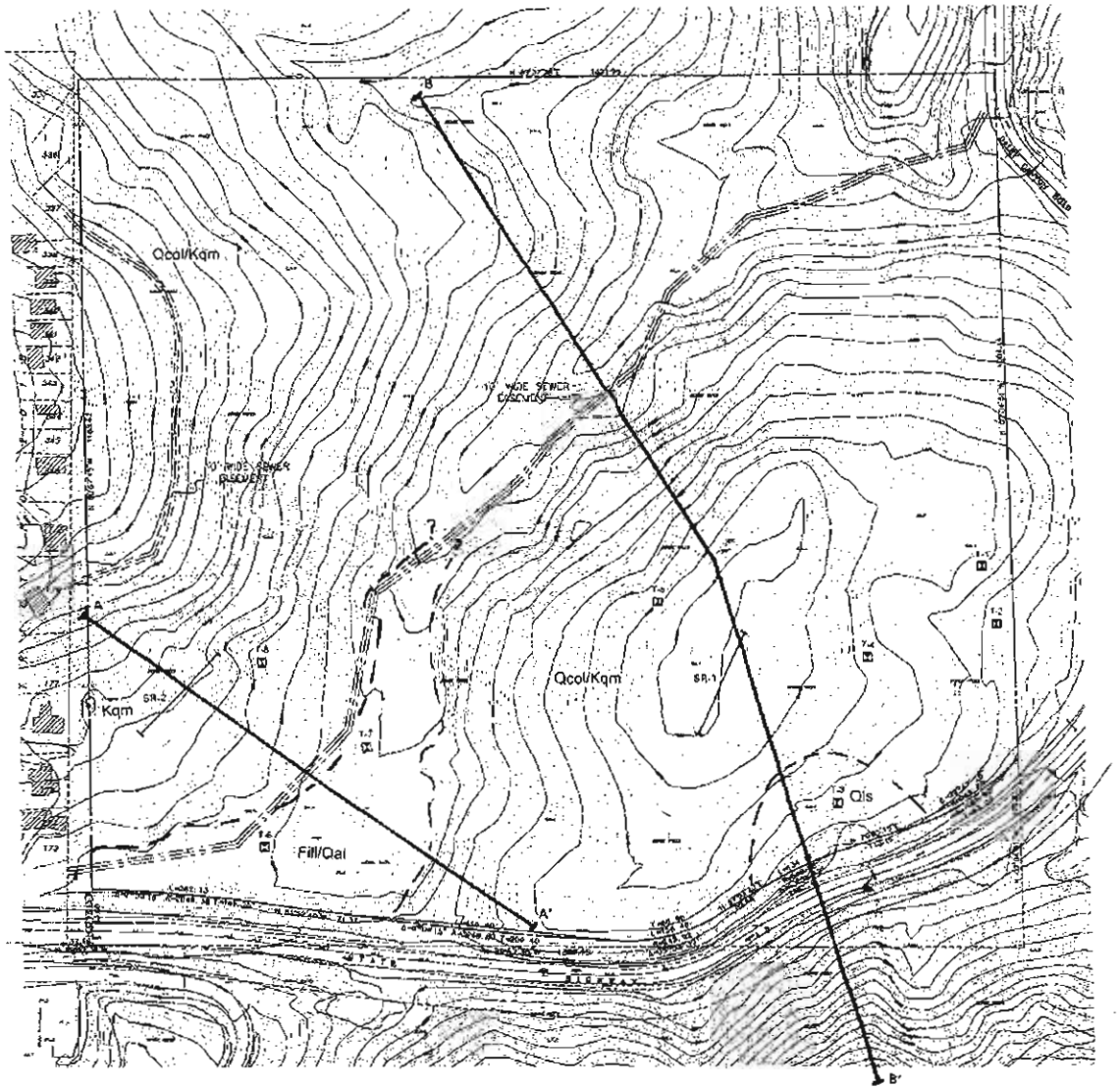
NOTES: 1) DIMENSIONS SHOWN SUBJECT TO FIELD CHANGE BASED ON ENGINEER'S JUDGEMENT

2) BENCHING REQUIRED WHEN FILLING OVER NATURAL GROUND STEEPER THAN 5H:1V

GEOTECHNICAL SKETCH

PROJECT: CHURCH OF THE WOODS, RIMFOREST AREA, SAN BERN. COUNTY, CA	PROJECT NO.: 51497.1
CLIENT: ICON	ENCLOSURE NO.: E-1
LOR Geotechnical Group, Inc.	DATE: NOVEMBER, 2001
	SCALE: AS SHOWN

Original map on file with the County of San Bernardino, Land Use Services Department



Geologic Units Explanation

Fill	artificial fills
Qal	valley fill and other alluvium
Qcol	topsoil, colluvium, and slope wash
Qls	recent slide materials
Kqm	quartz monzonite

PLATE 1

Legend

[illegible] - INDICATES SAMPLE MATCH TRENCH LOCATIONS

[illegible] - INDICATES SOIL UNITS

A——A' - INDICATES CROSS SECTIONS

PROJECT NO. [illegible] DATE: November 2001

SHEET [illegible]

PROJECT: Proposed 28 Lot Tract Property, [illegible], CA

LOR Geotechnical Group, Inc.

VICINITY MAP

N.T.S.

AUGUST 20, 2001

W.J. McKEEVER, INC.

CIVIL ENGINEERING

747 SOUTH MAIN STREET, SUITE A

STOCKTON, CALIFORNIA 95201

TEL (209) 948-9406

FAX (209) 941-0940

Appendix E

Draft Evacuation Plan

Timothy E. Paysen, Ph.D.

Draft Evacuation Plan

March 2010

Evacuation Plan

Church of the Woods Site

Prepared by

Timothy E. Paysen, PhD

Environmental Consultant

March 15, 2010

Revised, March 25, 2010

I. Plan Basis

The Church of the Woods Project site is located in the San Bernardino Mountains--within San Bernardino County, and surrounded by San Bernardino National Forest Lands. The Project is proposed to be developed on an approximately 37 acre parcel of land, located in the community of Rim Forest within the San Bernardino National Forest just north of Highway 18 (Rim of the World Highway) between Bear Springs Road and Daley Canyon Road (See Figure EVAC-1).

Figure EVAC-1. The COTW site is located near the crest of a portion of the San Bernardino Mountains. It is adjacent to State Highway 18 at its entrance, and abuts Daley Canyon road on its East. Note the three canyon mouths at its front.

The Church of the Woods (COTW) project involves a proposal to create five parcels. As shown on Tentative Parcel Map No. 16155, development would occur on portions of Parcels 1, 2, and 3. Parcels 4 and 5 would be retained as open space. As described in more detail elsewhere, the project would include an assembly building/youth center, an auditorium and children's ministry as a second phase addition to the assembly/youth center building, a maintenance building/caretaker unit, a 1,200 seat worship center, a chapel retreat building, various recreational

fields and facilities, and parking. The church structures would be located on Parcel 2 and most of the recreational facilities would be within Parcels 1 and 3. The project would be built in three distinct phases over a minimum four-year period.

General evacuation plans are already in place at the County level (County of San Bernardino 2007 General Plan, March 2007--see Appendix attachment in this document), and promulgated by a consortium of emergency organizations (Mountain Area Safety Task Force--MAST). Both have general evacuation route maps (see Appendix). Neither are detailed enough to apply to a specific locale within the area. An evacuation plan for a locale such as the Church of the Woods site, is therefore necessary.

The Church of the Woods site is situated in a noteworthy location that requires explicit attention to certain natural disasters, and requires particular attention to timing and preplanning. Technically, the site is subject to usual natural disasters--fire (natural or human-caused--the distinction is irrelevant for this plan), flood, and earthquake--but its primary threat comes from fire. Other disasters can occur and result in the need for evacuation--hazardous materials incidents being a salient potential problem.

Hazardous materials can range from local storage tanks containing compressed gases, such as oxygen and natural gases for cooking and heating, to off-site storage or transport of chemicals or radioactive material. Release of hazardous materials can result in wind-borne fumes or contaminated air that range from noxious to deadly, or in spills of material that can range from environmental damaging to injury or death for humans. Generally, these kinds of incidents require evacuation to locations out of the range of the particular spill, or wind-borne plume. However,

one kind of hazardous material incident--that of a tanker, carrying flammable material, that is burning requires more drastic evacuation procedures. The fire can often be emerging from a filler hole, or a puncture in the tank. If the tank is not cooled down in sufficient time, it can become an uncontrolled projectile. Evacuation from such an incident should be immediate, and constitute a long distance from the site--on the order of miles. Direction of evacuation is difficult to discuss because direction of the projectile is unpredictable. Cover from flying missiles is an useful consideration.

Flood will pose little need for evacuation. The site itself lies within a small watershed basin (see figure EVAC-2), and drains immediately into a creek in Daley Canyon.

Earthquakes are always a threat, but wholesale evacuation would be an unlikely requirement. Local damage could require people to move off site, but little else should be in order. General evacuation after an earthquake could be problematic due to the potential for infrastructure damage and dislodged boulders along roadways.

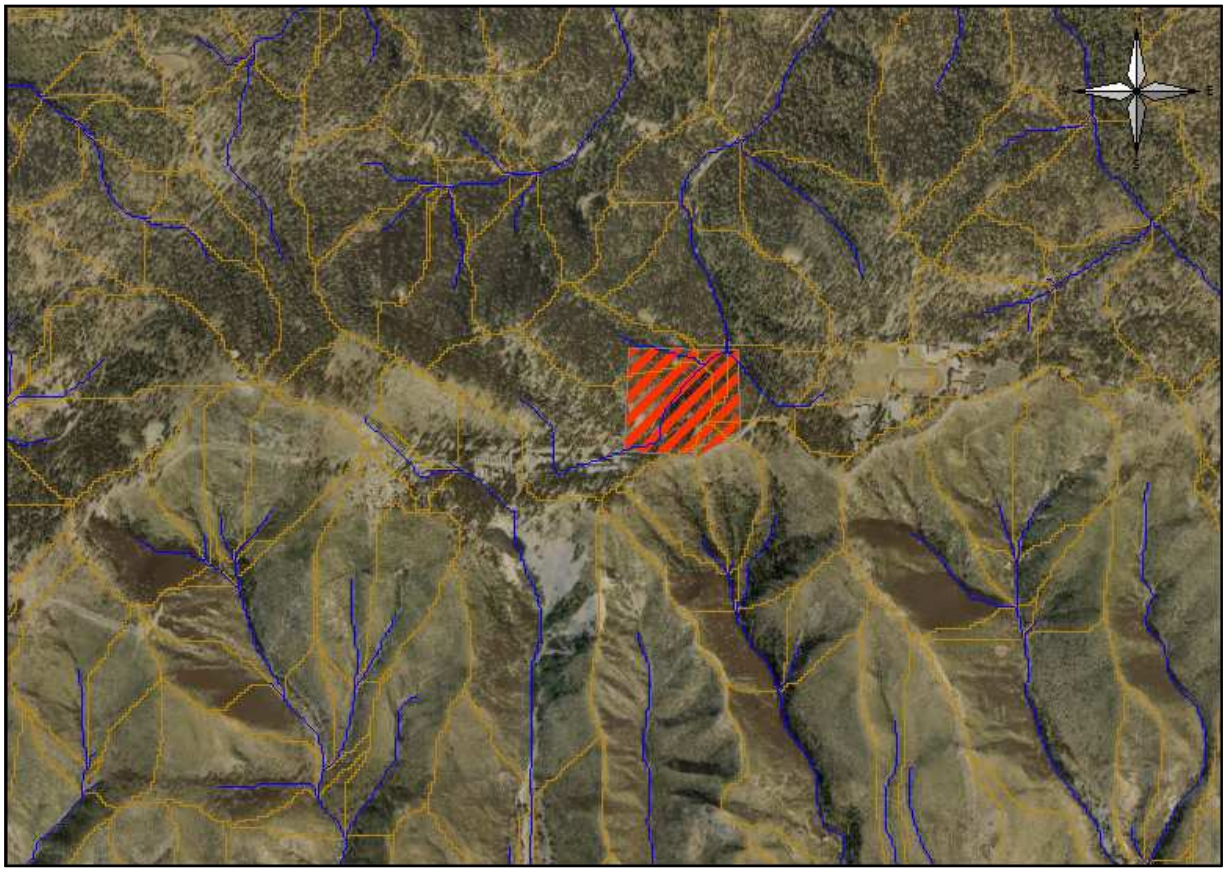


Figure EVAC-2. Watershed basins fall away to the North and to the South of the projected site. The site itself drains to the Northeast into Daley Canyon. (Watershed basins are delimited by orange lines, and major drainage lines are in blue.)

Fire poses a threat in fire-prone southern California, and is the primary disaster that requires careful evacuation planning for the COTW site. Particular attention must be paid to the nature of wildland fire in the vicinity--and to on-site fires, whether they ignite from firebrands arriving from off-site, or from a local on-site source, such as a structure. Fire's potential course, and the various characteristics that it can exhibit, must be understood in order to carry out effective evacuation efforts.

II. Fire Occurrence

Choice of evacuation routes will be pre-planned before any need arises.

Knowledge of historic fire occurrence patterns in the area, and some cognizance of things that affect burning patterns are necessary to facilitate rational decisions under an evacuation situation. This will be especially true if no emergency personnel are on site, and individuals will have to be self-directed for a time. To this end, figure EVAC-3 presents a history of large fire occurrence patterns, from the late 1800s to 2007. The location of the COTW site can be spotted with the naked eye in the '1800s through 1919' frame (little red dot). The site location can be viewed as being vulnerable to fire coming from many sides--but the same location characteristics also provide complementary avenues of escape.

The possible directions that wildland fires can take while burning are important to understand. The location of the fire is important to determine, and knowledge of the current wind direction is critical: know whether they are the prevailing southwesterly winds that generally occur during the day, or if they are Santa Ana winds that can range from the Northwest to the Northeast (see figure EVAC-4). These issues will affect the choice of evacuation routes.

Structural fires, by themselves, present a different kind of problem from that of wildland fires. The physics of structural fires is unique, and they are dealt with differently than wildland fires. If they can be restricted to a given structure, then evacuation can be a simple matter--people should evacuate the project area, and maintain a proper distance from the site out of the path of fire brands, and material from possible explosions within a burning structure. However, given unfortunate

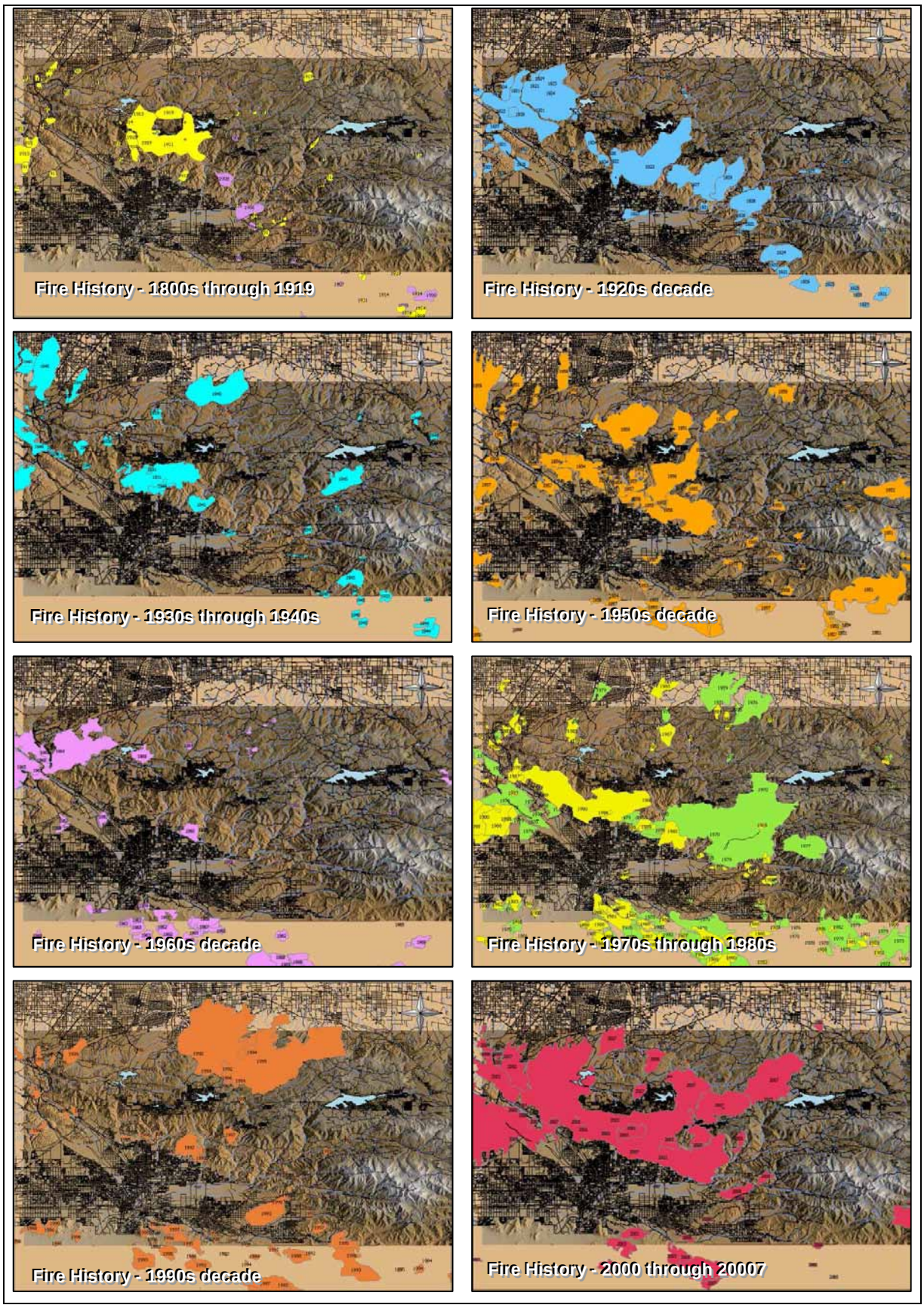


Figure EVAC-3. Fire history from the late 1800s through 2007. Fires predominate on the southern face of the mountain range, with some coming from the northern slope. These often reflect a combination of convection processes and prevailing winds. A number of fires originated from within the range--in some cases from the backbone of the ridge itself. The latter are often driven by Santa Ana winds, and spread counter to expected convection effects.

wind and fuel conditions, a structure fire can be the starting point for a wildland fire. Under such circumstances, wildland evacuation procedures will be necessary.

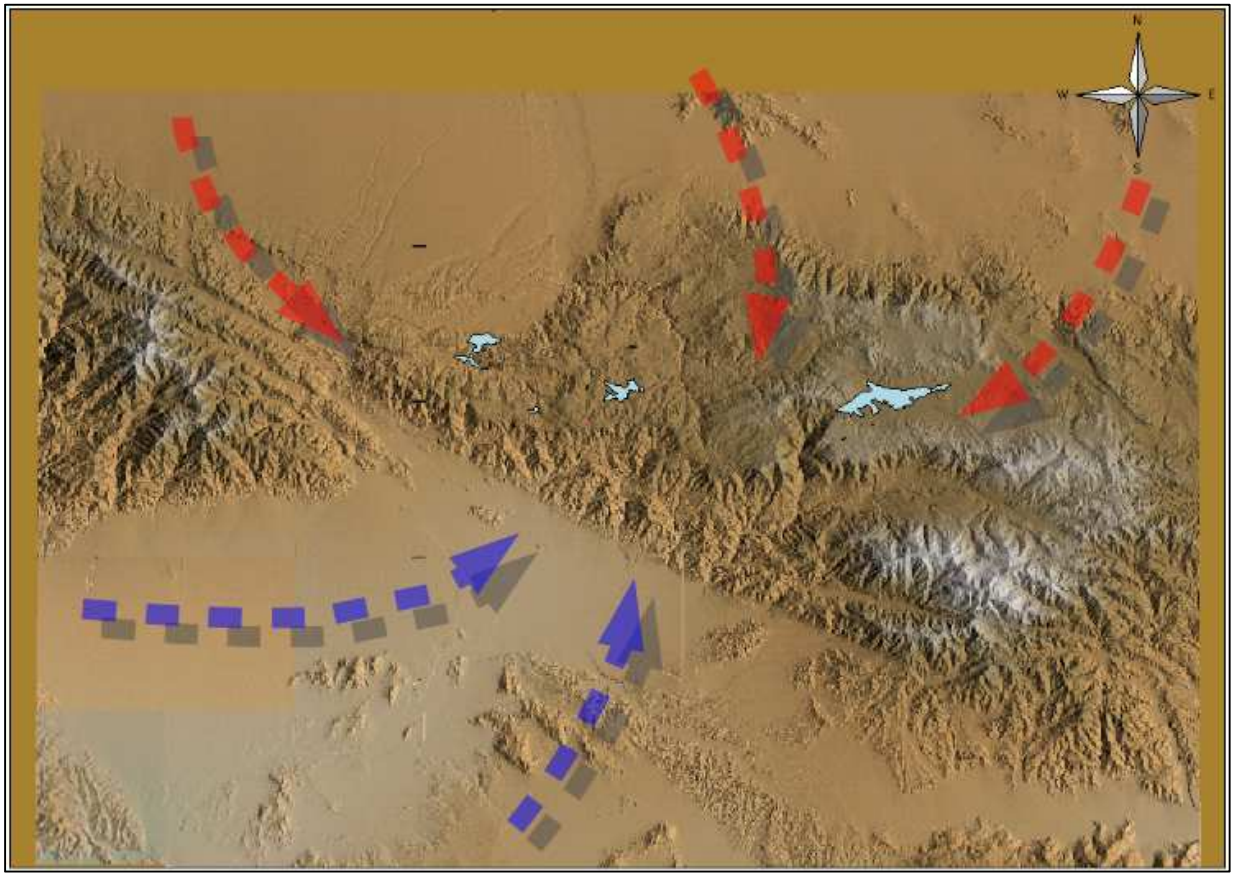


Figure EVAC-4. Wind patterns to be expected in the San Bernardino Mountain area. Specific winds blowing during an evacuation event must be ascertained.

Evacuation Routes and Their Use

Time of day and season will affect the direction of prevailing winds. The bulk of discussion in this plan will assume mid-day conditions during the late Spring to early Fall. Daytime and seasonal considerations will be discussed toward the end of the plan.

Evacuation routes presented in this plan are those that give the most functional and accessible means for exit from the COTW site. Circumstances dictate which routes best serve at the moment. Personal knowledge, and advise from emergency

personnel on site, have to combine to determine the most advisable exit route. This plan does not provide guarantees, but, rather, a basis for making a rational decision.

Figure EVAC-5 presents major routes that are suitable for evacuation use. The routes are complementary to those suggested in the San Bernardino General Plan, and in the MAST evacuation brochure. General strategies should involve choices

Figure EVAC-5. Major roads suitable for evacuation are indicated--with highway markers. Roads most suitable for evacuation to the South from the COTW site are highways 18, and (if appropriate) 330. Evacuation to the North is most expeditious by way of Highway 138, and if time and circumstances permit, Highway 189 to the Lake Arrowhead area. The latter should only be chosen if serious time constraints are not present (or, if there is no other choice); moving from Lake Arrowhead to points further North or Northwest can be slow.

of the following nature:

Fires coming from the North, Northwest, and Northeast

- **Convection-driven fires (non-Santa Ana wind driven)**

Evacuate to the southeast if fire is emerging directly from the North facing slope of the mountain range, and not near the major backbone of the ridge itself. If time is not critical (fire is far down on the northern front of the range), a southwest evacuation route could be feasible (figure EVAC-5.1).

- **Santa Ana wind-driven fires**

Evacuation to the West, and thence to either the South or North could be in order--depending upon the fire activity and specific wind direction. There is no direct route to the South from the COTW site.

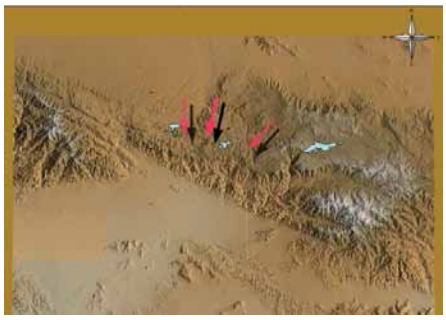


Figure EVAC-5.1. Convection driven fire pathways from the north of the COTW site.

  - **Santa Ana winds from the Northwest** (driving a fire from the Northwest) would probably make an eastern evacuation the most feasible.
  - **Santa Ana winds from the Northeast** (driving a fire from the Northeast) would dictate evacuation to either the Southwest or to the North.

    The Bear Fire of 1970 (see figure EVAC-3) originated on the top of the backbone of the general mountain range, and not only spread to the Southwest, but also turned to the West as it approached San Bernardino. ***In such a case****, evacuation to the South (down Highway 18, for example) would not be advised.*

Fires being driven by Santa Ana winds have challenging characteristics, due to the nature of the wind itself. Santa Ana winds, originating from low pressure zones windward of the mountain range, have characteristics of typical Foehn winds, and blow downslope on the leeward side of the range. As they drop in elevation, they warm and often increase in speed. As a consequence, the winds can offset the upslope convection tendencies of a burning fire, and push the fire downslope—most often accompanied by turbulent fire activity as the winds and convection forces conflict with one another. The typical notion that 'fire burns uphill' can not be relied upon under such circumstances.

Figure EVAC-5.2. Fires south of the mountain range can be located north of the COTW site. Adjustments in response protocol will be necessary.

Fires burning from the South, Southwest or Southeast

Evacuation generally to the North is necessary. Specific fire location and direction, however can alter this course of action. It is necessary to consider the physical orientation of the San Bernardino Mountain range itself in relation to the location of the COTW site. For example, a fire on the southern base of the foothills, being pushed by a wind from the South, could actually be to the north and West of the COTW site (figure EVAC-5.2). Under such a circumstance, an Eastward or Southeastward evacuation should be considered.

Figure EVAC-5.3. General path of Santa Ana wind-driven fires south of the COTW site.

The complexity of the terrain south of the major ridge line of the San Bernardino Mountains amplifies the need to pay attention to circumstances during a potential evacuation event. A Santa Ana wind from the Northeast pushing a fire down Mill Creek Canyon (e.g.- along a portion of Highway 38), or westward, down the Santa Ana River Canyon (by way of Seven Oaks) can end up being a fire moving westward along the southern face of the mountain range, south of the COTW site (figure EVAC-5.3). Such a fire would not behave in the same manner as a fire that starts to

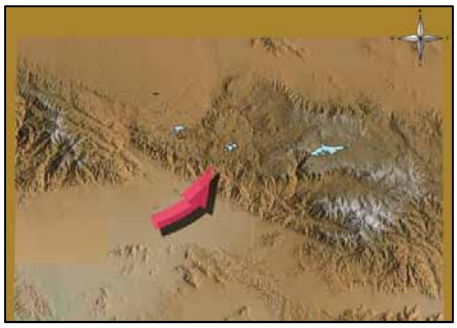


Figure EVAC-5.4. Stylized path of convection and prevailing wind-driven fires from the South of the COTW site.

the south of the COTW site, and is being pushed by southerly winds and fire convection upslope toward the site. The former would require exit to the North and Northwest; the latter could require the same, but might allow and eastward evacuation—ultimately to either the South or the North, according to circumstances (figure EVAC-5.4).

Daytime or night-time--Season of the year

In an area such as southern California, mountains winds will tend to shift direction twice in a 24 hour period. The shifts are a result of differences in the rates of heating and cooling between the land mass and the ocean to the west. The land will warm during the day, and cool at night much more quickly and to a greater degree than the ocean--the large mass of water offshore that varies very little in temperature throughout the day and night.

When the land mass is warmer than the ocean, air above the land will tend to rise--resulting in the normal 'up-canyon' winds that are experienced locally in the San Bernardino Mountains. These winds will begin early in the morning, as the land begins to warm. At night, as the land mass becomes cooler than the ocean, the opposite effect occurs, and 'down-canyon' winds are experienced locally in the mountains. This shift generally begins in the early evening--before sunset. The consequence of this shift does not present a hard and fast 'rule of thumb' to use under an evacuation event, but rather an element to be wary of.

At best, evening winds will oppose, slightly, the upward convection tendencies of a fire. This phenomenon--coupled with atmospheric conditions that are often cooler, and more moist than those during the day--might provide a night evacuation with a little more 'elbow-room'--or easier maintenance of calm. At worst, the down-slope winds *might* require a modification of escape plans--the nature and degree of

which can only be determined on-site, at the time of a given evacuation event. The need for individuals to pay attention to conditions will not disappear.

IV. Caveats Specific to the COTW site.

Refer to Figure EVAC-6. The site is at the head of three canyons leading up to the front entrance to the development. Should a fire emerge from the South, and accurate knowledge of its location is unknown, then a 'wait-and-see' approach to evacuation is not wise. People on site should leave immediately by way of Highway 18, and set a destination for either Lake Silverwood and Interstate I-15, or for the Big Bear area--continuing along Highway 18 to the East. Highways 18 and 330 to the South should not be considered.

Figure EVAC-6. The location of the COTW site can make it particularly susceptible to effects of southerly winds, 'chimney' effects of convection up the drainages to the South, and in these same drainages, the potential for the develop of local inversions that can burst--causing an instantaneous 'flash' effect due to combustible gases that were trapped under the inversion layer.

COTW Campus Evacuation Procedures

The project follows procedures to ensure:

1) the readiness of the campus in the event of an emergency that requires evacuation; and
2) the implementation of safe and timely evacuation of all church members and staff from the project site by ground transportation.

The maximum number of people on site at any one time will be 1200. This number represents approximately 400 cars.

The procedures are as follows:

Campus Evacuation Readiness Procedures

1. The Church Director shall be assigned the primary responsibility for the implementation of the Evacuation Plan. In the event that the Director leaves the project site, the Assistant Director (or designee) shall have the temporary responsibility for the implementation of the Evacuation Plan until the return of the Director.
2. The permanent church staff shall be required to review and be knowledgeable of the Evacuation Plan including the Campus Evacuation Procedures as a part of their staff orientation process.
3. The Campus Evacuation Procedures and a site map with exit routes shall be posted in prominent locations, where people will notice them, throughout the facility.
4. Church staff shall test the emergency alarm system on a monthly basis.
5. The Church Director in conjunction with the Church Leadership group shall review the Evacuation Plan on an annual basis to determine if changes to its contents are necessary. If it is determined that any changes are required,

they will be prepared in coordination with the CFFPD and, as appropriate, the Sheriff's Department.

6. During fire season, the church staff (or designees, as appropriate) shall monitor any fire danger warnings or fire events in the San Bernardino Mountains. This shall be accomplished through ongoing coordination with designated personnel at the CFFPD and the Sheriff's Department.

<u>Campus Evacuation Response Procedures</u>

1. The Sheriff's Department shall notify the Church Director (or designee) in the event that a voluntary evacuation order for the project area has been issued. At the time that the Church Director (or designee) receives the notification, the Evacuation Plan including the Evacuation Response Procedures shall be fully implemented. Upon receipt of this notification, the project shall have a maximum of 40 minutes for absolute departure of all attendees and staff (with exception of Church Director and Assistant Church Director per Item 4 below).
2. The Church Director shall coordinate with the Sheriff's Department in the selection of the appropriate evacuation route(s) to evacuate the project.
3. Prior to departure from the project site, the maps will be made available of the predetermined evacuation route(s) with a specific arrival destination of the the mountain region.
4. The Church Director and Assistant Church Director shall be responsible for the closure of the church site facilities prior to their final departure from the project site.

Telephone numbers of local emergency agencies (as indicated in the Appendix) should be consistently updated, and sources of emergency information (radio stations, television stations) should be noted as appropriate.

Appendix

Exhibit 1. Map of Fire Evacuation Routes from the San Bernardino General Plan

Exhibits 2 and 3. MAST brochure with evacuation route maps, key emergency agency telephone numbers, and radio stations that would provide emergency information.

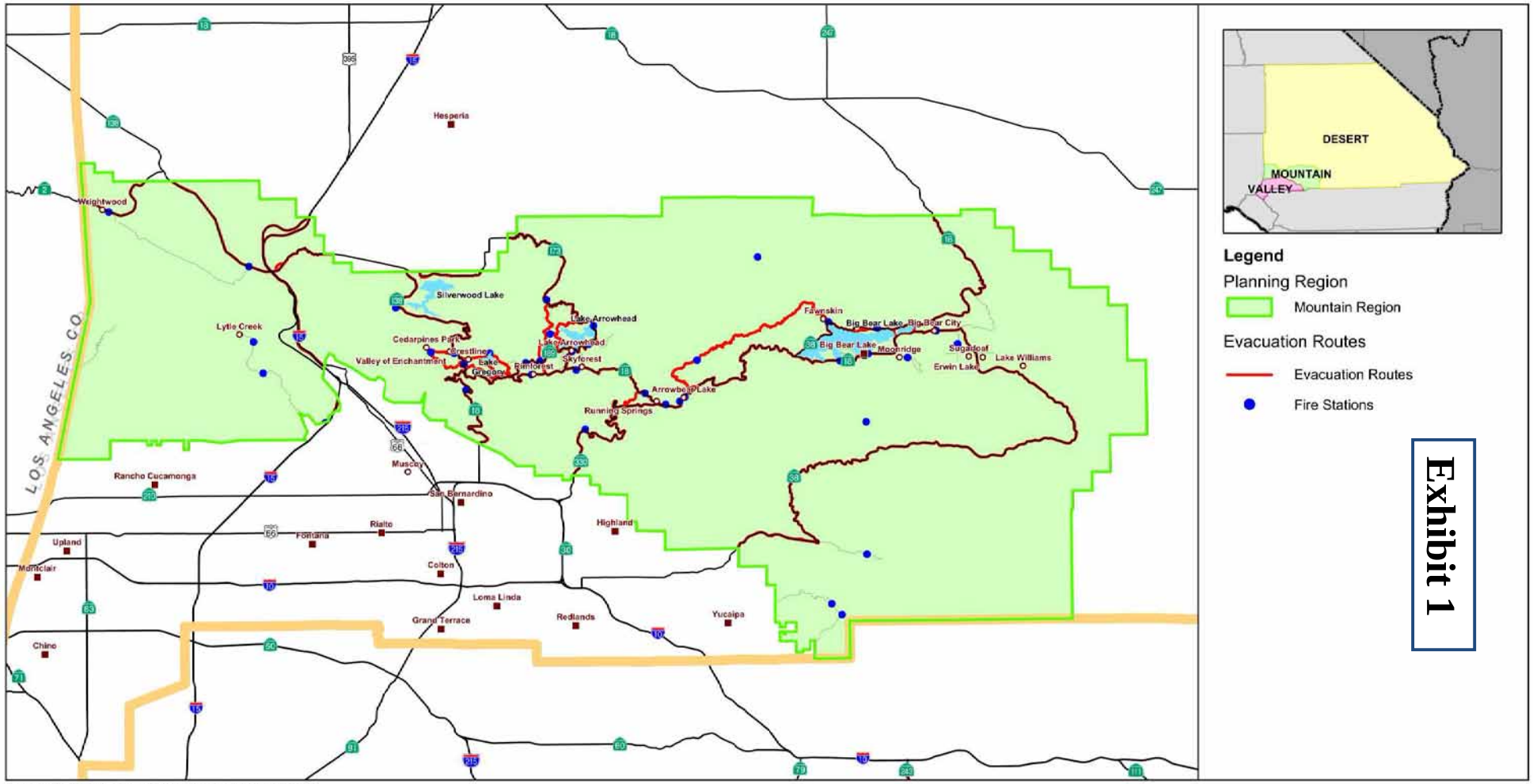


Exhibit 1

Sources: County of San Bernardino, Mountain Area Safety Task Force

5 2.5 0 5 10 Miles

N

City
Community
Highway/Freeway

San Bernardino County

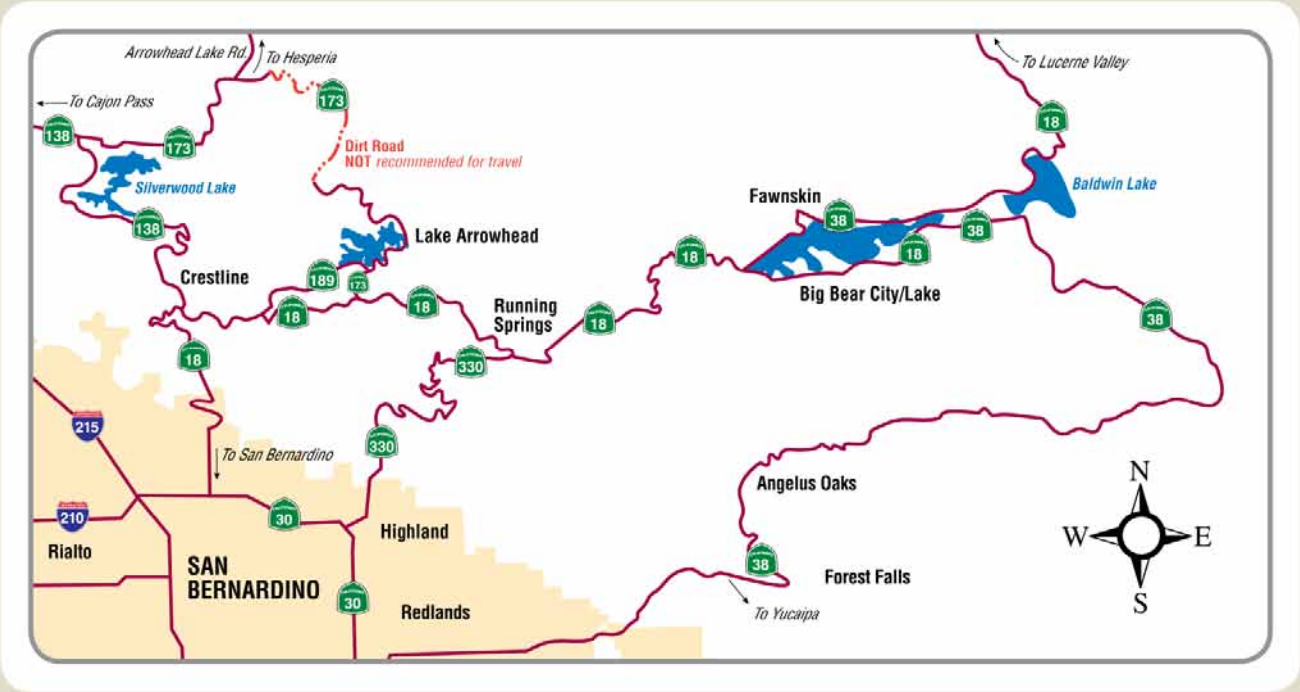
FIGURE 2-7B:
EVACUATION ROUTES - MOUNTAIN REGION

Exhibit 2

MOUNTAIN AREA ROUTES

EMERGENCY ALERT RADIO STATIONS

- 95.1 FM, 103.1 FM, 92.9 FM KFRG Valley/High Desert/Mountains
- 98.9 FM KHWY High Desert
- 102.3 FM KZXY Victor Valley
- 107.7 FM KCDZ Yucca Valley/Joshua Tree
- 93.3 FM KBHR Big Bear Valley



FIRE SAFETY TIPS - BE FIRE SMART

- Know before you go — fire danger level and weather conditions
- Plan your emergency route (see map inside)
- Be informed about restricted access to the national forest
- Campfires are only allowed at approved sites
- Obtain a campfire permit — required for campfires, barbecues and portable stoves (subject to restriction by local authorities)
- Safely put out and discard cigarettes and other burning material
- Clear a 10-foot space around your fire
- Fireworks are illegal, including Safe and Sane
- Operate equipment fitted with a spark arrester
- Do not ride your brakes while driving down the mountain
- Bring snow chains in winter

FOR MORE INFORMATION:

Big Bear Lake Fire Protection District
Office: (909) 866-4668

Big Bear City Fire Department
Office: (909) 585-2362

Running Springs Fire Department
Office: (909) 867-2630

Crest Forest Fire Protection District
Office: (909) 338-3311

San Bernardino County Fire Department
Office: (909) 387-5974
Emergency Information Line: (909) 355-8800

CAL FIRE
San Bernardino Unit: (909) 881-6900

U.S. Forest Service, San Bernardino National Forest
San Bernardino Office: (909) 382-2600
Information Center: (909) 383-5688

Inland Empire Fire Safe Alliance
To find your local fire safe council, please contact **(866) 923-3473** or visit **www.fireinformation.com**

ROAD CONDITIONS

Caltrans/CHP Current Highway Conditions
(800) 427-7623

Caltrans (909) 383-4631

SERVING THE MOUNTAIN AREA

MAST
Mountain Area Safety Taskforce

Formed in 2002, the Mountain Area Safety Taskforce (MAST) has significantly reduced the fire threat in the San Bernardino and San Gabriel Mountains, removing more than one million dead, dying or diseased trees.

However, the fire danger remains high.

Years of drought, bark beetle infestation and a century of fire suppression have left the forest tinder dry with the potential for a catastrophic wildfire.

Healthy forest initiatives are restoring the vigor of the forest so we can all enjoy this natural resource for generations to come.

For more information, visit:
www.calmast.org

BE FIRE SMART
SAVE PROPERTY, HOMES AND LIVES

Visitors Welcome to the SAN BERNARDINO COUNTY MOUNTAINS

MAST

HAVE FUN, BE FIRE SMART

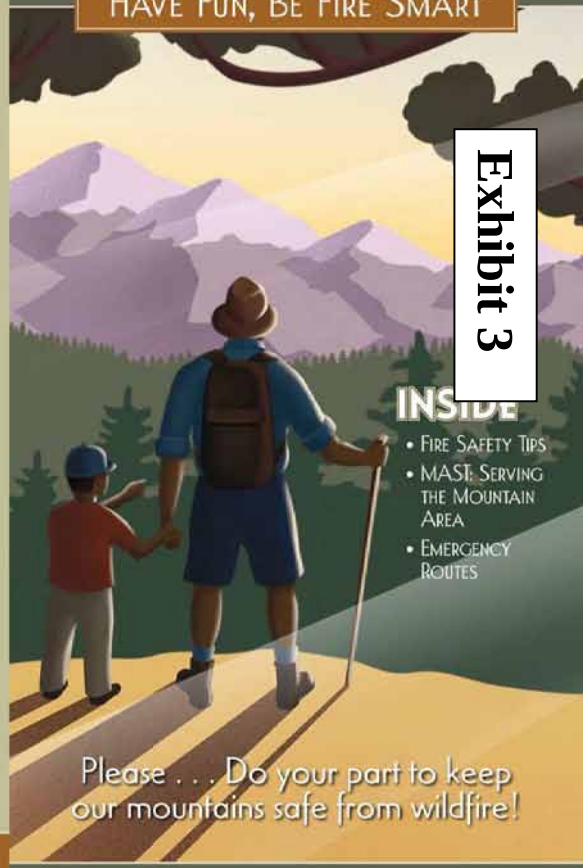


Exhibit 3

INSIDE
- FIRE SAFETY TIPS
- MAST: SERVING THE MOUNTAIN AREA
- EMERGENCY ROUTES

Please . . . Do your part to keep our mountains safe from wildfire!

IN CASE OF EMERGENCY DIAL 911
TO REPORT ARSON CALL "WE TIP" AT (800) 47-ARSON

Appendix F

Drainage Study and Additional Water Supply Information

W.J. McKeever, Inc.

Drainage Study Church of the Woods

July 7, 2005

DRAINAGE STUDY

CHURCH OF THE WOODS

RIM FOREST, CA

JULY 7, 2005

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Exhibit "B"- Rational Method Hydrology Calculations

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Exhibit "B-2"- Rational Method Hydraulic Calculations-Proposed Project area undeveloped (100 Year Storm Event)
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Exhibit "E"- Permanent Water Quality Management Plans

Site Description

The site consists of 36.7 acres on the north side of State Hwy 18 in the northwest ¼ of Section 29 T N, R. The site is located on the easterly edge of the area known as Rim Forest in the Lake Arrowhead area of San Bernardino County.

The site is bounded on the south by State Highway 18; on the west by an existing subdivision known as the Arrowview Tract (Tract No. 2015) consisting of 4,000 ± S. F. residential lots; on the north and east by vacant land owned by the U. S. Forest Service. State Highway 18 on the south boundary is a paved, two lane highway. Daley Canyon Road, an existing two-lane road, cuts across the northeast corner of the site.

The site itself is a typical wooded mountain site. There is an existing natural drainage course running diagonally through the site from the southwest corner to the northeast corner. There is an existing 8" sewer main located in the natural drainage course. This sewer is part of the Lake Arrowhead Community Services District's Wastewater Collection System.

There are no existing drainage or storm drain improvements located on the site.

Proposed Project

The proposed project consists of a church, athletic fields, and appurtenant facilities. A proposed site plan is included as Exhibit "A" of this report. The proposed facilities are located generally in the south and northwest areas of the site.

The total site consists of approximately 36.7 acres. Approximately 11.8 acres will be impervious area, buildings, parking lots, sidewalk and paved assembly areas. Approximately 11.9 acres will be landscaped areas, sodded recreation areas and landscaped slopes. Approximately 13 acres will be retained in its natural state.

The proposed project will require a fill in the natural drainage course in the southwest corner of the site. This fill will require the construction of approximately 750' of storm drain. This storm drain is shown on the site plan.

The development of this project will not alter the existing drainage patterns of the offsite watershed.

The development of this project will redirect approximately 5 acres of area that currently drains onto the property easterly of the site to the west and into the projects storm drain system. The project storm drain system discharges into the natural drainage course at approximately the center of the property.

In the natural state of this 5 acres drains onto the property to the east between this site and Daley Canyon Road. The flows then run northerly on Daley Canyon Road and are discharged into the natural drainage course in the vicinity of the northeast corner of the site.

In summary, all the redirected flows go to the same drainage course by the time that they reach the northeast corner of the property.

Hydrology Study

The hydrology study consists of a rational analysis of the off site areas contributing to the site based on a 100-year storm event.

The study was performed using the "San Bernardino County Rational Hydrology Program (Hydrology Manual date – August 1986) Civilcadd / Civildesign Engineering Soft Water (C) 1989-2000 versions 6.3". A field review of the existing drainage and road improvements, within the contributing drainage area was conducted to determine, as accurately as possible, the flow paths within the areas.

The rational method hydrology calculations are included as Exhibit "B" of this report

Existing Water Sheds

Offsite

The offsite watershed areas that contribute runoff to the site are generally located to the west of the site. These watershed areas are shown on the map labeled "Offsite Drainage Church of the Woods" combined in Exhibit "B" of this report.

Generally, the total watershed area consists of some vacant forested land, some existing mountain residential area and some commercial development.

The total watershed is broken down into 5 sub areas for the purpose of the Rational Method Hydrology Calculations.

These sub areas are identified by Node Numbers as required by the computer program. For example, the most westerly area runs from Node Number 1 to Node Number 2 and consists of 8.8 acres.

A discussion of each offsite watershed sub area is as follows:

Subarea Node 1-2

The area consists of 8.8 acres. This area is shown as an initial area in the Rational Method Calculations, the area is undeveloped and consists of "dense" ground cover. The

Soil group designation for this area is, "D". The elevation at the top (Node No. 1) of the area is 6,000 feet above sea level and the elevation at the bottom (Node No. 2) is 5920 feet above sea level. The length of the path of flow distance is 1,000 feet.

The calculated 100-year "Q" at Node No. 2 is 26.67 C.F.S.

The area contains no bluelined streams. The drainage ways within the subarea are unnamed.

Subarea Node 2-3

The area consists of 19.2 acres. Approximately 10 acres of this subarea is within Tract No 2015, the Arrowhead View Tract, a review of the San Bernardino County Assessor's records indicate that Tract No. 2015, which was recorded in 1929, consists of lots varying in size from 2600 S.F. to 8,000 S.F. in area. The homes that have been constructed within this tract have been constructed on the larger lots or combinations of the smaller lots. The homes themselves range in size from a small of 400 ± S.F. to a large of 2500 ± S. F. with most falling within the 900 S.F. to 1100 S.F. range. Consequently, we used a development classification of 2 dwelling units per acre for the purpose of the Rational Method Calculations.

The soil group designation is "D". The elevation at the top of the subarea (Node No. 2) is 5920 feet above sea level and the elevation at the bottom of the subarea (Node No. 3) is 5760 feet above sea level. The length of the flow path within the sub area is 1100 feet.

The 100-year "Q" at Node No. 3 is 81.82 C.F.S.

The subarea contains no blueline streams. The drainage maps within the subarea are unnamed.

Subarea Node 3-4

The subarea consists of 21.6 acres. Approximately 15.3 acres of this subarea is within Tract No. 2015. (See discussion above about character of this area). Approximately 6.4 acres consists of relatively low-density commercial development. Weighing the commercial portion of this subarea, we used a development classification of 3-4 dwelling units per acre for the purpose of the Rational Method "Calculations.

The soil group designation is "D". The elevation at the top of the subarea (Node No. 3) is 5760 feet above sea level and the elevation at the bottom of the subarea (Node No. 4) is 5600 feet above sea level. The length of the flow path within the subarea is 1100 feet. The 100-year "Q" at Node No. 4 is 140.79 C.F.S.

Node No. 4 is located on the west property line of the proposed project. At this point the flows will be picked up in a reinforced concrete storm drainpipe and conveyed approximately ½ of the way through the project.

The subarea contains no blueline streams. The drainage ways within the subarea are unnamed.

Subarea 6-7

The subarea consists of 10.0 acres. Approximately 8.8 acres of this subarea is undeveloped. Approximately 1.2 acres of this subarea are within Tract No. 2015 (See discussion above about character of this area). This subarea is shown as an initial area in the Rational Method Calculations.

Weighing the areas within this subarea we used a development classification of 2 dwelling units per acre for the purpose of the Rational Method Calculations.

The soil group designation is "D". The elevation at the top of the subarea (Node No. 6) is 5974 feet above sea level and the elevation at the bottom of the subarea (Node No. 7) is 5720 feet above sea level. The length of the flow path within the subarea is 700 feet. The 100-year "Q" at Node No. 7 is 75.25 C.F.S. the subarea contains no blue line streams. The drainage way within the subarea are unnamed.

Subarea 7-8

The subarea consists of 12.8 acres. Approximately 7.6 acres of the subarea is undeveloped. Approximately 5.2 acres of this subarea are within Tract No. 2015 (See discussion above about character of this area). Weighing the areas within this subarea, we used a development classification of 2 dwelling units per acre for the purpose of the Rational Method Calculations.

The soil group designation is "D". The elevation at the top of the subarea (Node No 7) is 5720 feet above sea level. The elevation at the bottom of the subarea (Node No. 8) is 5600 feet above sea level. The length of the flow path within the subarea is 1100 feet. The 100-year "Q" at Node No. 8 is 150.6 C.F.S.

The subarea contains no blueline streams, the drainage ways within the subarea are unnamed.

Node No. 8 is located at the point where the natural drainage course intersects the north boundary of the proposed project.

The natural drainage channels within the undeveloped offsite drainage areas are not highly eroded.

The natural drainage channels within the developed or semi developed offsite drainage areas consist of roadside swales and pipes that are maintained by the San Bernardino County Transportation Department. These swales are not highly eroded.

Construction Phase

Exhibit "D" of this report contains a Temporary Erosion Control Plan. These erosion control measures will be implemented during the construction phase of the project.

As shown on the plan, silt fences will be employed at the downhill boundary of all areas to be disturbed by the grading operation. Silt fences shall be constructed per ESC 50.

The plan also shows sand bag barriers or chevrons within the driveways and parking lots and sand bags around the storm drain entrance. These sand bag features are intended to prevent silt from migrating offsite during the construction phase of the project.

Sand bag barriers shall be constructed per ESC 52.

The plan shows stabilized construction entrances at the two access points to State Highway 189. These will be the only two access points that will be used during the construction phase of the project.

These stabilized construction entrances shall be constructed per ESC 24.

Exhibit "D" also contains other BMP's that may or may no be necessary depending on how the construction operation is phased.

The sediment control basin is located at the main storm drain inlet in the control portion of the project. This basin will mitigate flows from that portion of the project above the fill slopes, during the construction phase of the project. This basin will be created by placing sand bags around the storm drain inlet that is located in a sump.

Proposed Permanent Drainage Improvements

Major offsite flows enter the site at two locations. One location is on the north side of the highway at the southwest corner of the site. The other location is on the north boundary approximately 350' east of the northwest corner.

The flows entering the site at the southwest corner will be intercepted by a storm drain pipe. This pipe will continue through the fill area in the southwest portion of the site. The pipe will consist of a 60" reinforced concrete pipe and will be approximately 750 feet in length. See Capacity calculations included in Exhibit "C" of this report.

The flows entering the site on the north boundary line will be intercepted by a concrete lined channel. The flows will be conveyed by the channel, past the proposed fill slope required to construct the baseball field, and discharged into the natural drainage course within the site. The purpose of this channel is to protect the crib wall and fill slope from erosion damage.

See "Capacity Calculation-Concrete Channel-North P.L." included in exhibit "C" of this report. This exhibit also shows a cross section of the proposed channel with dimensions.

The storm drain improvements also include energy dissipaters at the outlet of the 60" R.C.P. and the concrete lined channel. The dimensions of these energy dissipaters are shown on the site plan included in Exhibit "A" of this report.

This site plan also shows a concrete "V" ditch at the top of the crib wall located easterly and northerly of the athletic field area. This "V" ditch is intended to intercept runoff from the slope above the crib wall. This will prevent runoff from eroding material out from behind the crib wall.

The water quality management BMP's proposed for the project consists of grassy swales and storm drain filters.

Initial "First Flush" flows from most of the parking and driveway areas will be directed to "grassy swales" within the landscape areas. These grassy swales are shown on the site plan included in Exhibit "A" of this report.

Additionally, Fossil Filters will be installed in the storm drain inlet to the 60" reinforced concrete pipe.

All of the proposed developed area, with the exception of the north 2.6 acres of the athletic fields, drains to this inlet.

The athletic fields, in addition to the landscape areas will act as infiltration beds to mitigate the increased runoff due to the impervious area. Overall, this project will consist of 50% pervious and 50% impervious area.

With proper maintenance of the landscape irrigation on site, there should be essentially no nuisance water exiting the site.

The increased storm water issue has been addressed by calculating the 100-year "Q" prior to the development and after the proposed development.

The drainage area within the developed portion of the site consists of step mountainous slopes, prior to the grading of the project. The grading of the site will create flatter areas where the steep slopes previously existed. This will change the nature of the storm water runoff by increasing the Time of Concentration, which decreases the average intensity for any given storm event.

The results of the Rational Method Calculations for the 100-year storm runoff from the site before development and after development are as follows:

Node No.	Undeveloped Area	Developed Area	"Q100" Undeveloped	"Q100" Developed
2	16.8	16.55	86.11	81.15
6	2.3	2.60	16.28	17.77
Total	19.1	19.15	102.39	98.92

In summary, according to the Rational Method Calculations, the proposed project will not increase the storm water runoff from the site.

William J. McKeever

EXHIBIT "A"

PROPOSED SITE PLAN

Original map on file with the County of San Bernardino, Land Use Services Department

CHURCH OF THE WOODS
CONDITIONAL USE PERMIT SITE PLAN

Scale: 1" = 60'

NOTES:

1. RECORD OWNER: CHURCH OF THE WOODS, A CALIFORNIA CORPORATION; P. O. BOX 2000; LAKE ARROWHEAD, CA. 92352; 909-337-5453.
2. PUBLIC UTILITIES ARE AS FOLLOWS:
   A) WATER: CRESTLINE LAKE ARROWHEAD WATER AGENCY; P.O. BOX 3602; CRESTLINE, CA. 92325; 909-338-1775
   B) SEWER: LAKE ARROWHEAD COMMUNITY SERVICES DIST; P. O. BOX 758; LAKE ARROWHEAD, CA 92352; 909-337-8555
   C) NATURAL GAS: SO. CAL. GAS CO.; P. O. BOX 6229; SAN BERNARDINO, CA; 909-889-9711
   D) ELECTRIC: SO. CAL. EDISON CO.; P. O. BOX 96; RIM FOREST, CA; 92378; 800-337-2584
   E) TELEPHONE: VERIZON; 1500 CRAFTON AVE.; MONTONE, CA; 92359; 909-783-7441
   F) CABLE TV: FALCON CABLE; P. O. BOX 9; RIM FOREST, CA. 92378; 909-336-2457
3. LEGAL DESCRIPTION: THE SE 1/4; NW 1/4; SECTION 29, T.2N; R.3W; SBM. COUNTY OF SAN BERNARDINO, CALIFORNIA. APN NO. 336-101-06
4. THE CURRENT AND PROPOSED GENERAL PLAN USE DISTRICT IS LA/RC.
5. ENTRY SIGNS WILL BE SUBMITTED FOR REVIEW AT A LATER DATE.
6. ALL PARKING AREAS WILL BE SURFACED WITH ASPHALT. THE MINIMUM PARKING SPACE WILL BE 9'x19' TYPICAL.
7. TREES TO BE REMOVED ARE DISCUSSED IN THE FORESTERS REPORT PREPARED BY JOHN HATCHER DATED 3-25-03.

PROJECT SUMMARY:

TOTAL PROJECT

a)	Building Coverage (First Floor)	89,219 SF	4.9%
b)	Drives / Walks / Drainage	340,612 SF	21.2%
c)	Ball Field and Play Fields	230,660 SF	14.4%
d)	Landscape and Recreation	128,300 SF	8.0%
e)	Landscape Slopes	233,635 SF	14.6%
f)	Natural Area	589,414 SF	37.1%
	TOTAL AREA	1,606,180 SF	100%

PROJECT SUMMARY

PARCEL 1: PLAYFIELDS:

a)	Building Coverage	490 SF	0.2%
b)	Drives and Walks	35,363 SF	15.5%
c)	Slope Area	43,445 SF	19.4%
d)	Ornamental Landscape	16,881 SF	7.4%
e)	Play Field	120,322 SF	53.2%
f)	Natural Area	10,022 SF	4.4%
	TOTAL AREA :	226,533 SF	100%

PARCEL 2: CHURCH OF THE WOODS:

a)	Building Coverage	68,749 SF	12.0%
b)	Drives and Walks	276,914 SF	48.1%
c)	Slope Area	71,791 SF	12.5%
d)	Ornamental Landscape/Recreation	106,228 SF	18.5%
e)	Natural Area	48,328 SF	8.5%
	TOTAL AREA :	575,710 SF	100%

PARCEL 3: BASEBALL FIELD:

a)	Drives, Walks and Drainage	28,316 SF	9.6%
b)	Slopes	116,520 SF	39.6%
c)	Ball Field and Adjacent Areas	118,536 SF	40.3%
d)	Landscape	2,181 SF	0.8%
e)	Natural Area	29,123 SF	9.9%
	TOTAL AREA .	294,675 SF	100%

PARCEL 4: NATURAL OPEN SPACE 147,481 SF

PARCEL 5: NATURAL OPEN SPACE 350,580 SF

BUILDING SUMMARY

CHURCH OF THE WOODS

PHASE I

ASSEMBLY BUILDING-(YOUTH CENTER)	
First Floor	18,305 SF
Second Floor	8,076 SF
Snack Bar	480 SF
SUBTOTAL	27,264 SF

PHASE II

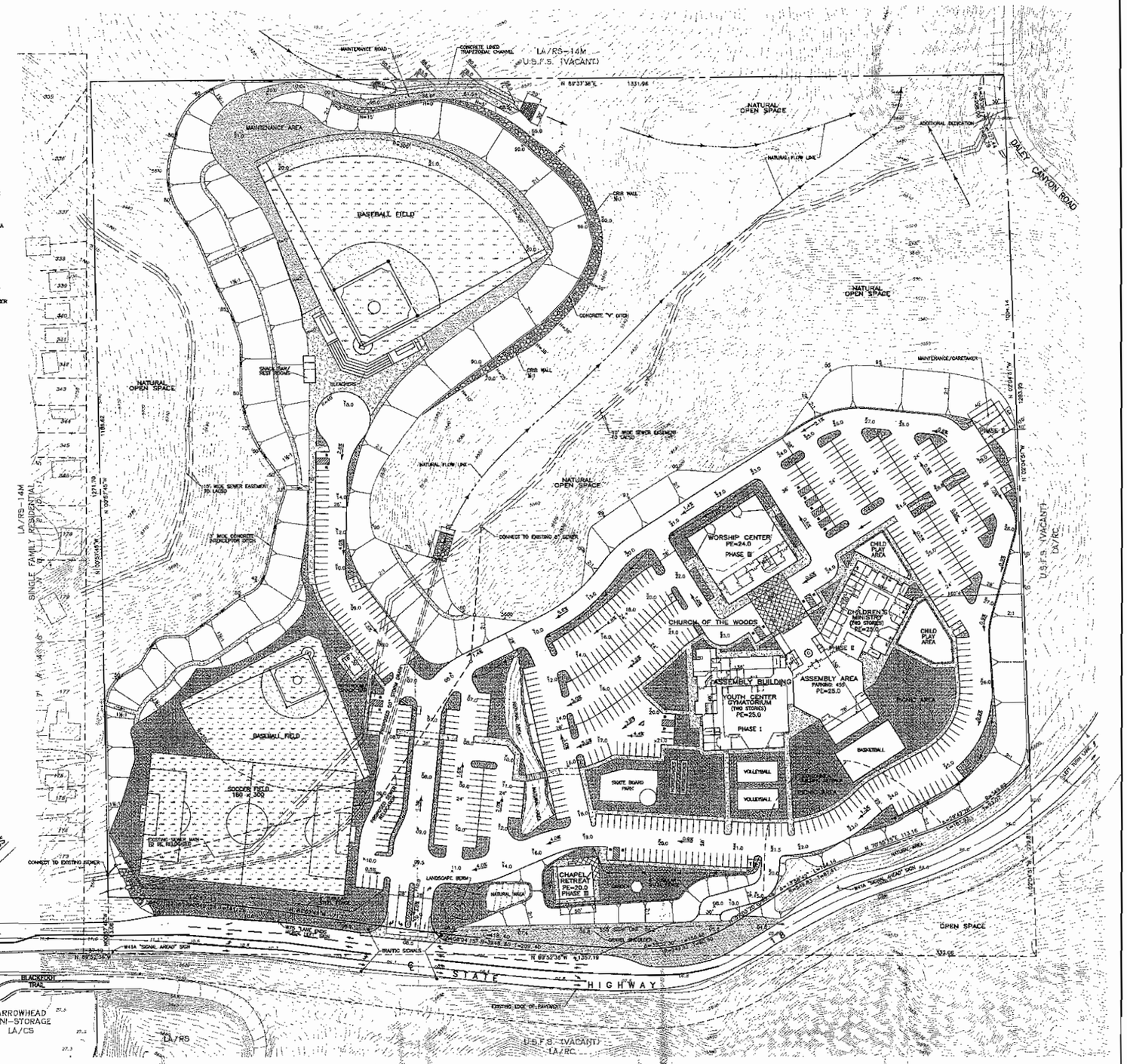
ASSEMBLY BUILDING ADDITION-(AUDITORIUM/CHILDREN'S MINISTRY)	
First Floor	27,294 SF
Second Floor	13,743 SF
SUBTOTAL	41,037 SF
MAINTENANCE BUILDING	
First Floor	1,900 SF
Second Floor	700 SF
SUBTOTAL	2,600 SF

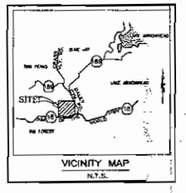
PHASE III

WORSHIP CENTER		
First Floor	18,880 SF	SEATING 800 PEOPLE
Second Floor	4,930 SF	400 PEOPLE
SUBTOTAL	23,810 SF	1,200 PEOPLE
CHAPEL/RETREAT		
First Floor	2,500 SF	
Second Floor	573 SF	
SUBTOTAL	3,073 SF	

TOTAL SQUARE FOOTAGE: (CHURCH OF THE WOODS) 97,484 SF

PARKING SUMMARY (9x19 TYPICAL)	REQUIRED	PROVIDED
CHURCH OF THE WOODS (BUILD OUT) 1200 SEATS (1 space for 4 seats)	300	PHASE III -- 540





LEGEND:

- INDICATES PLAY FIELD
- INDICATES ORNAMENTAL LANDSCAPE
- INDICATES LANDSCAPED MANUFACTURED SLOPE
- INDICATES GRAVEL SHOULDER (HIGHWAY 18)
- INDICATES NATURAL AREA
- INDICATES CONCRETE WALKWAY
- INDICATES 5' TUBULAR STEEL FENCE

REGISTERED PROFESSIONAL ENGINEER — WILLIAM J. McKEEVER — No. 22362 — Exp. 12-31-05 — CIVIL — STATE OF CALIFORNIA

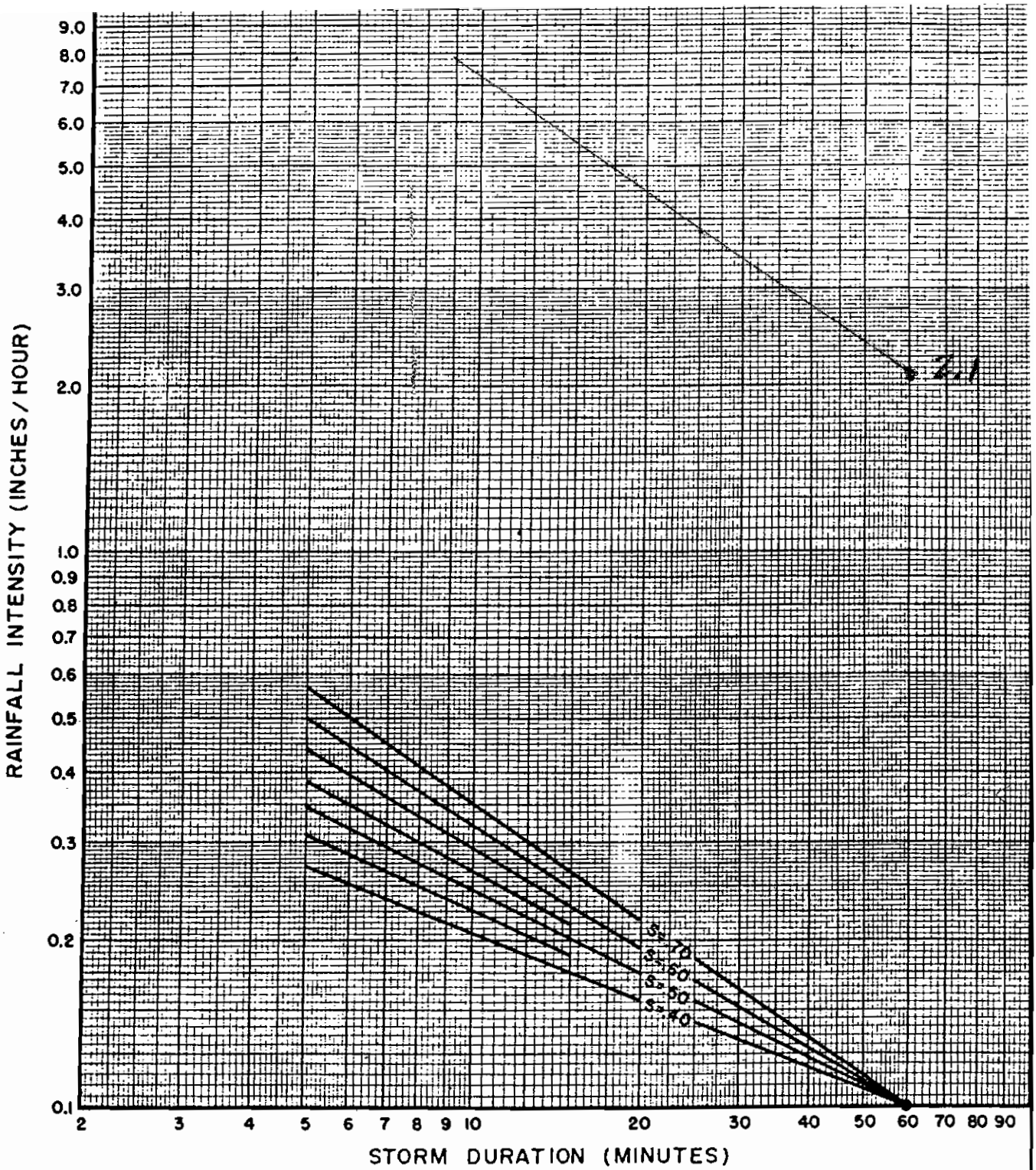
RCE 22362 EXP. 12-31-05 — DATE 9/11/05

9-09-04

W.J. McKEEVER, INC.
CIVIL ENGINEERING
647 NORTH MAIN STREET, SUITE 2A
BARSTOW, CALIFORNIA 92311
PH. (760) 256-3790
FAX (760) 256-3790

EXHIBIT "B"

RATIONAL METHOD HYDROLOGY CALCULATIONS



DESIGN STORM FREQUENCY = _____ YEARS

ONE HOUR POINT RAINFALL = _____ INCHES

LOG-LOG SLOPE = _____

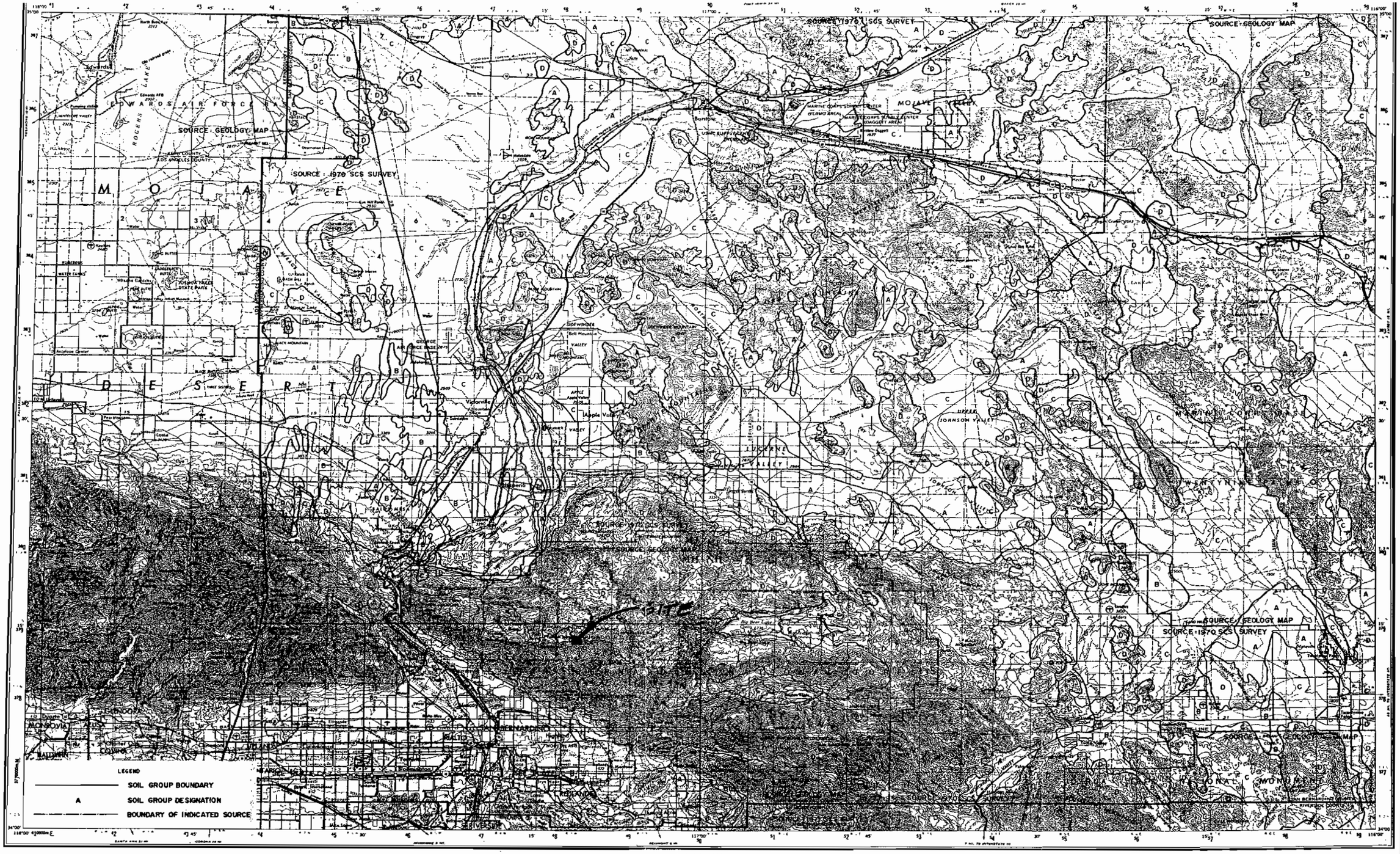
PROJECT LOCATION = _____

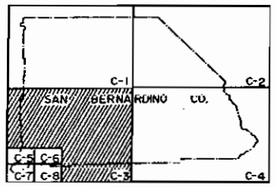
SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

FIGURE D-3





INDEX MAP

Scale 1:250,000

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS
TRANSVERSE MERCATOR PROJECTION

BASE MAP REPRODUCED FROM U.S.G.S. "SAN BERNARDINO" TOPOGRAPHIC MAP

SCALE REDUCED BY 1/2

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP FOR SOUTHCENTRAL AREA

FIGURE C-11

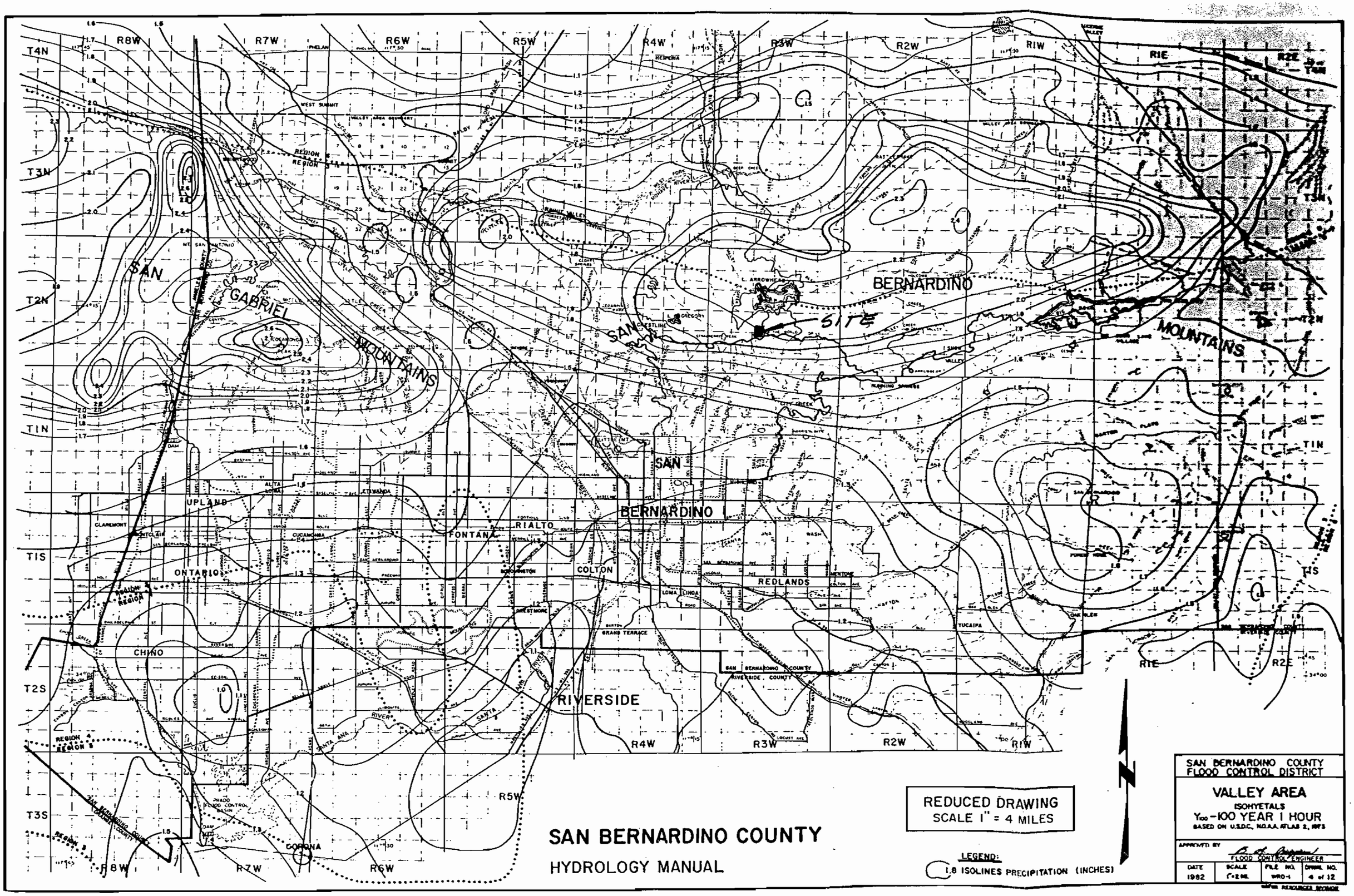
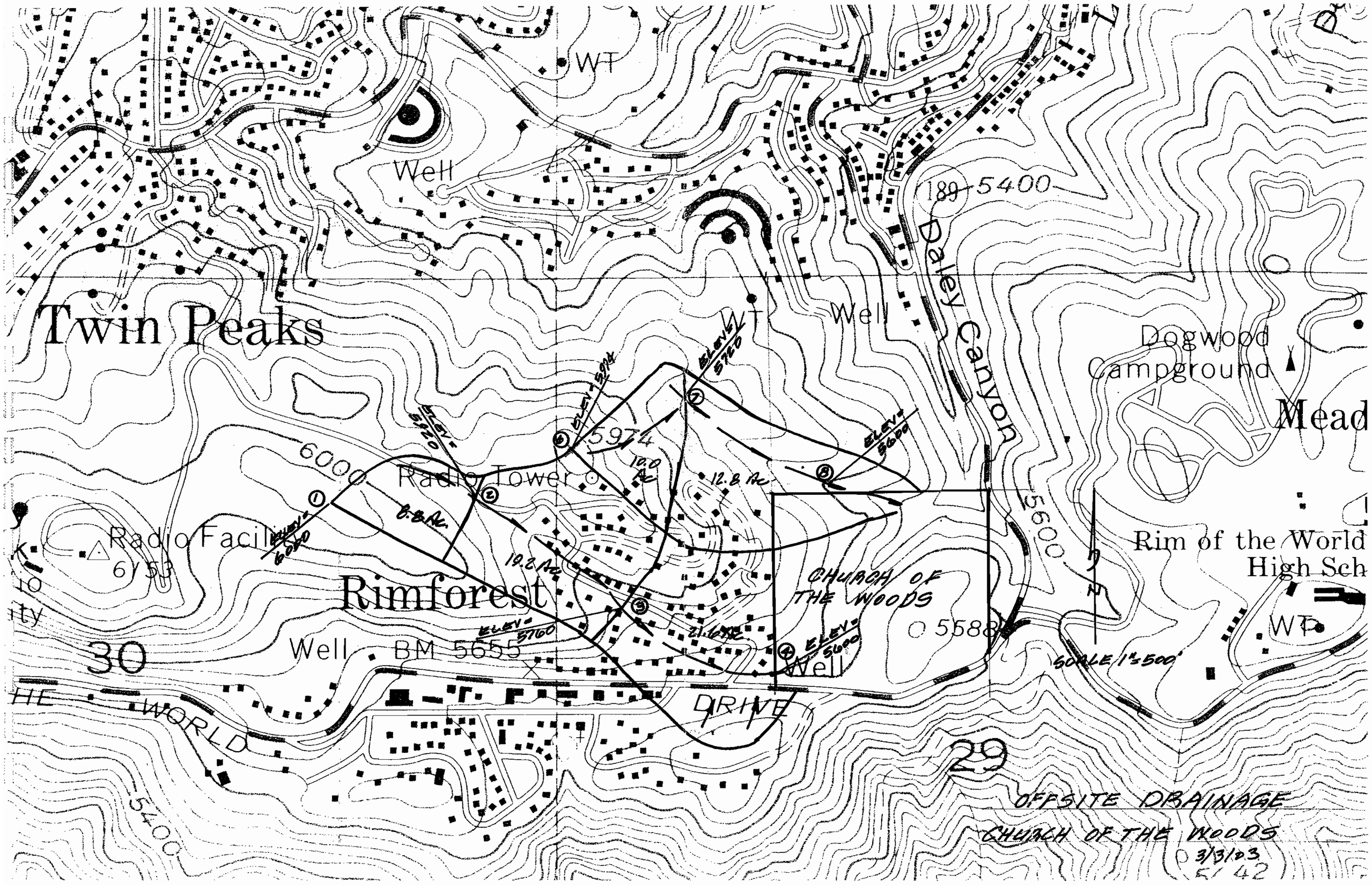

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
Y100 - 100 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE
1982
SCALE
1"=2 MI.
FILE NO.
WRD-1
DRWG. NO.
4 of 12
SAN BERNARDINO
MOUNTAINS
SAN GABRIEL
MOUNTAINS
SITE
UPLAND
ONTARIO
CHINO
RIALTO
FONTANA
COLTON
REDLANDS
RIVERSIDE
CORONA
YUCAIPA
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E

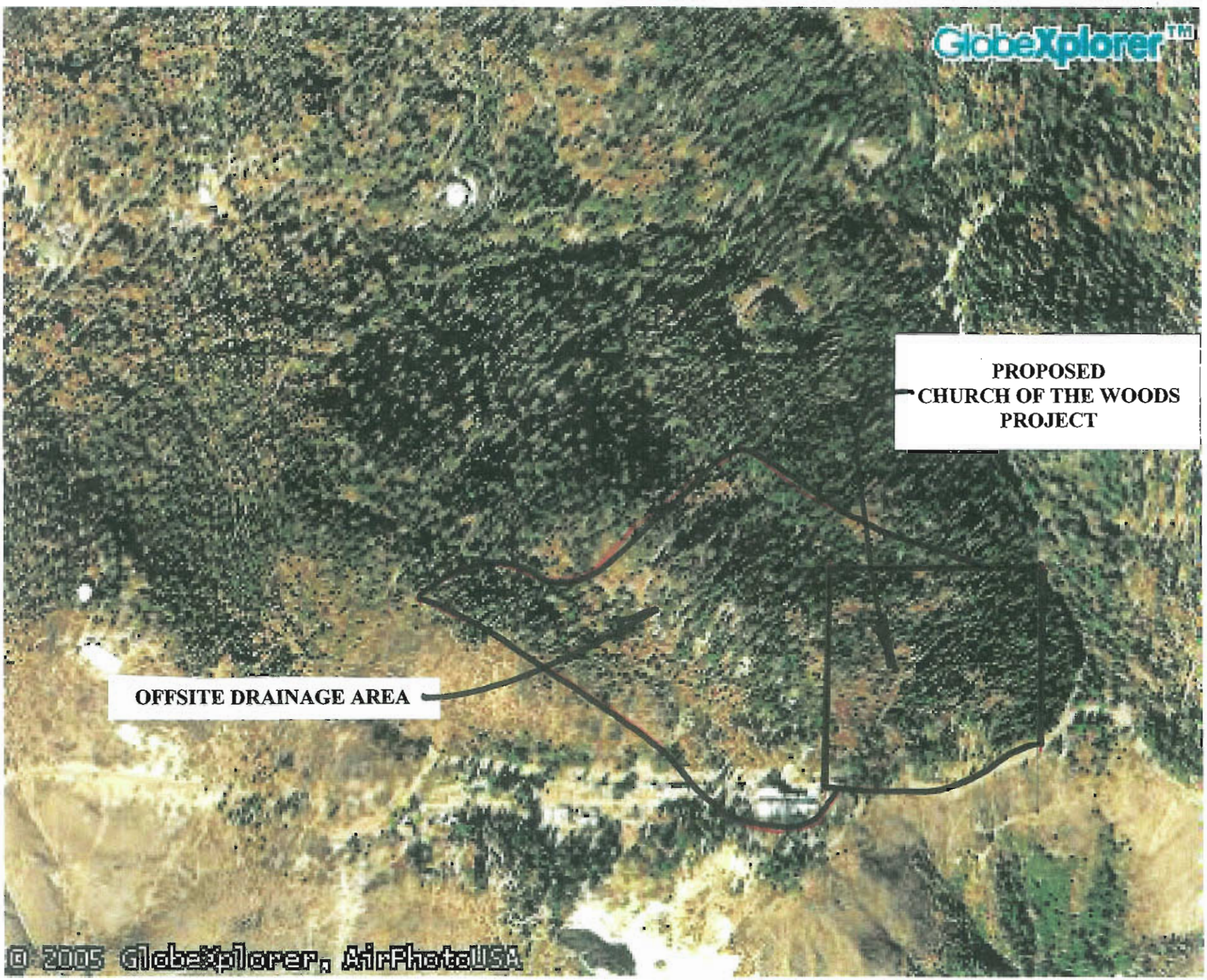
FIGURE B-4

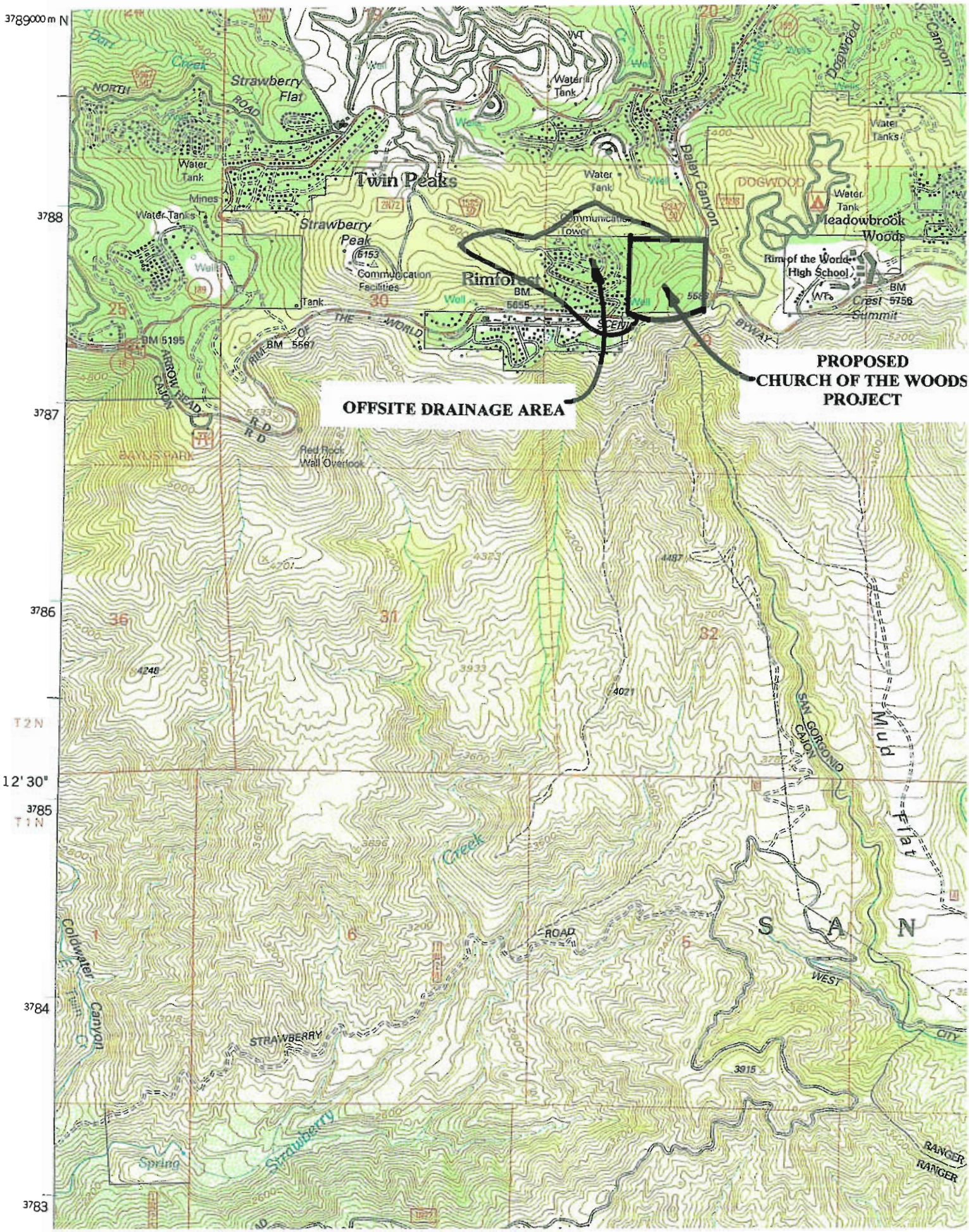
EXHIBIT "B-1"

RATIONAL METHOD HYDRAULIC CALCULATIONS OFFSITE AREAS WEST OF PROJECT

(100 YEAR STORM EVENT)


WT
Well
189
5400
Daley Canyon
Twin Peaks
Well
Dogwood
Campground
Mead
ELEV= 5974
ELEV= 5760
ELEV= 5720
ELEV= 5600
5974
10.0 Ac
12.8 Ac
6000
Radio Tower
8.8 Ac
Radio Facil
6153
ELEV= 6060
19.2 Ac
Rimforest
CHURCH OF
THE WOODS
5600
Rim of the World
High Sch
ELEV= 5760
21.6 Ac
ELEV= 5600
5588
WT
30
Well
BM 5655
Well
SCALE 1"=500'
DRIVE
WORLD
29
5400
OFFSITE DRAINAGE
CHURCH OF THE WOODS
3/3/03
5/42


GlobeXplorer™
PROPOSED
CHURCH OF THE WOODS
PROJECT
OFFSITE DRAINAGE AREA
© 2005 GlobeXplorer, AirPhotoUSA


PROPOSED
CHURCH OF THE WOODS
PROJECT
OFFSITE DRAINAGE AREA
Twin Peaks
Strawberry Flat
Strawberry Peak
Rimforest
Meadowbrook Woods
Rim of the World High School
Communication Facilities
Water Tank
Water Tanks
Mines
Well
Tank
Dogwood
Dogwood Canyon
Daley Canyon
Crest Summit
Red Rock Wall Overlook
Arrow Head Canyon
Bayles Park
Coldwater Canyon
San Gorgonio Canyon
Mud Flat
Strawberry Creek
Spring
Ranger
3789000 m N
3788
3787
3786
3785
3784
3783
12' 30"
T2N
T1N

```
              San Bernardino County Rational Hydrology Program

                   (Hydrology Manual Date - August 1986)

  CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
       Rational Hydrology Study        Date: 06/15/05
 ----------------------------------------------------------------------
 CHURCH OF THE WOODS
 LAKE ARROWHEAD
 100 YEAR UNDEVELOPED

 ----------------------------------------------------------------------


 Program License Serial Number 5032

 ----------------------------------------------------------------------
  *********   Hydrology Study Control Information **********

 ----------------------------------------------------------------------
 Rational hydrology study storm event year is   100.0
 Computed rainfall intensity:
 Storm year =   100.00   1 hour rainfall =     2.000 (In.)
 Slope used for rainfall intensity curve b =  0.7000
 Soil antecedent moisture condition (AMC) = 2


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        1.000 to Point/Station        2.000
 **** INITIAL AREA EVALUATION ****
 ______________________________________________________________________
 UNDEVELOPED (dense cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2)  = 80.00
 Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.370(In/Hr)
 Initial subarea data:
 Initial area flow distance =  1000.000(Ft.)
 Top (of initial area) elevation =  6000.000(Ft.)
 Bottom (of initial area) elevation =  5920.000(Ft.)
 Difference in elevation =    80.000(Ft.)
 Slope =    0.08000  s(%)=       8.00
 TC = k(0.935)*[(length^3)/(elevation change)]^0.2
 Initial area time of concentration =   24.558 min.
 Rainfall intensity =      3.738(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.811
 Subarea runoff =     26.674(CFS)
 Total initial stream area =        8.800(Ac.)
 Pervious area fraction = 1.000
 Initial area Fm value =    0.370(In/Hr)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        2.000 to Point/Station        3.000
 **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
 ______________________________________________________________________
 Estimated mean flow rate at midpoint of channel =      0.000(CFS)
```

```
Depth of flow =   2.146(Ft.), Average velocity =  11.787(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              10.00
      2             10.00               0.00
      3             20.00              10.00
Manning's 'N' friction factor =   0.040
-------------------------------------------------------------
Sub-Channel flow  =     54.295(CFS)
  '     '    flow top width =      4.292(Ft.)
  '     '    velocity=   11.787(Ft/s)
  '     '    area =      4.606(Sq.Ft)
  '     '    Froude number =     2.005

Upstream point elevation =  5920.000(Ft.)
Downstream point elevation =  5760.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    1.56 min.
Time of concentration =   26.11 min.
Depth of flow =   2.146(Ft.)
Average velocity =  11.787(Ft/s)
Total irregular channel flow =    54.295(CFS)
Irregular channel normal depth above invert elev. =   2.146(Ft.)
Average velocity of channel(s) =  11.787(Ft/s)
 Adding area flow to channel
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000     Max loss rate(Fm)=     0.317(In/Hr)
Rainfall intensity =      3.580(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.816
Subarea runoff =     55.144(CFS) for   19.200(Ac.)
Total runoff =     81.818(CFS)
Effective area this stream =       28.00(Ac.)
Total Study Area (Main Stream No. 1) =       28.00(Ac.)
Area averaged Fm value =    0.334(In/Hr)
Depth of flow =   2.503(Ft.), Average velocity =  13.060(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_____________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   2.810(Ft.), Average velocity =  14.105(Ft/s)
      ******* Irregular Channel Data ***********
-------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              10.00
      2             10.00               0.00
      3             20.00              10.00
Manning's 'N' friction factor =   0.040
-------------------------------------------------------------
```

```
Sub-Channel flow  =    111.339(CFS)
  '      '    flow top width =      5.619(Ft.)
  '      '    velocity=   14.105(Ft/s)
  '      '    area =      7.893(Sq.Ft)
  '      '    Froude number =     2.097

Upstream point elevation =  5760.000(Ft.)
Downstream point elevation =  5600.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    1.30 min.
Time of concentration =   27.41 min.
Depth of flow =   2.810(Ft.)
Average velocity =  14.105(Ft/s)
Total irregular channel flow =   111.339(CFS)
Irregular channel normal depth above invert elev. =   2.810(Ft.)
Average velocity of channel(s) =  14.105(Ft/s)
 Adding area flow to channel
RESIDENTIAL(3 - 4 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.6000     Max loss rate(Fm)=     0.272(In/Hr)
Rainfall intensity =      3.461(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.820
Subarea runoff =     58.976(CFS) for   21.600(Ac.)
Total runoff =    140.794(CFS)
Effective area this stream =       49.60(Ac.)
Total Study Area (Main Stream No. 1) =       49.60(Ac.)
Area averaged Fm value =    0.307(In/Hr)
Depth of flow =   3.068(Ft.), Average velocity =  14.958(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000     Max loss rate(Fm)=     0.317(In/Hr)
Initial subarea data:
Initial area flow distance =   700.000(Ft.)
Top (of initial area) elevation =  5974.000(Ft.)
Bottom (of initial area) elevation =  5720.000(Ft.)
Difference in elevation =   254.000(Ft.)
Slope =    0.36286  s(%)=      36.29
TC = k(0.438)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.372 min.
Rainfall intensity =      8.678(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.867
Subarea runoff =     75.252(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 0.700
Initial area Fm value =    0.317(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Estimated mean flow rate at midpoint of channel =      0.000(CFS)
Depth of flow =   2.982(Ft.), Average velocity =  12.709(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              10.00
      2             10.00               0.00
      3             20.00              10.00
Manning's 'N' friction factor =   0.040
----------------------------------------------------------------------
Sub-Channel flow  =    112.989(CFS)
  '     '    flow top width =      5.963(Ft.)
  '     '    velocity=   12.709(Ft/s)
  '     '    area =      8.890(Sq.Ft)
  '     '    Froude number =     1.834

Upstream point elevation =  5720.000(Ft.)
Downstream point elevation =  5600.000(Ft.)
Flow length =  1100.000(Ft.)
Travel time  =    1.44 min.
Time of concentration =    8.81 min.
Depth of flow =   2.982(Ft.)
Average velocity =  12.709(Ft/s)
Total irregular channel flow =   112.989(CFS)
Irregular channel normal depth above invert elev. =   2.982(Ft.)
Average velocity of channel(s) =  12.709(Ft/s)
 Adding area flow to channel
RESIDENTIAL(2 dwl/acre)
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.7000     Max loss rate(Fm)=     0.317(In/Hr)
Rainfall intensity =      7.658(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.863
Subarea runoff =     75.381(CFS) for   12.800(Ac.)
Total runoff =    150.633(CFS)
Effective area this stream =       22.80(Ac.)
Total Study Area (Main Stream No. 1) =       72.40(Ac.)
Area averaged Fm value =    0.317(In/Hr)
Depth of flow =   3.321(Ft.), Average velocity =  13.657(Ft/s)
End of computations, Total Study Area =           72.40 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.707
Area averaged SCS curve number =  75.6
```

EXHIBIT "B-2"

RATIONAL METHOD HYDRAULIC CALCULATIONS

PROPOSED PROJECT AREA UNDEVELOPED

(100 YEAR STORM EVENT)

```
              San Bernardino County Rational Hydrology Program

                   (Hydrology Manual Date - August 1986)

  CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
       Rational Hydrology Study        Date: 06/15/05
 ----------------------------------------------------------------------
 CHURCH OF THE WOODS
 LAKE ARROWHEAD
 100 YEAR UNDEVELOPED
 file: COWUNDEV
 ----------------------------------------------------------------------


 Program License Serial Number 5032

 ----------------------------------------------------------------------
  *********   Hydrology Study Control Information **********

 ----------------------------------------------------------------------
 Rational hydrology study storm event year is   100.0
 Computed rainfall intensity:
 Storm year =   100.00   1 hour rainfall =     2.000 (In.)
 Slope used for rainfall intensity curve b =  0.7000
 Soil antecedent moisture condition (AMC) = 2


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        1.000 to Point/Station        2.000
 **** INITIAL AREA EVALUATION ****
 ______________________________________________________________________
 UNDEVELOPED (poor cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2)  = 89.00
 Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.211(In/Hr)
 Initial subarea data:
 Initial area flow distance =  1000.000(Ft.)
 Top (of initial area) elevation =  5662.000(Ft.)
 Bottom (of initial area) elevation =  5577.000(Ft.)
 Difference in elevation =    85.000(Ft.)
 Slope =    0.08500  s(%)=       8.50
 TC = k(0.525)*[(length^3)/(elevation change)]^0.2
 Initial area time of concentration =   13.623 min.
 Rainfall intensity =      5.646(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
 Subarea runoff =     28.861(CFS)
 Total initial stream area =        5.900(Ac.)
 Pervious area fraction = 1.000
 Initial area Fm value =    0.211(In/Hr)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        1.000 to Point/Station        2.000
 **** CONFLUENCE OF MINOR STREAMS ****
 ______________________________________________________________________
 Along Main Stream number: 1 in normal stream number 1
```

```
Stream flow area =       5.900(Ac.)
Runoff from this stream =      28.861(CFS)
Time of concentration =   13.62 min.
Rainfall intensity =     5.646(In/Hr)
Area averaged loss rate (Fm) =    0.2108(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        3.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 89.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.211(In/Hr)
Initial subarea data:
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  5662.000(Ft.)
Bottom (of initial area) elevation =  5588.000(Ft.)
Difference in elevation =    74.000(Ft.)
Slope =    0.07400  s(%)=       7.40
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.006 min.
Rainfall intensity =      5.538(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.866
Subarea runoff =     20.615(CFS)
Total initial stream area =        4.300(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.211(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________
Depth of flow =   0.903(Ft.), Average velocity =   5.060(Ft/s)
      ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              2.00
      2             10.00              0.00
      3             20.00              2.00
Manning's 'N' friction factor =   0.040
----------------------------------------------------------------
Sub-Channel flow  =     20.615(CFS)
  '     '    flow top width =      9.027(Ft.)
  '     '    velocity=    5.060(Ft/s)
  '     '    area =      4.074(Sq.Ft)
  '     '    Froude number =     1.327

Upstream point elevation =  5588.000(Ft.)
Downstream point elevation =  5577.000(Ft.)
Flow length =   200.000(Ft.)
Travel time  =    0.66 min.
Time of concentration =   14.66 min.
```

```
Depth of flow =   0.903(Ft.)
Average velocity =   5.060(Ft/s)
Total irregular channel flow =    20.615(CFS)
Irregular channel normal depth above invert elev. =   0.903(Ft.)
Average velocity of channel(s) =   5.060(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      4.300(Ac.)
Runoff from this stream =     20.615(CFS)
Time of concentration =   14.66 min.
Rainfall intensity =     5.362(In/Hr)
Area averaged loss rate (Fm) =    0.2108(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 89.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.211(In/Hr)
Initial subarea data:
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =  5650.000(Ft.)
Bottom (of initial area) elevation =  5577.000(Ft.)
Difference in elevation =    73.000(Ft.)
Slope =    0.14600  s(%)=      14.60
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.266 min.
Rainfall intensity =      7.395(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.874
Subarea runoff =     25.862(CFS)
Total initial stream area =        4.000(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.211(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      4.000(Ac.)
Runoff from this stream =     25.862(CFS)
Time of concentration =    9.27 min.
Rainfall intensity =     7.395(In/Hr)
Area averaged loss rate (Fm) =    0.2108(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 89.00
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.211(In/Hr)
Initial subarea data:
Initial area flow distance =   600.000(Ft.)
Top (of initial area) elevation =  5680.000(Ft.)
Bottom (of initial area) elevation =  5577.000(Ft.)
Difference in elevation =   103.000(Ft.)
Slope =    0.17167  s(%)=      17.17
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.649 min.
Rainfall intensity =      7.188(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.874
Subarea runoff =     16.326(CFS)
Total initial stream area =        2.600(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.211(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      2.600(Ac.)
Runoff from this stream =     16.326(CFS)
Time of concentration =    9.65 min.
Rainfall intensity =     7.188(In/Hr)
Area averaged loss rate (Fm) =    0.2108(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)    (Ac.)       (min) (In/Hr)      (In/Hr)


1     28.86     5.900     13.62    0.211      5.646
2     20.61     4.300     14.66    0.211      5.362
3     25.86     4.000      9.27    0.211      7.395
4     16.33     2.600      9.65    0.211      7.188
Qmax(1) =
         1.000 *    1.000 *    28.861) +
         1.055 *    0.929 *    20.615) +
         0.757 *    1.000 *    25.862) +
         0.779 *    1.000 *    16.326) + =      81.352
Qmax(2) =
         0.948 *    1.000 *    28.861) +
         1.000 *    1.000 *    20.615) +
         0.717 *    1.000 *    25.862) +
         0.738 *    1.000 *    16.326) + =      78.568
Qmax(3) =
         1.322 *    0.680 *    28.861) +
```

```
          1.395 *    0.632 *    20.615) +
          1.000 *    1.000 *    25.862) +
          1.030 *    0.960 *    16.326) + =      86.114
 Qmax(4) =
          1.284 *    0.708 *    28.861) +
          1.354 *    0.658 *    20.615) +
          0.971 *    1.000 *    25.862) +
          1.000 *    1.000 *    16.326) + =      86.055

 Total of 4 streams to confluence:
 Flow rates before confluence point:
       28.861      20.615      25.862      16.326
 Maximum flow rates at confluence using above data:
        81.352      78.568      86.114      86.055
 Area of streams before confluence:
         5.900       4.300       4.000       2.600
 Effective area values after confluence:
        16.495      16.800      13.226      13.608
 Results of confluence:
 Total flow rate =     86.114(CFS)
 Time of concentration =     9.266 min.
 Effective stream area after confluence =     13.226(Ac.)
 Study area average Pervious fraction(Ap) =  1.000
 Study area average soil loss rate(Fm) =    0.211(In/Hr)
 Study area total (this main stream) =      16.80(Ac.)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        5.000 to Point/Station        6.000
 **** INITIAL AREA EVALUATION ****
 ______________________________________________________________________
 UNDEVELOPED (poor cover) subarea
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2)  = 89.00
 Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.211(In/Hr)
 Initial subarea data:
 Initial area flow distance =   380.000(Ft.)
 Top (of initial area) elevation =  5680.000(Ft.)
 Bottom (of initial area) elevation =  5620.000(Ft.)
 Difference in elevation =    60.000(Ft.)
 Slope =    0.15789  s(%)=      15.79
 TC = k(0.525)*[(length^3)/(elevation change)]^0.2
 Initial area time of concentration =    8.173 min.
 Rainfall intensity =      8.073(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.877
 Subarea runoff =     16.276(CFS)
 Total initial stream area =        2.300(Ac.)
 Pervious area fraction = 1.000
 Initial area Fm value =    0.211(In/Hr)
 End of computations, Total Study Area =           19.10 (Ac.)
 The following figures may
 be used for a unit hydrograph study of the same area.
 Note: These figures do not consider reduced effective area
 effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged SCS curve number =  89.0
```

DRAINAGE MAP

SHOWING NATURAL DRAINAGE AREA WITHIN AREA TO BE DEVELOPED

AREAS USED FOR CALCULATIONS OF UNDEVELOPED "Q_{100}"

Original map on file with the County of San Bernardino, Land Use Services Department

CHURCH OF THE WOODS

DRAINAGE MAP

SHOWING NATURAL DRAINAGE AREAS WITHIN AREA TO BE DEVELOPED - AREAS USED FOR CALCULATIONS OF UNDEVELOPED "Q_{100}"

Scale: 1" = 50'

NOTES:

1. RECORD OWNER: CHURCH OF THE WOODS, A CALIFORNIA CORPORATION; P. O. BOX 2000; LAKE ARROWHEAD, CA. 92352; 909-337-5483.
2. PUBLIC UTILITIES ARE AS FOLLOWS:
   A) WATER: CRESTLINE LAKE ARROWHEAD WATER AGENCY; P.O. BOX 3660; CRESTLINE, CA. 92325; 909-338-1775
   B) SEWER: LAKE ARROWHEAD COMMUNITY SERVICES DIST; P. O. BOX 758; LAKE ARROWHEAD, CA 92352; 909-337-8555
   C) NATURAL GAS: SO. CAL. GAS CO.; P. O. BOX 6226; SAN BERNARDINO, CA; 909-889-9711
   D) ELECTRIC: SO. CAL. EDISON CO.; P. O. BOX 95; RIM FOREST, CA; 92378; 909-337-2564
   E) TELEPHONE: VERIZON; 1500 CRESTON AVE.; MOUNTAIN, CA; 92338; 909-703-7441
   F) CABLE TV: FALCON CABLE; P. O. BOX 9; RIM FOREST, CA; 92378; 909-336-2457
3. LEGAL DESCRIPTION: THE SE 1/4; NW 1/4; SECTION 29, T.3N; R.3W; SBM. COUNTY OF SAN BERNARDINO, CALIFORNIA. APN NO. 336-101-06
4. THE CURRENT AND PROPOSED GENERAL PLAN USE DISTRICT IS LA/RS.
5. ENTRY SIGNS WILL BE SUBMITTED FOR REVIEW AT A LATER DATE.
6. ALL PARKING AREAS WILL BE SURFACED WITH ASPHALT. THE MINIMUM PARKING SPACE WILL BE 9'x19' TYPICAL.
7. TREES TO BE REMOVED ARE DISCUSSED IN THE FORESTERS REPORT PREPARED BY JOHN HATCHER DATED 3-25-03.

PROJECT SUMMARY:

TOTAL PROJECT

a)	Building Coverage (First Floor)	69,319 SF	4.3%
b)	Drives / Walks / Drainage	340,012 SF	21.2%
c)	Ball Field and Play Fields	238,660 SF	14.9%
d)	Landscape and Recreation	128,200 SF	8.0%
e)	Landscape Slopes	233,535 SF	14.6%
f)	Natural Area	595,414 SF	37.1%
	TOTAL AREA	1,605,150 SF	100%

PROJECT SUMMARY

PARCEL 1: PLAYFIELDS:

a)	Building Coverage	480 SF	0.2%
b)	Drives and Walks	33,462 SF	13.5%
c)	Slope Area	45,845 SF	18.0%
d)	Ornamental Landscape	18,881 SF	7.4%
e)	Play Field	120,312 SF	52.6%
f)	Natural Area	10,023 SF	4.4%
	TOTAL AREA :	228,533 SF	100%

PARCEL 2: CHURCH OF THE WOODS:

a)	Building Coverage	68,740 SF	12.0%
b)	Drives and Walks	270,914 SF	46.1%
c)	Slope Area	71,791 SF	12.5%
d)	Ornamental Landscape/Recreation	108,238 SF	18.9%
e)	Natural Area	49,338 SF	8.5%
	TOTAL AREA :	575,710 SF	100%

PARCEL 3: BASEBALL FIELD:

a)	Drives, Walks and Drainage	28,316 SF	9.6%
b)	Slopes	118,969 SF	39.6%
c)	Ball Field and Adjacent Areas	118,558 SF	40.3%
d)	Landscape	2,281 SF	0.8%
e)	Natural Area	29,123 SF	9.9%
	TOTAL AREA :	294,576 SF	100%

PARCEL 4: NATURAL OPEN SPACE 147,481 SF

PARCEL 5: NATURAL OPEN SPACE 359,360 SF

BUILDING SUMMARY

CHURCH OF THE WOODS

PHASE I

ASSEMBLY BUILDING-(YOUTH CENTER)

First Floor	18,925 SF
Second Floor	8,576 SF
Snack Bar	483 SF
SUBTOTAL	27,984 SF

PHASE II

ASSEMBLY BUILDING ADDITION-(AUDITORIUM/CHILDREN'S MINISTRY)

First Floor	27,254 SF
Second Floor	13,783 SF
SUBTOTAL	41,037 SF

MAINTENANCE BUILDING

First Floor	1,800 SF
Second Floor	700 SF
SUBTOTAL	2,500 SF

PHASE III

		SEATING
WORSHIP CENTER		
First Floor	18,580 SF	500 PEOPLE
Second Floor	4,930 SF	400 PEOPLE
SUBTOTAL	23,510 SF	1,200 PEOPLE
CHAPEL/RETREAT		
First Floor	2,900 SF	
Second Floor	173 SF	
SUBTOTAL	3,073 SF	

TOTAL SQUARE FOOTAGE: (CHURCH OF THE WOODS) 97,484 SF

PARKING SUMMARY (9x19 TYPICAL)	REQUIRED	PROVIDED
CHURCH OF THE WOODS (BUILD OUT) 1200 SEATS (1 space for 4 seats)	300	PHASE III - 540

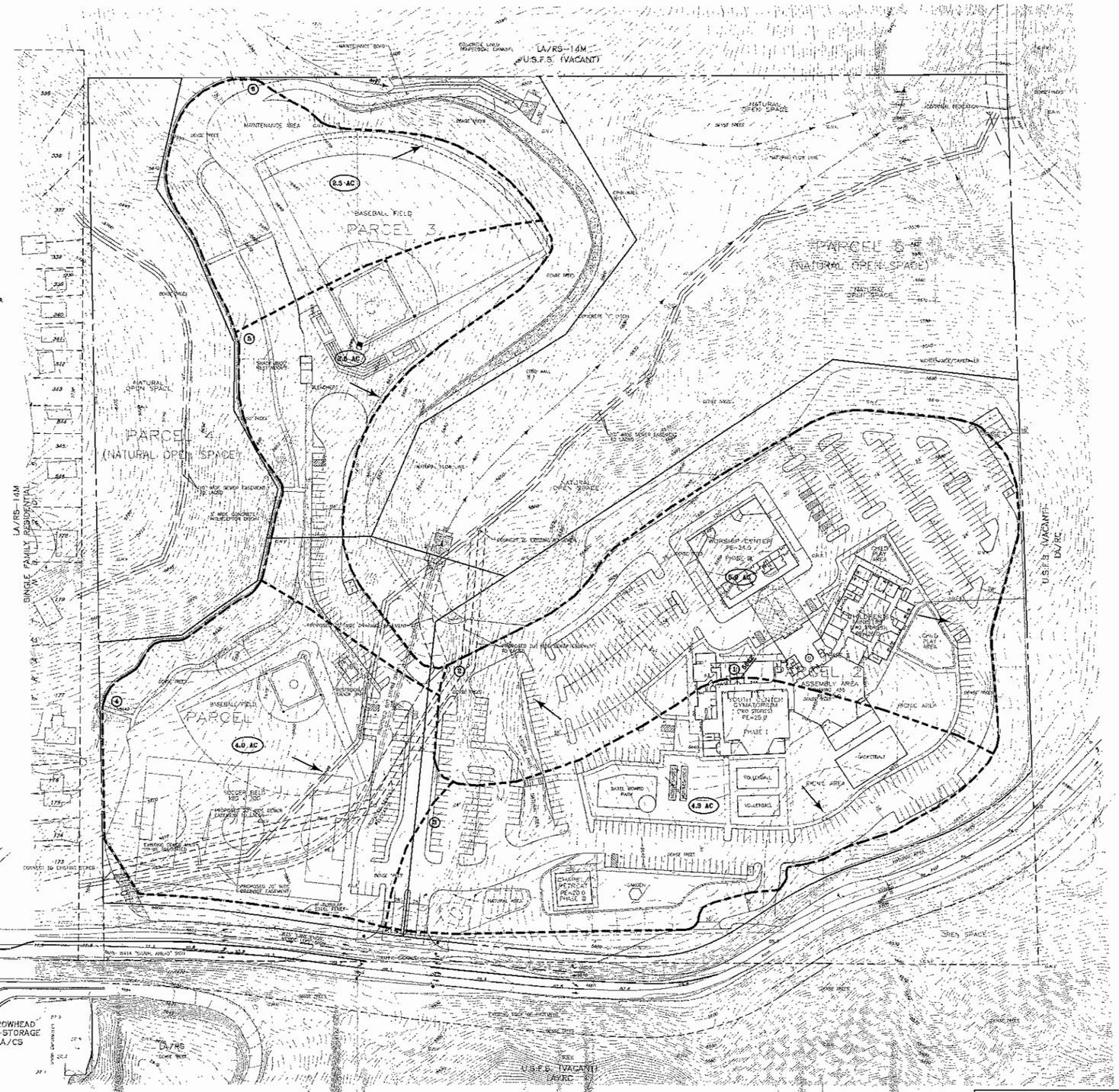


EXHIBIT "B-3"

RATIONAL METHOD HYDRAULIC CALCULATIONS

PROPOSED PROJECT AREA DEVELOPED

(100 YEAR STORM EVENT)

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              San Bernardino County Rational Hydrology Program

                   (Hydrology Manual Date - August 1986)

  CIVILCADD/CIVILDESIGN  Engineering Software, (c) 1989-2005 Version 7.1
       Rational Hydrology Study        Date: 06/15/05
 ----------------------------------------------------------------------
 CHURCH OF THE WOODS
 LAKE ARROWHEAD
 100 YEAR DEVELOPED
 file:COWDEV
 ----------------------------------------------------------------------


 Program License Serial Number 5032

 ----------------------------------------------------------------------
  *********   Hydrology Study Control Information **********

 ----------------------------------------------------------------------
 Rational hydrology study storm event year is   100.0
 Computed rainfall intensity:
 Storm year =   100.00   1 hour rainfall =     2.000 (In.)
 Slope used for rainfall intensity curve b =  0.7000
 Soil antecedent moisture condition (AMC) = 2


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        1.000 to Point/Station        2.000
 **** INITIAL AREA EVALUATION ****
 ______________________________________________________________________
 Decimal fraction soil group A = 0.000
 Decimal fraction soil group B = 0.000
 Decimal fraction soil group C = 0.000
 Decimal fraction soil group D = 1.000
 SCS curve number for soil(AMC 2)  = 75.00
 Pervious ratio(Ap) = 0.2000     Max loss rate(Fm)=     0.091(In/Hr)
 Initial subarea data:
 Initial area flow distance =  1000.000(Ft.)
 Top (of initial area) elevation =  5629.000(Ft.)
 Bottom (of initial area) elevation =  5606.000(Ft.)
 Difference in elevation =    23.000(Ft.)
 Slope =    0.02300  s(%)=       2.30
 TC = k(0.324)*[(length^3)/(elevation change)]^0.2
 Initial area time of concentration =   10.919 min.
 Rainfall intensity =      6.592(In/Hr) for a   100.0 year storm
 Effective runoff coefficient used for area (Q=KCIA) is C = 0.888
 Subarea runoff =     33.058(CFS)
 Total initial stream area =        5.650(Ac.)
 Pervious area fraction = 0.200
 Initial area Fm value =    0.091(In/Hr)


 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
 Process from Point/Station        1.000 to Point/Station        2.000
 **** CONFLUENCE OF MINOR STREAMS ****
 ______________________________________________________________________
 Along Main Stream number: 1 in normal stream number 1
 Stream flow area =      5.650(Ac.)
```

```
Runoff from this stream =      33.058(CFS)
Time of concentration =   10.92 min.
Rainfall intensity =      6.592(In/Hr)
Area averaged loss rate (Fm) =     0.0906(In/Hr)
Area averaged Pervious ratio (Ap) = 0.2000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        3.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.3500     Max loss rate(Fm)=     0.159(In/Hr)
Initial subarea data:
Initial area flow distance =   900.000(Ft.)
Top (of initial area) elevation =  5629.000(Ft.)
Bottom (of initial area) elevation =  5620.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.360)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.740 min.
Rainfall intensity =      5.612(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.875
Subarea runoff =     17.670(CFS)
Total initial stream area =        3.600(Ac.)
Pervious area fraction = 0.350
Initial area Fm value =    0.159(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________
Top of street segment elevation =  5619.000(Ft.)
End of street segment elevation =  5606.000(Ft.)
Length of street segment  =   520.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  18.000(Ft.)
Distance from crown to crossfall grade break  =  16.500(Ft.)
Slope from gutter to grade break (v/hz) =   0.080
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =   7.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     20.039(CFS)
Depth of flow =   0.431(Ft.), Average velocity =   4.415(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.720(Ft.)
Flow velocity =   4.42(Ft/s)
Travel time =    1.96 min.     TC =   15.70  min.
 Adding area flow to street
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.4000     Max loss rate(Fm)=     0.181(In/Hr)
Rainfall intensity =      5.111(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.871
Subarea runoff =      4.590(CFS) for    1.400(Ac.)
Total runoff =     22.259(CFS)
Effective area this stream =        5.00(Ac.)
Total Study Area (Main Stream No. 1) =       10.65(Ac.)
Area averaged Fm value =    0.165(In/Hr)
Street flow at end of street =     22.259(CFS)
Half street flow at end of street =     11.130(CFS)
Depth of flow =   0.444(Ft.), Average velocity =   4.530(Ft/s)
Flow width (from curb towards crown)=  15.345(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.000(Ac.)
Runoff from this stream =     22.259(CFS)
Time of concentration =   15.70 min.
Rainfall intensity =     5.111(In/Hr)
Area averaged loss rate (Fm) =    0.1649(In/Hr)
Area averaged Pervious ratio (Ap) = 0.3640


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.9000     Max loss rate(Fm)=     0.408(In/Hr)
Initial subarea data:
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =  5611.000(Ft.)
Bottom (of initial area) elevation =  5606.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.01000  s(%)=       1.00
TC = k(0.487)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.693 min.
Rainfall intensity =      5.355(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.831
Subarea runoff =     15.139(CFS)
Total initial stream area =        3.400(Ac.)
Pervious area fraction = 0.900
Initial area Fm value =    0.408(In/Hr)


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Process from Point/Station        4.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      3.400(Ac.)
Runoff from this stream =      15.139(CFS)
Time of concentration =   14.69 min.
Rainfall intensity =     5.355(In/Hr)
Area averaged loss rate (Fm) =    0.4077(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.9000     Max loss rate(Fm)=     0.408(In/Hr)
Initial subarea data:
Initial area flow distance =   650.000(Ft.)
Top (of initial area) elevation =  5685.000(Ft.)
Bottom (of initial area) elevation =  5606.000(Ft.)
Difference in elevation =    79.000(Ft.)
Slope =    0.12154  s(%)=      12.15
TC = k(0.487)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.903 min.
Rainfall intensity =      7.058(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.848
Subarea runoff =     14.964(CFS)
Total initial stream area =        2.500(Ac.)
Pervious area fraction = 0.900
Initial area Fm value =    0.408(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      2.500(Ac.)
Runoff from this stream =     14.964(CFS)
Time of concentration =    9.90 min.
Rainfall intensity =     7.058(In/Hr)
Area averaged loss rate (Fm) =    0.4077(In/Hr)
Area averaged Pervious ratio (Ap) = 0.9000
Summary of stream data:

Stream Flow rate    Area     TC     Fm       Rainfall Intensity
 No.    (CFS)    (Ac.)       (min) (In/Hr)      (In/Hr)


1      33.06     5.650     10.92    0.091       6.592
2      22.26     5.000     15.70    0.165       5.111
3      15.14     3.400     14.69    0.408       5.355
4      14.96     2.500      9.90    0.408       7.058
Qmax(1) =
```

```
          1.000 *    1.000 *    33.058) +
          1.299 *    0.695 *    22.259) +
          1.250 *    0.743 *    15.139) +
          0.930 *    1.000 *    14.964) + =      81.145
 Qmax(2) =
          0.772 *    1.000 *    33.058) +
          1.000 *    1.000 *    22.259) +
          0.951 *    1.000 *    15.139) +
          0.707 *    1.000 *    14.964) + =      72.767
 Qmax(3) =
          0.810 *    1.000 *    33.058) +
          1.049 *    0.936 *    22.259) +
          1.000 *    1.000 *    15.139) +
          0.744 *    1.000 *    14.964) + =      74.892
 Qmax(4) =
          1.072 *    0.907 *    33.058) +
          1.394 *    0.631 *    22.259) +
          1.344 *    0.674 *    15.139) +
          1.000 *    1.000 *    14.964) + =      80.375

 Total of 4 streams to confluence:
 Flow rates before confluence point:
       33.058      22.259      15.139      14.964
 Maximum flow rates at confluence using above data:
        81.145      72.767      74.892      80.375
 Area of streams before confluence:
         5.650       5.000       3.400       2.500
 Effective area values after confluence:
        14.154      16.550      16.228      13.068
 Results of confluence:
 Total flow rate =     81.145(CFS)
 Time of concentration =    10.919 min.
 Effective stream area after confluence =     14.154(Ac.)
 Study area average Pervious fraction(Ap) =  0.499
 Study area average soil loss rate(Fm) =    0.226(In/Hr)
 Study area total (this main stream) =      16.55(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
SCS curve number for soil(AMC 2)  = 75.00
Pervious ratio(Ap) = 0.9000     Max loss rate(Fm)=     0.408(In/Hr)
Initial subarea data:
Initial area flow distance =   460.000(Ft.)
Top (of initial area) elevation =  5685.000(Ft.)
Bottom (of initial area) elevation =  5616.500(Ft.)
Difference in elevation =    68.500(Ft.)
Slope =    0.14891  s(%)=      14.89
TC = k(0.487)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.280 min.
Rainfall intensity =      8.000(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.854
Subarea runoff =     17.767(CFS)
Total initial stream area =        2.600(Ac.)
```

Pervious area fraction = 0.900
Initial area Fm value = 0.408(In/Hr)
End of computations, Total Study Area = 19.15 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.554
Area averaged SCS curve number = 75.0

DRAINAGE MAP

SHOWING DRAINAGE AREAS AFTER DEVELOPMENT IS COMPLETED AREAS USED FOR CALCULATIONS OF DEVELOPED "Q_{100}"

Original map on file with the County of San Bernardino, Land Use Services Department

CHURCH OF THE WOODS

CONDITIONAL USE PERMIT
SITE PLAN
DRAINAGE MAP

SHOWING DRAINAGE AREAS
AFTER DEVELOPMENT IS COMPLETE

Scale 1" = 50'

NOTES:

1. RECORD OWNER: CHURCH OF THE WOODS, A CALIFORNIA CORPORATION; P. O. BOX 2000; LAKE ARROWHEAD, CA; 92352; 909-337-5483.
2. PUBLIC UTILITIES ARE AS FOLLOWS:
   A) WATER: CRESTLINE LAKE ARROWHEAD WATER AGENCY; P.O. BOX 3650; CRESTLINE, CA. 92325; 909-338-1775
   B) SEWER: LAKE ARROWHEAD COMMUNITY SERVICES DIST. P. O. BOX 789; LAKE ARROWHEAD, CA 92352; 909-337-8555
   C) NATURAL GAS: SO. CAL. GAS CO.; P. O. BOX 6225; SAN BERNARDINO, CA; 909-889-9711
   D) ELECTRIC: SO. CAL. EDISON CO.; P. O. BOX 95; RIM FOREST, CA; 92378; 909-337-2564
   E) TELEPHONE: VERIZON; 1500 GRAFTON AVE.; MENTONE, CA; 92359; 909-793-7441
   F) CABLE TV: FALCON CABLE; P. O. BOX 9; RIM FOREST, CA; 92378; 909-336-2437
3. LEGAL DESCRIPTION: THE SE 1/4; NW 1/4; SECTION 29, T.2N; R.3W; SBM. COUNTY OF SAN BERNARDINO, CALIFORNIA. APN NO. 336-101-06
4. THE CURRENT AND PROPOSED GENERAL PLAN USE DISTRICT IS IA/RC.
5. ENTRY SIGNS WILL BE SUBMITTED FOR REVIEW AT A LATER DATE.
6. ALL PARKING AREAS WILL BE SURFACED WITH ASPHALT. THE MINIMUM PARKING SPACE WILL BE 9'x19' TYPICAL.
7. TREES TO BE REMOVED ARE DISCUSSED IN THE FORESTERS REPORT PREPARED BY JOHN HATCHER DATED 3-25-03.

PROJECT SUMMARY:

TOTAL PROJECT

a) Building Coverage (First Floor)	69,218 SF	4.2%
b) Drives / Walks / Drainage	340,612 SF	21.2%
c) Ball Field and Play Fields	238,800 SF	14.9%
d) Landscape and Recreation	125,200 SF	8.0%
e) Landscape Slopes	233,830 SF	14.6%
f) Natural Area	595,414 SF	37.1%
TOTAL AREA	1,602,160 SF	100%

PROJECT SUMMARY

PARCEL 1: PLAYFIELDS:

a) Building Coverage	480 SF	0.2%
b) Drives and Walks	35,382 SF	15.5%
c) Slope Area	45,448 SF	19.9%
d) Ornamental Landscape	16,981 SF	7.4%
e) Play Field	120,303 SF	52.6%
f) Natural Area	10,022 SF	4.4%
TOTAL AREA :	228,533 SF	100%

PARCEL 2: CHURCH OF THE WOODS:

a) Building Coverage	68,748 SF	12.0%
b) Drives and Walks	276,014 SF	48.1%
c) Slope Area	71,791 SF	12.5%
d) Ornamental Landscape/Recreation	106,028 SF	18.5%
e) Natural Area	49,226 SF	8.5%
TOTAL AREA :	573,716 SF	100%

PARCEL 3: BASEBALL FIELD:

a) Drives, Walks and Drainage	28,316 SF	9.6%
b) Slopes	110,969 SF	38.5%
c) Ball Field and Adjacent Areas	118,556 SF	40.2%
d) Landscape	2,281 SF	0.8%
e) Natural Area	29,123 SF	9.8%
TOTAL AREA :	294,876 SF	100%

PARCEL 4: NATURAL OPEN SPACE 147,481 SF

PARCEL 5: NATURAL OPEN SPACE 359,500 SF

BUILDING SUMMARY

CHURCH OF THE WOODS

PHASE I
ASSEMBLY BUILDING--(YOUTH CENTER)

First Floor	18,805 SF
Second Floor	8,679 SF
Snack Bar	480 SF
SUBTOTAL	27,364 SF

PHASE II
ASSEMBLY BUILDING ADDITION--(AUDITORIUM/CHILDREN'S MINISTRY)

First Floor	27,284 SF
Second Floor	13,753 SF
SUBTOTAL	41,037 SF

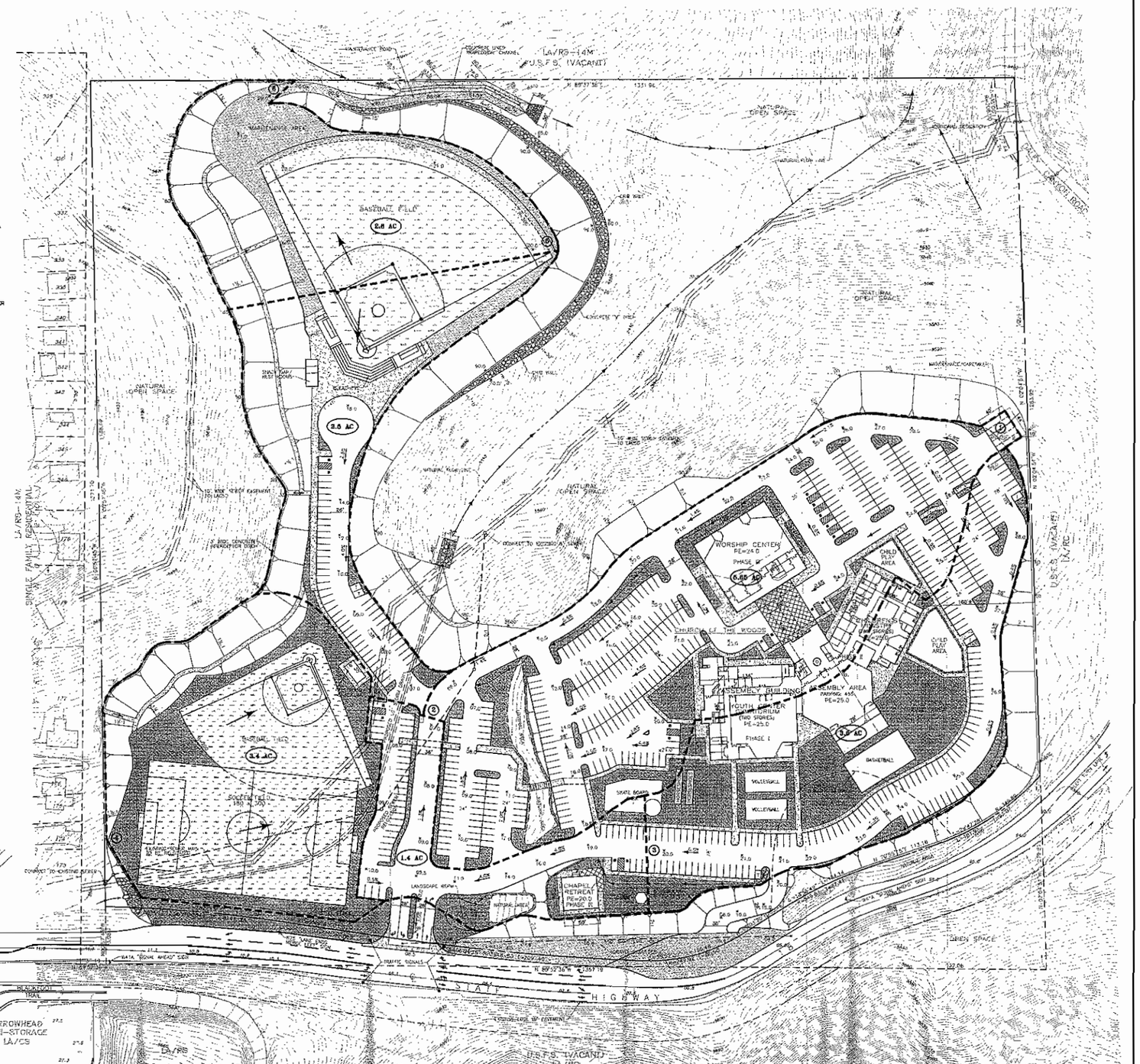
MAINTENANCE BUILDING

First Floor	1,800 SF
Second Floor	700 SF
SUBTOTAL	2,500 SF

PHASE III

WORSHIP CENTER		SEATING
First Floor	18,880 SF	800 PEOPLE
Second Floor	4,630 SF	400 PEOPLE
SUBTOTAL	23,510 SF	1,200 PEOPLE
CHAPEL/RETREAT		
First Floor	2,900 SF	
Second Floor	172 SF	
SUBTOTAL	3,072 SF	
TOTAL SQUARE FOOTAGE (CHURCH OF THE WOODS)	97,484 SF	

PARKING SUMMARY (@x19 TYPICAL)	REQUIRED	PROVIDED
CHURCH OF THE WOODS (BUILD OUT) 1200 SEATS (1 space for 4 seats)	300	PHASE III – 540



LEGEND:

- INDICATES PLAY FIELD
- INDICATES ORNAMENTAL LANDSCAPE
- INDICATES LANDSCAPED MANUFACTURED SLOPE
- INDICATES GRAVEL SHOULDER (HIGHWAY 18)
- INDICATES NATURAL AREA
- INDICATES CONCRETE WALKWAY
- INDICATES 6' TUBULAR STEEL FENCE

DRAINAGE MAP LEGEND:

- INDICATES BORDER OF DRAINAGE AREA
- XX.AC — INDICATES AREA OF DRAINAGE SUB-AREA IN ACRES
- X — INDICATES NODE NUMBER CORRESPONDING TO RATIONAL METHOD HYDROLOGY CALCULATIONS

W.J. McKEEVER, P.E.E. — DATE 9/14/05

REGISTERED PROFESSIONAL ENGINEER — W. J. McKEEVER — No. 22560 — Exp. 12-31-05 — CIVIL — STATE OF CALIFORNIA

9-09-04

W.J. McKEEVER, INC.
CIVIL ENGINEERING
847 NORTH MAIN STREET, SUITE E2
RIVERSIDE, CALIFORNIA 92501
PH.: (951) 241-1200
FAX: (951) 241-3740

EXHIBIT "C"

DRAINAGE IMPROVEMENT PLAN

&

CAPACITY CALCULATIONS

Original map on file with the County of San Bernardino, Land Use Services Department

CHURCH OF THE WOODS
CONDITIONAL USE PERMIT SITE PLAN

Scale: 1" = 50'

NOTES:
1. RECORD OWNER: CHURCH OF THE WOODS, A CALIFORNIA CORPORATION; P. O. BOX 2000; LAKE ARROWHEAD, CA; 92352; 909-337-3483.
2. PUBLIC UTILITIES ARE AS FOLLOWS:
   A) WATER: CRESTLINE LAKE ARROWHEAD WATER AGENCY; P.O. BOX 3880; CRESTLINE, CA. 92325; 909-338-1779
   B) SEWER: LAKE ARROWHEAD COMMUNITY SERVICES DIST; P. O. BOX 700; LAKE ARROWHEAD, CA 92352; 909-337-3532
   C) NATURAL GAS: SO. CAL. GAS CO.; P. O. BOX 6232; SAN BERNARDINO, CA; 800-655-9711
   D) ELECTRIC: SO. CAL. EDISON CO.; P. O. BOX 95; RIM FOREST, CA; 92378; 909-337-2364
   E) TELEPHONE: VERIZON; 1500 CRAFTON AVE.; MONTCLAIR, CA; 91350; 909-793-7441
   F) CABLE TV: FALCON CABLE; P. O. BOX 9; RIM FOREST, CA; 92378; 909-336-2457
3. LEGAL DESCRIPTION: THE SE 1/4; NW 1/4; SECTION 20, T.2N, R.3W, SBM. COUNTY OF SAN BERNARDINO; CALIFORNIA APN NO. 336-101-06
4. THE CURRENT AND PROPOSED GENERAL PLAN USE DISTRICT IS LA/RC.
5. ENTRY SIGNS WILL BE SUBMITTED FOR REVIEW AT A LATER DATE.
6. ALL PARKING AREAS WILL BE SURFACED WITH ASPHALT. THE MINIMUM PARKING SPACE WILL BE 9'x19' TYPICAL.
7. TREES TO BE REMOVED ARE DISCUSSED IN THE FORESTERS REPORT PREPARED BY JOHN HATCHER DATED 3-25-03.

PROJECT SUMMARY:

TOTAL PROJECT

a)	Building Coverage (Total Floor)	59,219 SF	4.2%
b)	Drives / Walks / Drainage	340,612 SF	21.2%
c)	Ball Field and Play Fields	236,800 SF	14.8%
d)	Landscape and Recreation	128,230 SF	8.0%
e)	Landscape Slopes	233,635 SF	14.6%
f)	Natural Area	595,414 SF	37.1%
	TOTAL AREA	1,606,150 SF	100%

PROJECT SUMMARY

PARCEL 1: PLAYFIELDS:

a)	Building Coverage	600 SF	0.3%
b)	Drives and Walks	35,382 SF	15.6%
c)	Slope Area	45,445 SF	19.9%
d)	Ornamental Landscape	16,681 SF	7.4%
e)	Play Field	120,322 SF	52.8%
f)	Natural Area	10,033 SF	4.4%
	TOTAL AREA :	228,533 SF	100%

PARCEL 2: CHURCH OF THE WOODS:

a)	Building Coverage	58,748 SF	12.0%
b)	Drives and Walks	278,914 SF	48.1%
c)	Slope Area	71,791 SF	12.5%
d)	Ornamental Landscape/Recreation	109,035 SF	18.9%
e)	Natural Area	48,223 SF	8.3%
	TOTAL AREA :	575,710 SF	100%

PARCEL 3: BASEBALL FIELD:

a)	Drives, Walks and Drainage	38,316 SF	9.6%
b)	Slopes	116,560 SF	29.3%
c)	Ball Field and Adjacent Areas	119,536 SF	43.2%
d)	Landscape	2,291 SF	0.6%
e)	Natural Area	29,173 SF	9.1%
	TOTAL AREA :	324,876 SF	100%

PARCEL 4: NATURAL OPEN SPACE 147,481 SF

PARCEL 5: NATURAL OPEN SPACE 309,290 SF

BUILDING SUMMARY

CHURCH OF THE WOODS

PHASE I

ASSEMBLY BUILDING-(YOUTH CENTER)

First Floor	18,305 SF
Second Floor	8,571 SF
Snack Bar	488 SF
SUBTOTAL	27,364 SF

PHASE II

ASSEMBLY BUILDING ADDITION-(AUDITORIUM/CHILDREN'S MINISTRY)

First Floor	27,354 SF
Second Floor	13,783 SF
SUBTOTAL	41,137 SF

MAINTENANCE BUILDING

First Floor	1,800 SF
Second Floor	700 SF
SUBTOTAL	2,500 SF

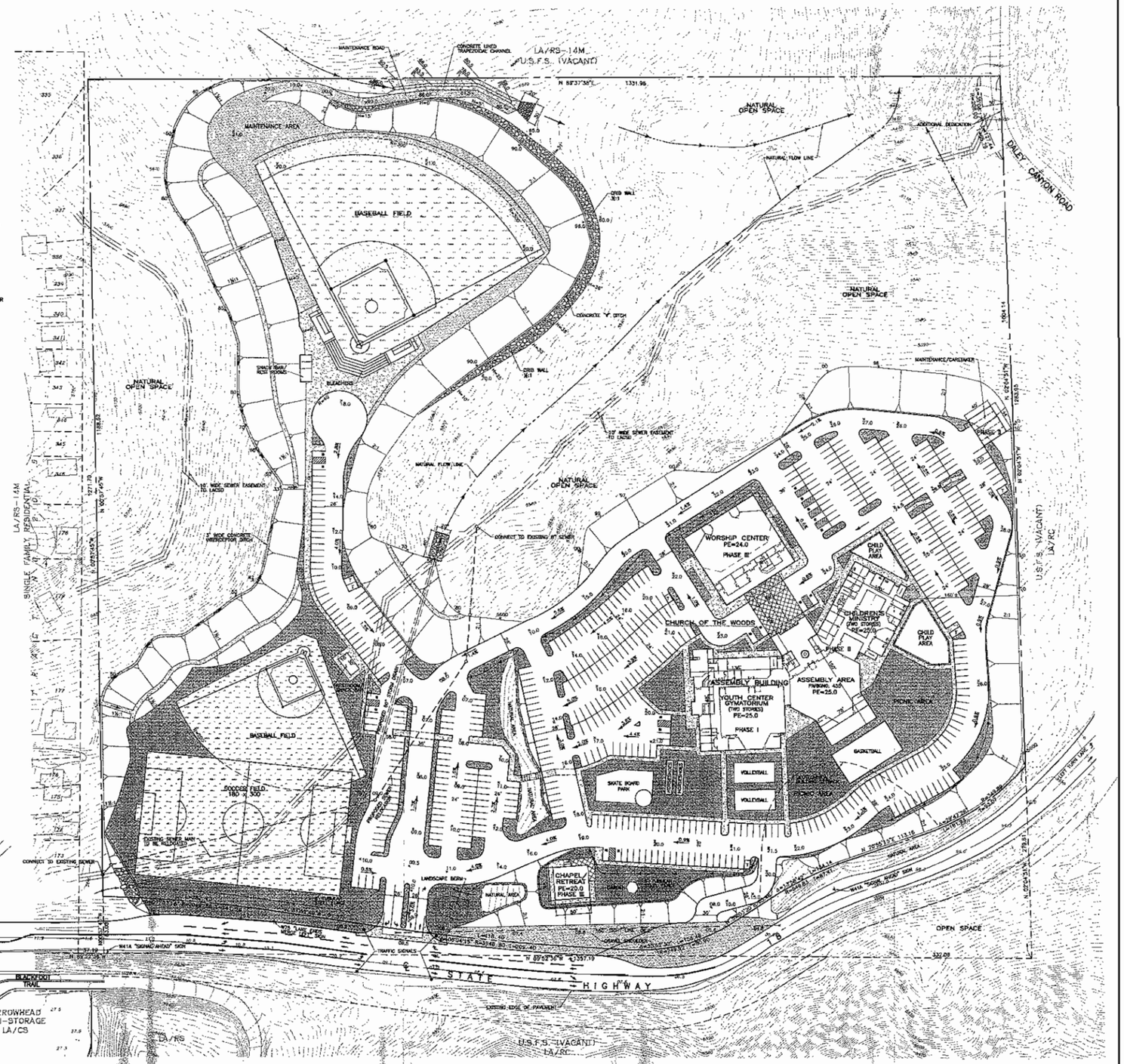
PHASE III

		SEATING
WORSHIP CENTER		
First Floor	18,800 SF	800 PEOPLE
Second Floor	4,630 SF	400 PEOPLE
SUBTOTAL	23,510 SF	1,200 PEOPLE
CHAPEL/RETREAT		
First Floor	2,500 SF	
Second Floor	573 SF	
SUBTOTAL	3,073 SF	

TOTAL SQUARE FOOTAGE: (CHURCH OF THE WOODS) 97,484 SF

PARKING SUMMARY (9x19 TYPICAL)

	REQUIRED	PROVIDED
CHURCH OF THE WOODS (BUILD OUT) 1200 SEATS (1 space for 4 seats)	300	PHASE III - 540



LEGEND:
- INDICATES PLAY FIELD
- INDICATES ORNAMENTAL LANDSCAPE
- INDICATES LANDSCAPED MANUFACTURED SLOPE
- INDICATES GRAVEL SHOULDER (HIGHWAY 18)
- INDICATES NATURAL AREA
- INDICATES CONCRETE WALKWAY
- INDICATES 6' TUBULAR STEEL FENCE

7/11/05
DATE

9-09-04

W.J. McKEEVER, INC.
CIVIL ENGINEERING
047 NORTH MAIN STREET, SUITE 3A
SAN BERNARDINO, CALIFORNIA 92301
PH: (909) 881-0700
FAX: (909) 881-0740

CAPACITY CALCULATION 60" R.C.P.

OUTPUT INFORMATION

This report is for a channel running full.

The Flow Capacity is 159.6 cfs OK Q_{100} = 138.9 CFS
The flow velocity is 8.129 fps

CHANNEL PROPERTIES

The friction factor 'n' = 0.0150
The channel slope = 5.00E-03 ft/ft

Round Channel:

Diameter = 5.000 ft
Flow Area = 19.63 sq-ft
Wetted perimiter = 15.71 ft
Hydraulic radius = 1.250 ft

CAPACITY CALCULATION
CONCRETE CHANNEL - NORTH P.L.

OUTPUT INFORMATION

This report is for a channel running full.

The Flow Capacity is 290.4 cfs
The flow velocity is 27.66 fps

CHANNEL PROPERTIES

The friction factor 'n' = 0.0150
The channel slope = 0.0800 ft/ft

'Trapizoidal' Shaped Channel:

Width at top = 10.00ft
Width at bottom = 4.000ft
Height = 1.500ft
Flow Area = 10.50 sq-ft
Wetted perimiter = 10.71 ft
Hydraulic radius = 0.981 ft

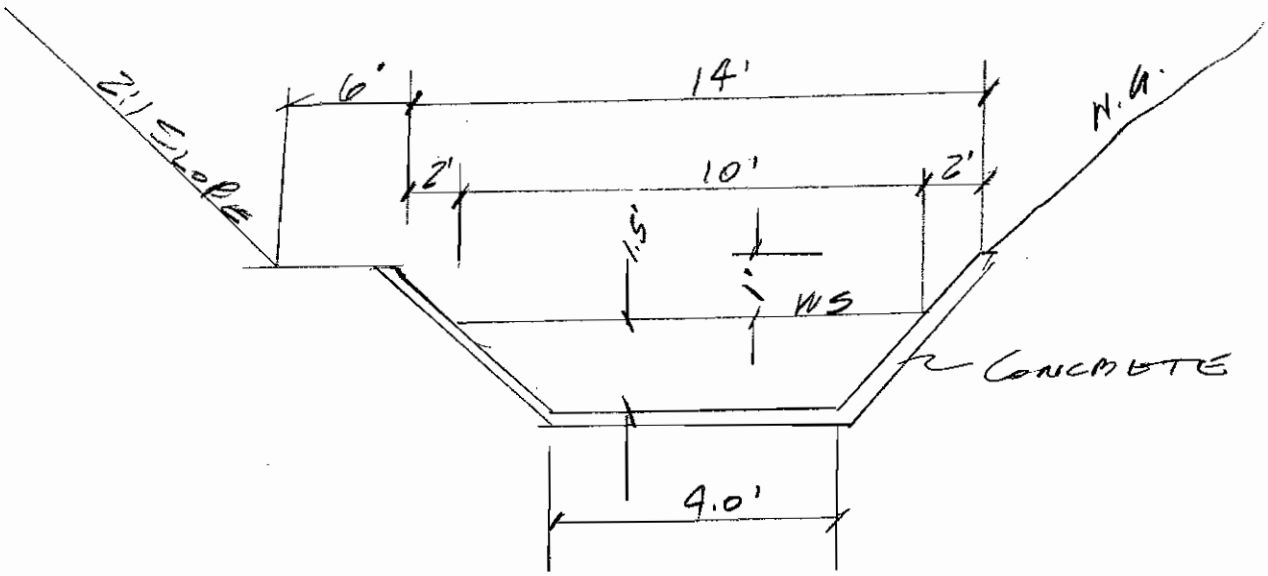


EXHIBIT "D"

EROSION CONTROL BMP'S

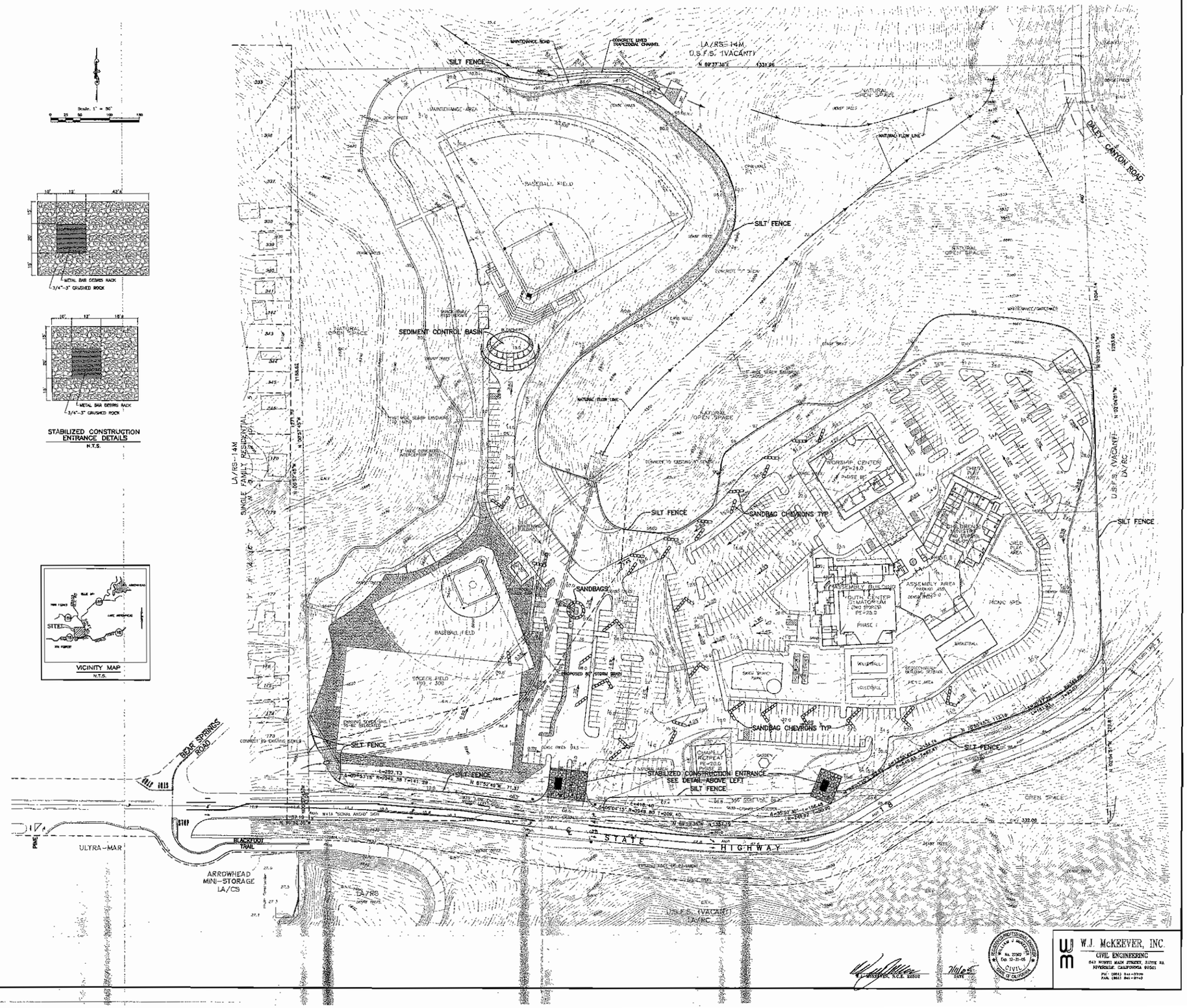
&

PRELIMINARY EROSION CONTROL PLAN

Original map on file with the County of San Bernardino, Land Use Services Department

CHURCH OF THE WOODS AND LAKE ARROWHEAD CHRISTIAN SCHOOL

TEMPORARY EROSION CONTROL PLAN



BMP'S FOR

CONTRACTOR ACTIVITY

4. *BMPs FOR CONTRACTOR ACTIVITIES*

INTRODUCTION

This chapter describes specific Best Management Practices (BMPs) for common construction activities that may pollute storm water. Chapter 2 led you through the steps of identifying activities at your site that can pollute storm water, while Chapter 3 provided guidance on BMP selection. This chapter will provide a list of BMPs that can be used to fit your site's needs.

BMP fact sheets are provided for each of the contractor's activities, noted in the box, are consistent with Worksheet 4 in Chapter 2.

Each fact sheet contains a cover sheet with:

- A description of the BMP
- Approach
- Requirements
  - Costs, including capital costs, and operation and maintenance (O&M) costs
  - Maintenance (including administrative and staffing)
- Limitations
- References

The side bar presents information on which BMP objective applies, targeted constituents, and an indication of the level of effort and costs to implement. For some BMPs, further information is provided in additional sheets.

Contractor Activities

Construction Practices
- CA1 Dewatering Operations
- CA2 Paving Operations
- CA3 Structure Construction and Painting

Material Management
- CA10 Material Delivery and Storage
- CA11 Material Use
- CA12 Spill Prevention and Control

Waste Management
- CA20 Solid Waste Management
- CA21 Hazardous Waste Management
- CA22 Contaminated Soil Management
- CA23 Concrete Waste Management
- CA24 Sanitary/Septic Waste Management

Vehicle and Equipment Management
- CA30 Vehicle and Equipment Cleaning
- CA31 Vehicle and Equipment Fueling
- CA32 Vehicle and Equipment Maintenance

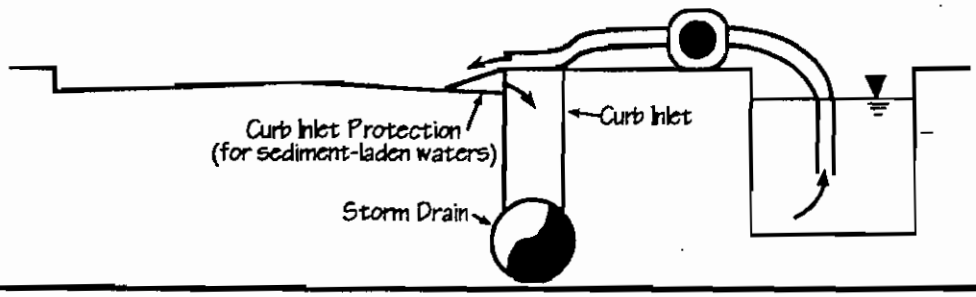
Contractor Training
- CA40 Employee/Subcontractor Training

These BMP fact sheets are suitable for inclusion in many storm water pollution prevention plans for typical contractor activities. The BMPs listed are not an exhaustive list, nor will every BMP be appropriate for every situation. Therefore, suggested BMPs which are inappropriate may be deleted and additional BMPs for specific site conditions should be added. In addition, your selection and implementation of BMPs should be reviewed on a regular basis to match the changing conditions at construction sites.

TABLE 4.1 CONTRACTOR ACTIVITIES AND BMP OBJECTIVES

	BMP CATEGORY	BMP OBJECTIVES						
		PRACTICE GOOD HOUSE-KEEPING	CONTAIN WASTE	MINIMIZE DISTURBED AREA	STABILIZE DISTURBED AREA	PROTECT SLOPES AND CHANNELS	CONTROL SITE PERIMETER	CONTROL INTERNAL EROSION
	Construction Practices							
CA01	Dewatering Operations	✓				✓	✓	✓
CA02	Paving Operations	✓						
CA03	Structure Construction and Painting	✓			✓			
	Material Management							
CA10	Material Delivery and Storage	✓						
CA11	Material Use	✓						
CA12	Spill Prevention and Control	✓						
	Waste Management							
CA20	Solid Waste Management		✓					
CA21	Hazardous Waste Management		✓					
CA22	Contaminated Soil Management		✓	✓	✓			
CA23	Concrete Waste Management		✓					
CA24	Sanitary/Septic Waste Management		✓					
	Vehicle and Equipment Management							
CA30	Vehicle and Equipment Cleaning	✓					✓	✓
CA31	Vehicle and Equipment Fueling	✓						
CA32	Vehicle and Equipment Maintenance	✓						
	Contractor Training							
CA40	Employee/Subcontractor Training	✓	✓					

ACTIVITY: DEWATERING OPERATIONS



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ◒ Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ◒ O&M Costs
- ◒ Maintenance
- ◒ Training
- ○ Suitability for Slopes >5%

● High ○ Low

CA1

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from dewatering operations by using sediment controls and by testing the groundwater for pollution.

APPROACH

There are two general classes of pollutants that may result from dewatering operations; sediment, and toxics and petroleum products. A high sediment content in dewatering discharges is common because of the nature of the operation. On the other hand, toxics and petroleum products are not commonly found in dewatering discharges unless, the site or surrounding area has been used for light or heavy industrial activities, or the area has a history of groundwater contamination. The following steps will help reduce storm water pollution from dewatering discharges:

Sediment

- Use sediment controls to remove sediment from water generated by dewatering (See Sediment Trap (ESC 55) and Sediment Basin (ESC 56) in Chapter 5).
- Use filtration to remove sediment from a sediment trap or basin. Filtration can be achieved with:
  - Sump pit and a perforated or slit standpipe with holes and wrapped in filter fabric. The standpipe is surrounded by stones which filters the water as it collects in the pit before being pumped out.Wrapping the standpipe in filter fabric may require an increased suction inlet area to avoid clogging and unacceptable pump operation.
  - Floating suction hose to allow cleaner surface water to be pumped out.

Toxics and Petroleum Products

- In areas suspected of having groundwater pollution, sample the groundwater near the excavation site and have the water tested for known or suspected pollutants at a certified laboratory. Check with the Regional Water Quality Control Board and the local wastewater treatment plant for their requirements for dewatering, additional water quality tests, and disposal options.
- With a permit from the Regional Water Quality Control Board, you may be able to recycle/reuse pumped groundwater for landscape irrigation, or discharge to the storm sewer. With a permit from the local agency, you may be able to treat pumped groundwater and discharge it to the municipal wastewater treatment plant via the sanitary sewer.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

CONTRACTOR ACTIVITY: DEWATERING OPERATIONS (Continue)

REQUIREMENTS

- Costs (Capital, O&M)
  - Sediment controls are low cost measures.
  - Treatment and/or discharge of polluted groundwater can be quite expensive.
- Maintenance
  - Maintain sediment controls and filters in good working order. (See Chapter 5 for details)
  - Inspect excavated areas daily for signs of contaminated water as evidenced by discoloration, oily sheen, or odors.

LIMITATIONS

- The presence of contaminated water may indicate contaminated soil as well. See CA22 (Contaminated Soil Management) in this chapter for more information.

REFERENCES

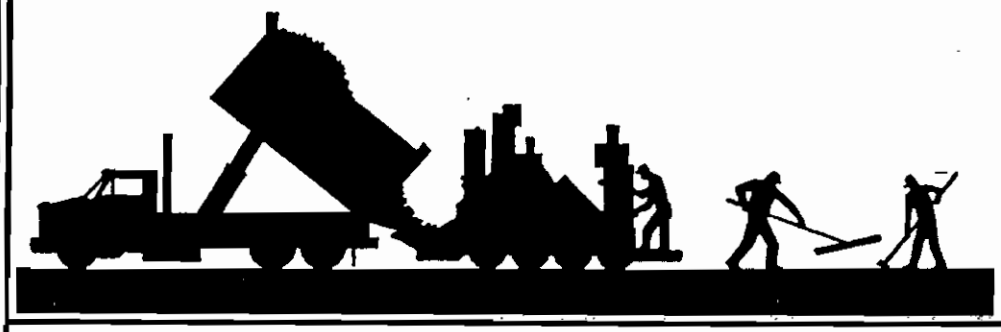
Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

CA1

ACTIVITY: PAVING OPERATIONS

Graphic: North Central Texas COG, 1993



Objectives

- (Housekeeping Practices)
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

DESCRIPTION

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runon and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

APPROACH

- Avoid paving during wet weather.
- Store materials away from drainage courses to prevent storm water runon (see CA10 Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or trap/filter sediment (see Chapter 5).
- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials rather than burying. See CA32 (Vehicle and Equipment Maintenance) and CA12 (Spill Prevention and Control) in this chapter.
- Cover catch basins and manholes when applying seal coat, tack coat, slurry seal, fog seal, etc.
- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- If paving involves portland cement concrete, see CA23 (Concrete Waste Management) in this chapter.
- If paving involves asphaltic concrete, follow these steps:
  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks by sweeping. Properly dispose of this waste by referring to CA20 (Solid Waste Management) in this chapter.
  - Old asphalt must be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.
  - If paving involves on-site mixing plant, follow the storm water permitting requirements for industrial activities.
- Train employees and subcontractors.

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Inspect employees and subcontractors to ensure that measures are being followed.
  - Keep ample supplies of drip pans or absorbent materials on-site.

LIMITATIONS

- There are no major limitations to this best management practice.

Targeted Pollutants

- ◒ Sediment
- ○ Nutrients
- ◒ Toxic Materials
- ◒ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ○ Capital Costs
- ○ O&M Costs
- ◒ Maintenance
- ◒ Training
- ○ Suitability for Slopes >5%

● High ○ Low

CA2

Best Management Practices

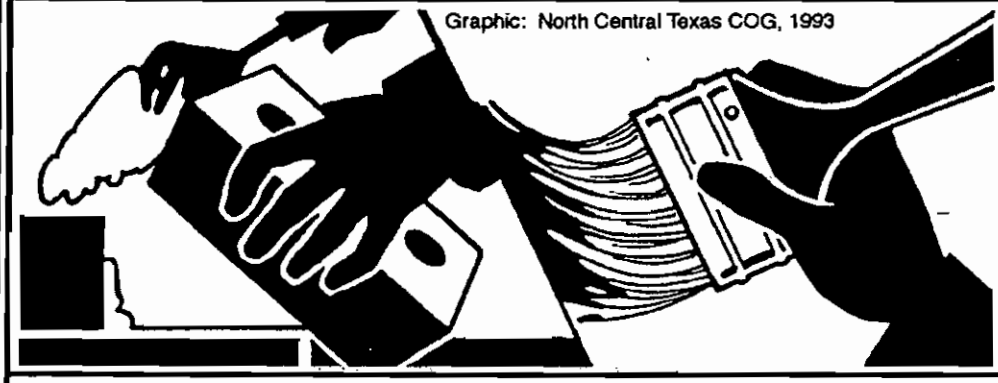
REFERENCES

Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

Hot-mix Asphalt Paving Handbook, U.S, Army Corps of Engineers, AC 150/5370-14, Appendix I, July 1991.

CA2

ACTIVITY: STRUCTURE CONSTRUCTION AND PAINTING



Graphic: North Central Texas COG, 1993

Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ○ *Sediment*
- ○ *Nutrients*
- ◒ *Toxic Materials*
- ○ *Oil & Grease*
- ● *Floatable Materials*
- ● *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ○ *O&M Costs*
- ○ *Maintenance*
- ◒ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA3

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from structure construction and painting by enclosing or covering or berming building material storage areas, using good housekeeping practices, using safer alternative products, and training employees and subcontractors.

APPROACH

- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Use soil erosion control techniques if bare ground is exposed (See Chapter 5).
- Buy recycled or less hazardous products to the maximum extent practicable.
- Conduct painting operations consistent with local air quality and OSHA regulations.
- Properly store paints and solvents. See CA10 (Material Delivery and Storage) in this chapter.
- Properly store and dispose waste materials generated from the activity. See the waste management BMPs (CA20 to CA24) in this chapter.
- Recycle residual paints, solvents, lumber, and other materials to the maximum extent practicable.
- Make sure that nearby storm drains are well marked to minimize the chance of inadvertent disposal of residual paints and other liquids.
- Clean the storm drain system in the immediate construction area after construction is completed.
- Educate employees who are doing the work.
- Inform subcontractors of company policy on these matters and include appropriate provisions in their contract to make certain proper housekeeping and disposal practices are implemented.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

- Costs (Capital, O&M)
  - These BMPs are generally of low to moderate cost.
- Maintenance
  - Maintenance should be minimal.

LIMITATIONS

- Safer alternative products may not be available, suitable, or effective in every case.
- Hazardous waste that cannot be re-used or recycled must be disposed of by a licensed hazardous waste hauler.

- Be certain that actions to help storm water quality are consistent with Cal- and Fed-OSHA and air quality regulations.

Construction and painting activities can generate pollutants that can reach storm water if proper care is not taken. The sources of these contaminants may be solvents, paints, paint and varnish removers, finishing residues, spent thinners, soap cleaners, kerosene, asphalt and concrete materials, adhesive residues, and old asbestos insulation. For specific information on some of these wastes see the following BMPs in this chapter:

CA20 Solid Waste,
CA21 Hazardous Waste, and
CA23 Concrete Waste.

More specific information on structure construction practices is listed below.

Erosion and Sediment Control

If the work involves exposing large areas of soil or if old buildings are being torn down and not replaced in the near future, employ the appropriate soil erosion and control techniques described in Chapter 5.

Storm/Sanitary Sewer Connections

Carefully install all plumbing and drainage systems. Cross connections between the sanitary and storm drain systems, as well as any other connections into the drainage system from inside a building, are illegal. Color code or flag pipelines on the project site to prevent such connections, and train construction personnel.

Painting

Local air pollution regulations may, in many areas of the state, specify painting procedures which if properly carried out are usually sufficient to protect storm water quality. These regulations may require that painting operations be properly enclosed or covered to avoid drift. Use temporary scaffolding to hang drop cloths or draperies to prevent drift. Application equipment that minimizes overspray also helps. When using sealants on wood, pavement, roofs, etc, quickly clean up spills. Remove excess liquid with absorbent material or rags.

If painting requires scraping or sand blasting of the existing surface, use a drop cloth to collect most of the chips. Dispose the residue properly. If the paint contains lead or tributyl tin, it is considered a hazardous waste. Refer to the waste management BMPs in this chapter for more information.

Mix paint indoors, in a containment area, or in a flat unpaved area not subject to significant erosion. Do so even during dry weather because cleanup of a spill will never be 100% effective. Dried paint will erode from sloped surfaces and be washed away by storms. If using water based paints, clean the application equipment in a sink that is connected to the sanitary sewer or in a containment area where the dried paint can be readily removed. Properly store leftover paints if they are to be kept for the next job, or dispose of properly.

Roof work

When working on roofs, if small particles have accumulated in the gutter, either sweep out the gutter or wash the gutter and trap the particles at the outlet of the downspout. A sock or geofabric placed over the outlet may effectively trap the materials. If the downspout is lined tight, place a temporary plug at the first convenient point in the storm drain and pump out the water with a vactor truck, and clean the catch basin sump where you placed the plug.

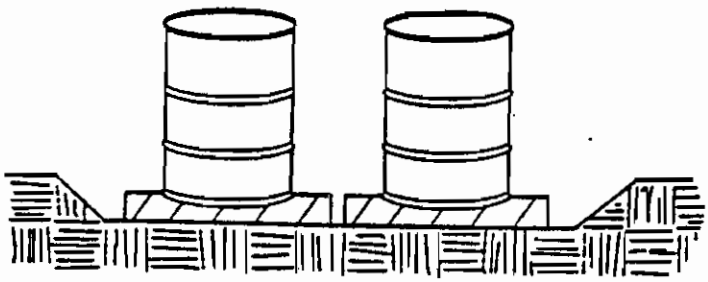
REFERENCES

Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

CA3

Best Management Practices

ACTIVITY: MATERIAL DELIVERY AND STORAGE



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ◒ *Sediment*
- ◒ *Nutrients*
- ◒ *Toxic Materials*
- ◒ *Oil & Grease*
- ◒ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ○ *O&M Costs*
- ○ *Maintenance*
- ◒ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA10

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from material delivery and storage by minimizing the storage of hazardous materials on-site, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see CA11 (Material Use), or CA12 (Spill Prevention and Control). For information on wastes, see the waste management BMPs in this chapter.

APPROACH

The following materials are commonly stored on construction sites:

- Soil,
- Pesticides and herbicides,
- Fertilizers,
- Detergents,
- Plaster or other products,
- Petroleum products such as fuel, oil, and grease, and
- Other hazardous chemicals such as acids, lime, glues, paints, solvents, and curing compounds.

Storage of these materials on-site can pose the following risks:

- Storm water pollution,
- Injury to workers or visitors,
- Groundwater pollution, and
- Soil contamination.

Therefore, the following steps should be taken to minimize your risk:

- Designate areas of the construction site for material delivery and storage.
  - Place near the construction entrances, away from waterways
  - Avoid transport near drainage paths or waterways
  - Surround with earth berms (see ESC30, Earth Dike.)
  - Place in an area which will be paved
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.
- Keep an accurate, up-to-date inventory of materials delivered and stored on-site.
- Keep your inventory down.

- Minimize hazardous materials on-site storage.
- Handle hazardous materials as infrequently as possible.
- During the rainy season, consider storing materials in a covered area. Store materials in secondary containments such as an earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids and to reduce corrosion.
- Try to keep chemicals in their original containers, and keep them well labeled.
- Train employees and subcontractors.
- Employees trained in emergency spill cleanup procedures should be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove materials and any contaminated soil (See CA22). If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

REQUIREMENTS

- Cost (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Keep the designated storage area clean and well organized.
  - Conduct routine weekly inspections and check for external corrosion of material containers.
  - Keep an ample supply of spill cleanup materials near the storage area.

LIMITATIONS

- Storage sheds often must meet building and fire code requirements.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites; Flood Control District of Maricopa County, AZ, September 1992.

Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

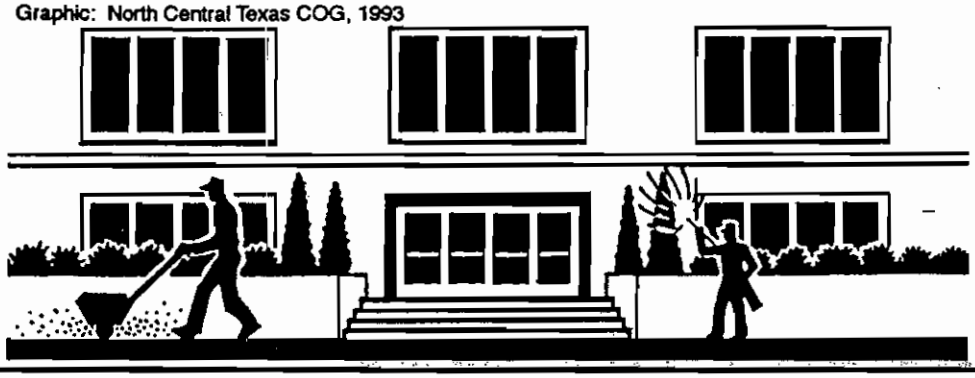
Storm Water Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

CA10

Best Management Practices

ACTIVITY: MATERIAL USE

Graphic: North Central Texas COG, 1993



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ○ *Sediment*
- ◒ *Nutrients*
- ◒ *Toxic Materials*
- ◒ *Oil & Grease*
- ◒ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ○ *O&M Costs*
- ○ Maintenance
- ◒ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA11

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from material use by using alternative products, minimizing hazardous material use on-site, and training employees and subcontractors.

APPROACH

The following materials are commonly used on construction sites:

- Pesticides and herbicides,
- Fertilizers,
- Detergents,
- Plaster and other products,
- Petroleum products such as fuel, oil, and grease, and
- Other hazardous chemicals such as acids, lime, glues, paints, solvents, and curing compounds.

Use of these materials on-site can pose the following risks:

- Storm water pollution,
- Injury to workers or visitors,
- Groundwater pollution, and
- Soil contamination.

Therefore, the following steps should be taken to minimize your risk:

- Use less hazardous, alternative materials as much as possible.
- Minimize use of hazardous materials on-site.
- Use materials only where and when needed to complete the construction activity.
- Follow manufacturer's instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Personnel who use pesticides should be trained in their use. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct on-site inspections.
- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydroseeding. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried off-site by runoff. Do not apply these chemicals just before it rains.
- Train employees and subcontractors in proper material use.

ACTIVITY: MATERIAL USE (Continue)

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Maintenance of this best management practice is minimal.

LIMITATIONS

- Alternative materials may not be available, suitable, or effective in every case.

REFERENCES

Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

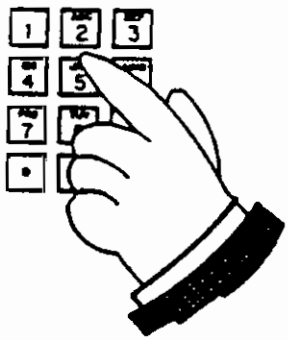
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Storm Water Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

CA11

Best Management Practices

ACTIVITY: SPILL PREVENTION AND CONTROL



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ○ *Sediment*
- ○ *Nutrients*
- ◒ *Toxic Materials*
- ◒ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ◒ *O&M Costs*
- ○ *Maintenance*
- ◒ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA12

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, CA10 (Material Delivery and Storage) and CA11 (Material Use), also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this chapter.

APPROACH

The following steps will help reduce the storm water impacts of leaks and spills:

Define "Significant Spill"

- Different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.

General Measures

- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals.

Cleanup

- Clean up leaks and spills immediately.
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this chapter for specific information.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).

ACTIVITY: SPILL PREVENTION AND CONTROL (Continue)

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur on-site, use a designated area and/or a secondary containment, located away from drainage courses, to prevent the runon of storm water and the runoff of spills.
- Regularly inspect on-site vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment on-site.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- Oil filters disposed of in trash cans or dumpsters can leak oil and pollute storm water. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur on-site, use designated areas, located away from drainage courses, to prevent the runon of storm water and the runoff of spills.
- Discourage "topping-off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/leaks.

REQUIREMENTS

- Costs (Capital, O&M)
  - Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.
- Maintenance
  - Keep ample supplies of spill control and cleanup materials on-site, near storage, unloading, and maintenance areas.
  - Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals on-site.

LIMITATIONS

- If necessary, use a private spill cleanup company.

REFERENCES

Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

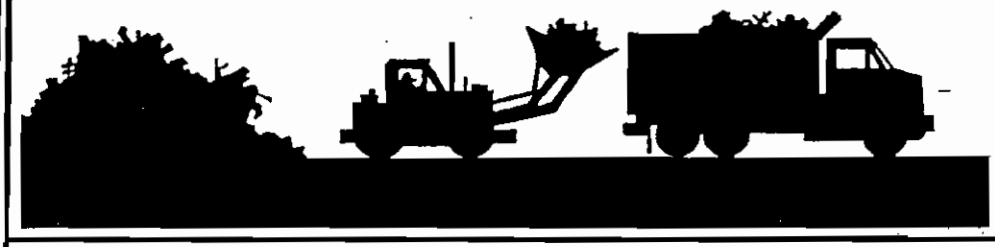
Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

CA12

Best Management Practices

ACTIVITY: SOLID WASTE MANAGEMENT

Graphic: North Central Texas COG, 1993



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ◒ *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ● *Floatable Materials*
- ● *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ◒ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA20

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

APPROACH

Solid waste is one of the major pollutants resulting from construction. Construction debris includes:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction;
- Packaging materials including wood, paper and plastic;
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products; and
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, and plastic wrappers, and cigarettes.

The following steps will help keep a clean site and reduce storm water pollution:

- Select designated waste collection areas on-site.
- Inform trash hauling contractors that you will accept only water-tight dumpsters for on-site use. Inspect dumpsters for leaks and repair any dumpster that is not water tight.
- Locate containers in a covered area and/or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it's windy.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Erosion and sediment control devices tend to collect litter. Remove this solid waste promptly.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Salvage or recycle any useful material. For example, trees and shrubs from land clearing can be used as a brush barrier (see ESC53), or converted into wood chips, then used as mulch on graded areas (see ESC11).
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to trash hauling contractor.
- Arrange for regular waste collection before containers overflow.

- If a container does spill, clean up immediately.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.
- Train employees and subcontractors in proper solid waste management.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Collect site trash daily.
  - Inspect construction waste area regularly.
  - Arrange for regular waste collection.

LIMITATIONS

- There are no major limitations to this best management practice.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites; Flood Control District of Maricopa County, AZ, September 1992.

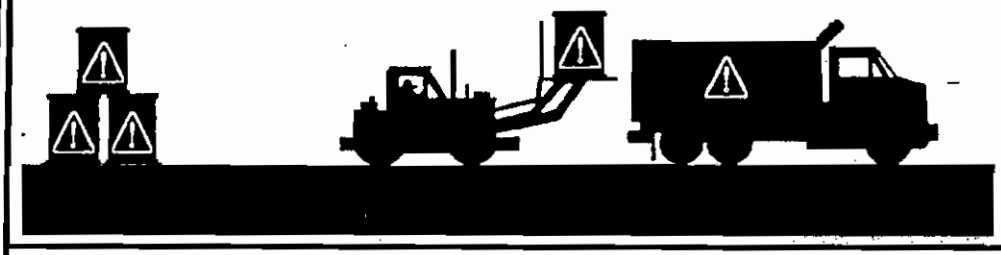
Processes, Procedures, and Methods to Control Pollution Resulting from all Construction Activity; USEPA, 430/9-73-007, 1973.

Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

CA20

ACTIVITY: HAZARDOUS WASTE MANAGEMENT

Graphic: North Central Texas COG, 1993



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ○ *Sediment*
- ○ *Nutrients*
- ◒ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ◒ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA21

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

APPROACH

Many of the chemicals used on-site can be hazardous materials which become hazardous waste upon disposal. These wastes may include:

- Paints and solvents;
- Petroleum products such as oils, fuels, and grease;
- Herbicides and pesticides;
- Acids for cleaning masonry; and
- Concrete curing compounds.

In addition, sites with existing structures may contain wastes which must be disposed of in accordance with Federal, State, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints;
- Asbestos; and
- PCBs (particularly in older transformers).

The following steps will help reduce storm water pollution from hazardous wastes:

Material Use

- Use all of the product before disposing of the container.
- Do not remove the original product label, it contains important safety and disposal information.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried off-site by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with Federal and State regulations.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and re-use thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.

Waste Recycling/Disposal

- Select designated hazardous waste collection areas on-site.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, make recycling impossible, and complicate disposal.
- Recycle any useful material such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g. excess oil-based paint and sludges) is collected, removed, and disposed of only at authorized disposal areas.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

Training

- Train employees and subcontractors in proper hazardous waste management.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Inspect hazardous waste receptacles and area regularly.
  - Arrange for regular hazardous waste collection.

LIMITATIONS

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.

REFERENCES

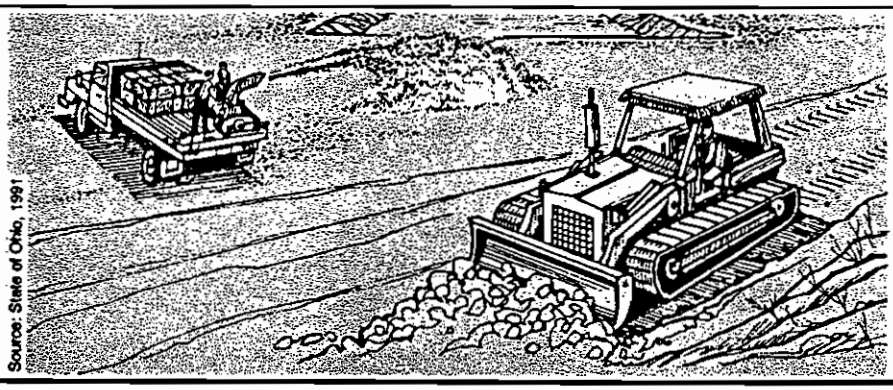
Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

Processes, Procedures, and Methods to Control Pollution Resulting from all Construction Activity; USEPA, 430/9-73-007, 1973.

Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

CA21

ACTIVITY: CONTAMINATED SOIL MANAGEMENT


Source: State of Ohio, 1991

Objectives

Housekeeping Practices
Contain Waste
Minimize Disturbed Areas
Stabilize Disturbed Areas
Protect Slopes/Channels
Control Site Perimeter
Control Internal Erosion

Targeted Pollutants

- ◒ *Sediment*
- ○ *Nutrients*
- ● *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ◒ *O&M Costs*
- ◒ *Maintenance*
- ◒ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA22

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

APPROACH

Contaminated soils may occur on your site for several reasons including:

- Past site uses and activities;
- Detected or undetected spills and leaks; and
- Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline-forming elements.

Most developers conduct pre-construction environmental assessments as a matter of routine. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil, highlight the need for contractors to confirm that a site assessment is completed before earth moving begins.

The following steps will help reduce storm water pollution from contaminated soil:

- Conduct thorough site planning including pre-construction geologic surveys.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills to the maximum extent practicable. Contaminated soil can be expensive to treat and/or dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- Test suspected soils at a certified laboratory.
- If the soil is contaminated, work with the local regulatory agencies to develop options for treatment and/or disposal.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

- Costs (Capital, O&M)
  - Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil can be quite expensive.
- Maintenance
  - Inspect excavated areas daily for signs of contaminated soil.
  - Implement CA12, Spill Prevention and Control, to prevent leaks and spills as much as possible.

LIMITATIONS

- Contaminated soils that cannot be treated on-site must be disposed of off-site by a licensed hazardous waste hauler.
- The presence of contaminated soil may indicate contaminated water as well. See CA1 (Dewatering Operations) in this chapter for more information.

REFERENCES

Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

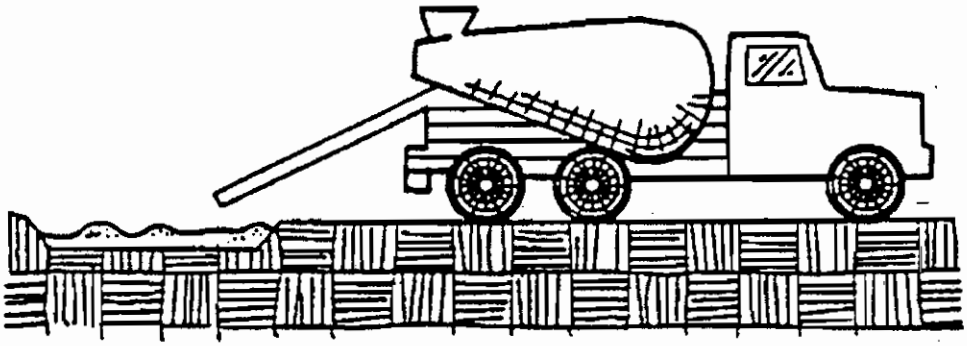
Processes, Procedures, and Methods to Control Pollution Resulting from all Construction Activity; USEPA, 430/9-73-007, 1973.

Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

CA22

Best Management Practices

ACTIVITY: CONCRETE WASTE MANAGEMENT



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from concrete waste by conducting washout off-site, performing on-site washout in a designated area, and training employees and subcontractors.

APPROACH

The following steps will help reduce storm water pollution from concrete wastes:

- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete or cement on-site.
- Perform washout of concrete trucks off site or in designated areas only.
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams.
- Do not allow excess concrete to be dumped on-site, except in designated areas.
- For on-site washout:
  - locate washout area at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste;
  - wash out wastes into the temporary pit where the concrete can set, be broken up, and then disposed of properly.
- When washing concrete to remove fine particles and expose the aggregate, avoid creating runoff by draining the water to a bermed or level area.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stock pile, or dispose in the trash.
- Train employees and subcontractors in proper concrete waste management.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Inspect subcontractors to ensure that concrete wastes are being properly managed.
  - If using a temporary pit, dispose hardened concrete on a regular basis.

LIMITATIONS

- Off-site washout of concrete wastes may not always be possible.

Targeted Pollutants

- ○ *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ◒ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ◒ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA23

Best Management Practices

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites; Flood Control District of Maricopa County, AZ, July 1992.

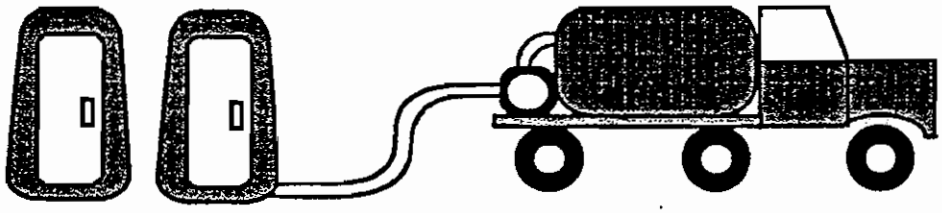
Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

CA23

Best Management Practices

ACTIVITY: SANITARY/SEPTIC WASTE MANAGEMENT



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from sanitary/septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

APPROACH

Sanitary or septic wastes should be treated or disposed of in accordance with State and local requirements. These requirements may include:

- Locate sanitary facilities in a convenient location.
- Untreated raw wastewater should never be discharged or buried.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an on-site disposal system (OSDS), such as a septic system, comply with local health agency requirements.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- If discharging to the sanitary sewer, contact the local wastewater treatment plant for their requirements.
- Sanitary/septic facilities should be maintained in good working order by a licensed service.
- Arrange for regular waste collection by a licensed hauler before facilities overflow.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Inspect facilities regularly.
  - Arrange for regular waste collection.

LIMITATIONS

- There are no major limitations to this best management practice.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites; Flood Control District of Maricopa County, AZ, September 1992.

Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Targeted Pollutants

- ○ *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ◒ *Floatable Materials*
- ◒ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA24

Best Management Practices

ACTIVITY: VEHICLE AND EQUIPMENT CLEANING

Graphic: North Central Texas COG, 1993

Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ○ *Sediment*
- ○ *Nutrients*
- ◒ *Toxic Materials*
- ◒ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

CA30

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from vehicle and equipment cleaning by using off-site facilities, washing in designated, contained areas only, eliminating discharges to the storm drain by infiltrating or recycling the wash water, and/or training employees and subcontractors.

APPROACH

- Use off-site commercial washing businesses as much as possible. Washing vehicles and equipment outdoors or in areas where wash water flows onto paved surfaces or into drainage pathways can pollute storm water. If you wash a large number of vehicles or pieces of equipment, consider conducting this work at an off-site commercial business. These businesses are better equipped to handle and dispose of the wash waters properly. Performing this work off-site can also be economical by eliminating the need for a separate washing operation at your site.
- If washing must occur on-site, use designated, bermed wash areas to prevent wash water contact with storm water, creeks, rivers, and other water bodies. The wash area can be sloped for wash water collection and subsequent infiltration into the ground.
- Use as little water as possible to avoid having to install erosion and sediment controls for the wash area.
- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning on-site. Steam cleaning can generate significant pollutant concentrations.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Minimal, some berm repair may be necessary.

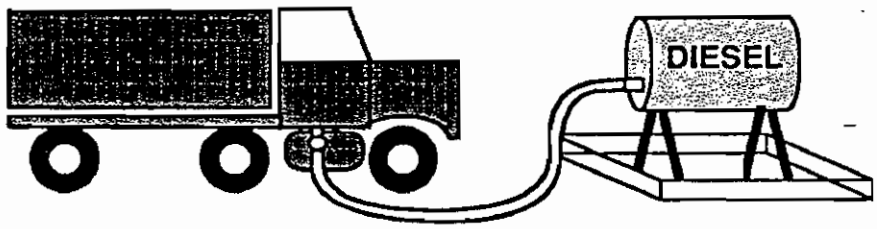
LIMITATIONS

- Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades.
- Sending vehicles/equipment off-site should be done in conjunction with ESC24 (Stabilized Construction Entrance).

REFERENCE

Swisher, R.D., 1987. Surfactant Biodegradation, Marcel Decker Corporation

ACTIVITY: VEHICLE AND EQUIPMENT FUELING



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

DESCRIPTION

Prevent fuel spills and leaks, and reduce their impacts to storm water by using off-site facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors.

APPROACH

- Use off-site fueling stations as much as possible. Fueling vehicles and equipment outdoors or in areas where fuel may spill/leak onto paved surfaces or into drainage pathways can pollute storm water. If you fuel a large number of vehicles or pieces of equipment, consider using an off-site fueling station. These businesses are better equipped to handle fuel and spills properly. Performing this work off-site can also be economical by eliminating the need for a separate fueling area at your site.
- If fueling must occur on-site, use designated areas, located away from drainage courses, to prevent the runon of storm water and the runoff of spills.
- Discourage "topping-off" of fuel tanks.
- Always use secondary containment, such as a drain pan or drop cloth, when fueling to catch spills/leaks.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- Carry out all Federal and State requirements regarding stationary above ground storage tanks.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and perhaps forklifts, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above measures are low cost, except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.
- Maintenance
  - Keep ample supplies of spill cleanup materials on-site.
  - Inspect fueling areas and storage tanks on a regular schedule.

LIMITATIONS

- Sending vehicles/equipment off-site should be done in conjunction with ESC24 (Stabilized Construction Entrance).

Targeted Pollutants

- ○ *Sediment*
- ○ *Nutrients*
- ◒ *Toxic Materials*
- ◒ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ◒ *Training*
- ○ *Suitability for Slopes >5%*

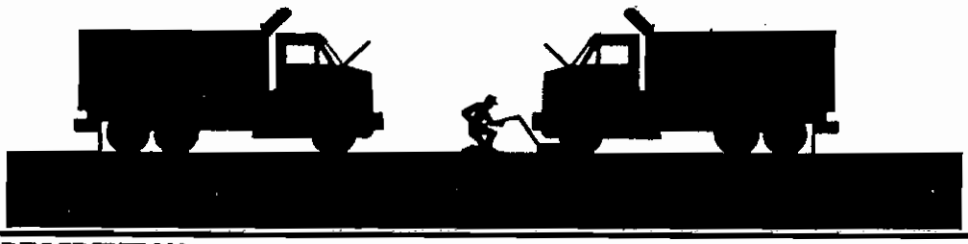
● *High* ○ *Low*

CA31

Best Management Practices

ACTIVITY: VEHICLE AND EQUIPMENT MAINTENANCE

Graphic: North Central Texas COG, 1993



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

Targeted Pollutants

- ○ Sediment
- ○ Nutrients
- ◒ Toxic Materials
- ◒ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

- ● Likely to Have Significant Impact
- ○ Probable Low or Unknown Impact

Implementation Requirements

- ○ Capital Costs
- ○ O&M Costs
- ○ Maintenance
- ◒ Training
- ○ Suitability for Slopes >5%

● High ○ Low

CA32

Best Management Practices

DESCRIPTION

Prevent or reduce the discharge of pollutants to storm water from vehicle and equipment maintenance by running a "dry site". This involves using off-site facilities, performing work in designated areas only, providing cover for materials stored outside, checking for leaks and spills, containing and cleaning up spills immediately, and training employees and subcontractors.

APPROACH

- Keep vehicles and equipment clean, don't allow excessive build-up of oil and grease.
- Use off-site repair shops as much as possible. Maintaining vehicles and equipment outdoors or in areas where vehicle or equipment fluids may spill or leak onto the ground can pollute storm water. If you maintain a large number of vehicles or pieces of equipment, consider using an off-site repair shop. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work off-site can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur on-site, use designated areas, located away from drainage courses, to prevent the runon of storm water and the runoff of spills.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Use adsorbent materials on small spills rather than hosing down or burying the spill. Remove the adsorbent materials promptly and dispose of properly.
- Regularly inspect on-site vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment on-site.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic, and transmission fluids.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- For a quick reference on disposal alternatives for specific wastes, see Table 4.2, CA40, Employee/Subcontractor Training.

REQUIREMENTS

- Costs (Capital, O&M)
  - All of the above are low cost measures.
- Maintenance
  - Keep ample supplies of spill cleanup materials on-site.
  - Inspect maintenance areas on a regular schedule.

LIMITATIONS

- Sending vehicles/equipment off-site should be done in conjunction with ESC24 (Stabilized Construction Entrance).

Outdoor vehicle or equipment maintenance is a potentially significant source of storm water pollution. Activities that can contaminate storm water include engine repair and service, particularly changing or replacement of fluids, and outdoor equipment storage and parking (dripping engines). For further information on vehicle or equipment servicing, see CA30, Vehicle and Equipment Cleaning, and CA31, Vehicle and Equipment Fueling.

Listed below is further information if you must perform vehicle or equipment maintenance on-site.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, 1,1,1-trichloroethane, or methylene chloride. Many of these parts cleaners are harmful and must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents (1,1,1-trichloroethane, methylene chloride, etc.) with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling/Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous and non-hazardous wastes separate, do not mix used oil and solvents, and keep chlorinated solvents (like 1,1,1-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.

Oil filters disposed of in trash cans or dumpsters can leak oil and contaminate storm water. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Do not bury used tires.

REFERENCES

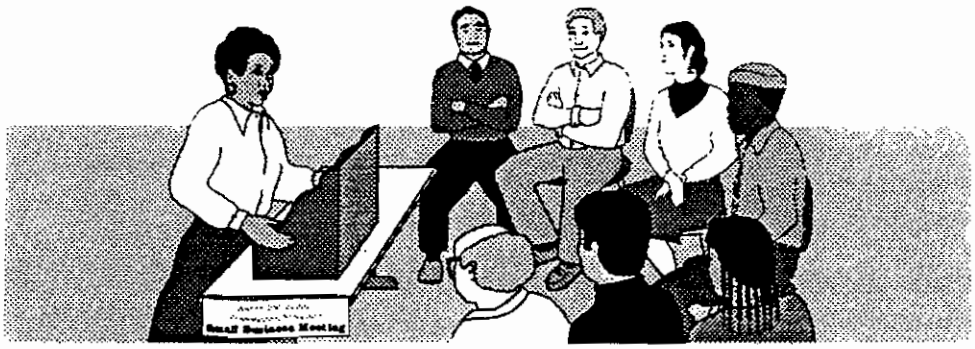
Best Management Practices and Erosion Control Manual for Construction Sites; Flood Control District of Maricopa County, AZ, September 1992.

Blueprint for a Clean Bay-Construction-Related Industries: Best Management Practices for Storm Water Pollution Prevention; Santa Clara Valley Nonpoint Source Pollution Control Program, 1992.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

CA32

ACTIVITY: EMPLOYEE/SUBCONTRACTOR TRAINING



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

DESCRIPTION

Employee/subcontractor training, like maintenance or a piece of equipment, is not so much a best management practice as it is a method by which to implement BMPs. This fact sheet highlights the importance of training and of integrating the elements of employee/subcontractor training from the individual source controls into a comprehensive training program as part of a company's Storm Water Pollution Prevention Plan (SWPPP).

The specific employee/subcontractor training aspects of each of the source controls are highlighted in the individual fact sheets. The focus of this fact sheet is more general, and includes the overall objectives and approach for assuring employee/subcontractor training in storm water pollution prevention. Accordingly, the organization of this fact sheet differs somewhat from the other fact sheets in this chapter.

OBJECTIVES

Employee/subcontractor training should be based on four objectives:

- Promote a clear identification and understanding of the problem, including activities with the potential to pollute storm water;
- Identify solutions (BMPs);
- Promote employee/subcontractor ownership of the problems and the solutions; and
- Integrate employee/subcontractor feedback into training and BMP implementation.

APPROACH

- Integrate training regarding storm water quality management with existing training programs that may be required for your business by other regulations such as: the Illness and Injury Prevention Program (IIPP) (SB 198) (California Code of Regulations Title 8, Section 3203), the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard (29 CFR 1910.120), the Spill Prevention Control and Countermeasure (SPCC) Plan (40 CFR 112), and the Hazardous Materials Management Plan (Business Plan) (California Health and Safety Code, Section 6.95).
- Businesses, particularly smaller ones that may not be regulated by Federal, State, or local regulations, may use the information in this Handbook to develop a training program to reduce their potential to pollute storm water.
- Use the quick reference on disposal alternatives (Table 4.2) to train employee/subcontractors in proper and consistent methods for disposal.

CA40

Best Management Practices

ACTIVITY: EMPLOYEE/SUBCONTRACTOR TRAINING (Continue)

- Consider posting the quick reference table around the job site or in the on-site office trailer to reinforce training.
- Train employee/subcontractors in standard operating procedures and spill cleanup techniques described in the fact sheets. Employee/subcontractors trained in spill containment and cleanup should be present during the loading/ unloading and handling of materials.
- Personnel who use pesticides should be trained in their use. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct on-site inspections.
- Proper education of off-site contractors is often overlooked. The conscientious efforts of well trained employee/ subcontractors can be lost by unknowing off-site contractors, so make sure they are well informed about what they are expected to do on-site.

CA40

Best Management Practices

TABLE 4.2 QUICK REFERENCE - DISPOSAL ALTERNATIVES
(Adopted from Santa Clara County Nonpoint Source Pollution Control Program - December 1992)

All of the waste products on this chart are prohibited from discharge to the storm drain system. Use this matrix to decide which alternative disposal strategies to use. **ALTERNATIVES ARE LISTED IN PRIORITY ORDER.**

Key: HHW Household hazardous waste (Government-sponsored drop-off events)
POTW Publically Owned Treatment Plant
Reg.Bd. Regional Water Quality Control Board (Oakland)
"Dispose to sanitary sewer" means dispose into sink, toilet, or sanitary sewer clean-out connection.
"Dispose as trash" means dispose in dumpsters or trash containers for pickup and/or eventual disposal in landfill.
"Dispose as hazardous waste" for business/commercial means contract with a hazardous waste hauler to remove and dispose.

DISCHARGE/ACTIVITY	BUSINESS/COMMERCIAL Disposal Priorities	Approval	RESIDENTIAL Disposal Priorities
General Construction and Painting; Street and Utility Maintenance			
Excess paint (oil-based)	1. Recycle/reuse. 2. Dispose as hazardous waste.		1. Recycle/reuse. 2. Take to HHW drop-off.
Excess paint (water-based)	1. Recycle/reuse. 2. Dry residue in cans, dispose as trash. 3. If volume is too much to dry, dispose as hazardous waste.		1. Recycle/reuse. 2. Dry residue in cans, dispose as trash. 3. If volume is too much to dry, take to HHW drop-off
Paint cleanup (oil-based)	Wipe paint out of brushes, then: 1. Filter & reuse thinners, solvents. 2. Dispose as hazardous waste.		Wipe paint out of brushes, then: 1. Filter & reuse thinners, solvents. 2. Take to HHW drop-off.
Paint cleanup (water-based)	Wipe paint out of brushes, then: 1. Rinse to sanitary sewer.		Wipe paint out of brushes, then: 1. Rinse to sanitary sewer.
Empty paint cans (dry)	1. Remove lids, dispose as trash.		1. Remove lids, dispose as trash.
Paint stripping (with solvent)	1. Dispose as hazardous waste.		1. Take to HHW drop-off.
Building exterior cleaning (high-pressure water)	1. Prevent entry into storm drain and remove offsite 2. Wash onto dirt area, spade in 3. Collect (e.g. mop up) and discharge to sanitary sewer	POTW	
Cleaning of building exteriors which have **HAZARDOUS MATERIALS** (e.g. mercury, lead) in paints	1. Use dry cleaning methods 2. Contain and dispose washwater as hazardous waste (Suggestion: dry material first to reduce volume)		

DISCHARGE/ACTIVITY	BUSINESS/COMMERCIAL Disposal Priorities	Approval	RESIDENTIAL Disposal Priorities
General Construction and Painting; Street and Utility Maintenance (cont'd)			
Non-hazardous paint scraping/ sand blasting	1. Dry sweep, dispose as trash		1. Dry sweep, dispose as trash
HAZARDOUS paint scraping/sand blasting (e.g. marine paints or paints containing lead or tributyl tin)	1. Dry sweep, dispose as hazardous waste		1. Dry sweep, take to HHW drop-off
Soil from excavations during periods when storms are forecast	1. Should not be placed in street or on paved areas 2. Remove from site or backfill by end of day 3. Cover with tarpaulin or surround with hay bales, or use other runoff controls 4. Place filter mat over storm drain Note: Thoroughly sweep following removal of dirt in all four alternatives.		
Soil from excavations placed on paved surfaces during periods when storms are not forecast	1. Keep material out of storm conveyance systems and thoroughly remove via sweeping following removal of dirt		
Cleaning streets in construction areas	1. Dry sweep and minimize tracking of mud 2. Use silt ponds and/or similar pollutant reduction techniques when flushing pavement		
Soil erosion, sediments	1. Cover disturbed soils, use erosion controls, block entry to storm drain. 2. Seed or plant immediately.		
Fresh cement, grout, mortar	1. Use/reuse excess 2. Dispose to trash		1. Use/reuse excess 2. Dispose as trash
Washwater from concrete/mortar (etc.) cleanup	1. Wash onto dirt area, spade in 2. Pump and remove to appropriate disposal facility 3. Settle, pump water to sanitary sewer	POTW	1. Wash onto dirt area, spade in 2. Pump and remove to appropriate disposal facility 3. Settle, pump water to sanitary sewer
Aggregate wash from driveway/patio construction	1. Wash onto dirt area, spade in 2. Pump and remove to appropriate disposal facility 3. Settle, pump water to sanitary sewer	POTW	1. Wash onto dirt area, spade in 2. Pump and remove to appropriate disposal facility 3. Settle, pump water to sanitary sewer

DISCHARGE/ACTIVITY	BUSINESS/COMMERCIAL Disposal Priorities	Approval	RESIDENTIAL Disposal Priorities
General Construction and Painting; Street and Utility Maintenance (cont'd)			
Rinsewater from concrete mixing trucks	1. Return truck to yard for rinsing into pond or dirt area 2. At construction site, wash into pond or dirt area		
Non-hazardous construction and demolition debris	1. Recycle/reuse (concrete, wood, etc.) 2. Dispose as trash		1. Recycle/reuse (concrete, wood, etc. 2. Dispose as trash
Hazardous demolition and construction debris (e.g. asbestos)	1. Dispose as hazardous waste		1. Do not attempt to remove yourself. Contact asbestos removal service for safe removal and disposal 2. Very small amounts (less than 5 lbs) may be double-wrapped in plastic and taken to HHW drop-off
Saw-cut slurry	1. Use dry cutting technique and sweep up residue 2. Vacuum slurry and dispose off-site. 3. Block storm drain or berm with low weir as necessary to allow most solids to settle. Shovel out gutters; dispose residue to dirt area, construction yard or landfill.		
Construction dewatering (Nonturbid, uncontaminated groundwater)	1. Recycle/Reuse 2. Discharge to storm drain		
Construction dewatering (Other than nonturbid, uncontaminated groundwater)	1. Recycle/reuse 2. Discharge to sanitary sewer 3. As appropriate, treat prior to discharge to storm drain	POTW Reg. Bd.	
Portable toilet waste	1. Leasing company shall dispose to sanitary sewer at POTW	POTW	
Leaks from garbage dumpsters	1. Collect, contain leaking material. Eliminate leak, keep covered, return to leasing company for immediate repair 2. If dumpster is used for liquid waste, use plastic liner		

DISCHARGE/ACTIVITY	BUSINESS/COMMERCIAL Disposal Priorities	Approval	RESIDENTIAL Disposal Priorities
General Construction and Painting; Street and Utility Maintenance (cont'd)			
Leaks from construction debris bins	1. Insure that bins are used for dry nonhazardous materials only (Suggestion: Fencing, covering help prevent misuse)		
Dumpster cleaning water	1. Clean at dumpster owner's facility and discharge waste through grease interceptor to sanitary sewer 2. Clean on site and discharge through grease interceptor to sanitary sewer	POTW POTW	
Cleaning driveways, paved areas * (Special Focus = Restaurant alleys Grocery dumpster areas) * Note: Local drought ordinances may contain additional restrictions	1. Sweep and dispose as trash (Dry cleaning only). 2. For vehicle leaks, restaurant/grocery alleys, follow this 3-step process: a. Clean up leaks with rags or absorbents. b. Sweep, using granular absorbent material (cat litter). c. Mop and dispose of mopwater to sanitary sewer (or collect rinsewater and pump to the sanitary sewer). 3. Same as 2 above, but with rinsewater (2c)(no soap) discharged to storm drain.		1. Sweep and dispose as trash (Dry cleaning only). 2. For vehicle leaks, follow this 3-step process: a. Clean up leaks with rags or absorbents; dispose as hazardous waste. b. Sweep, using granular absorbent material (cat litter). c. Mop and dispose of mopwater to sanitary sewer.
Steam cleaning of sidewalks, plazas * * Note: Local drought ordinances may contain additional restrictions	1. Collect all water and pump to sanitary sewer. 2. Follow this 3-step process: a. Clean oil leaks with rags or adsorbents b. Sweep (Use dry absorbent as needed) c. Use no soap, discharge to storm drain		
Potable water/line flushing Hydrant testing	1. Deactivate chlorine by maximizing time water will travel before reaching creeks		
Super-chlorinated (above 1 ppm) water from line flushing	1. Discharge to sanitary sewer 2. Complete dechlorination required before discharge to storm drain		

DISCHARGE/ACTIVITY	BUSINESS/COMMERCIAL Disposal Priorities	Approval	RESIDENTIAL Disposal Priorities
Landscape/Garden Maintenance			
Pesticides	1. Use up. Rinse containers use rinsewater as product. Dispose rinsed containers as trash 2. Dispose unused pesticide as hazardous waste		1. Use up. Rinse containers, use rinsewater as pesticide. Dispose rinsed container as trash. 2. Take unused pesticide to HHW drop-off
Garden clippings	1. Compost 2. Take to Landfill		1. Compost 2. Dispose as trash.
Tree trimming	1. Chip if necessary, before composting or recycling		1. Chip if necessary, before composting or recycling
Swimming pool, spa, fountain water (emptying)	1. Do not use metal-based algicides (i.e. Copper Sulfate) 2. Recycle/reuse (e.g. irrigation) 3. Determine chlorine residual = 0, wait 24 hours and then discharge to storm drain.	POTW	1. Do not use metal-based algicides (i.e. Copper Sulfate) 2. Recycle/reuse (e.g. irrigation) 3. Determine chlorine residual = 0, wait 24 hours and then discharge to storm drain.
Acid or other pool/spa/fountain cleaning	1. Neutralize and discharge to sanitary sewer	POTW	
Swimming pool, spa filter backwash	1. Reuse for irrigation 2. Dispose on dirt area 3. Settle, dispose to sanitary sewer		1. Use for landscape irrigation 2. Dispose on dirt area 3. Settle, dispose to sanitary sewer
Vehicle Wastes			
Used motor oil	1. Use secondary containment while storing, send to recycler.		1. Put out for curbside recycling pickup where available 2. Take to Recycling Facility or auto service facility with recycling program 3. Take to HHW events accepting motor oil
Antifreeze	1. Use secondary containment while storing, send to recycler.		1. Take to Recycling Facility
Other vehicle fluids and solvents	1. Dispose as hazardous waste		1. Take to HHW event
Automobile batteries	1. Send to auto battery recycler 2. Take to Recycling Center		1. Exchange at retail outlet 2. Take to Recycling Facility or HHW event where batteries are accepted
Motor home/construction trailer waste	1. Use holding tank. Dispose to sanitary sewer		1. Use holding tank, dispose to sanitary sewer.

DISCHARGE/ACTIVITY	BUSINESS/COMMERCIAL Disposal Priorities	Approval	RESIDENTIAL Disposal Priorities
Vehicle Wastes (cont'd)			
Vehicle Washing	1. Recycle 2. Discharge to sanitary sewer, never to storm drain	POTW	1. Take to Commercial Car Wash. 2. Wash over lawn or dirt area 3. If soap is used, use a bucket for soapy water and discharge remaining soapy water to sanitary sewer.
Mobile Vehicle Washing	1. Collect washwater and discharge to sanitary sewer.	POTW	
Rinsewater from dust removal at new car fleets	1. Discharge to sanitary sewer 2. If rinsing dust from exterior surfaces from appearance purposes, use no soap (water only); discharge to storm drain.	POTW	
Vehicle leaks at Vehicle Repair Facilities	Follow this 3-step process: 1. Clean up leaks with rags or absorbents 2. Sweep, using granular absorbent material (cat litter) 3. Mop and dispose of mopwater to sanitary sewer.		
Other Wastes			
Carpet cleaning solutions & other mobile washing services	1. Dispose to sanitary sewer	POTW	1. Dispose to sanitary sewer
Roof drains	1. If roof is contaminated with industrial waste products, discharge to sanitary sewer 2. If no contamination is present, discharge to storm drain		
Cooling water Air conditioning condensate	1. Recycle/reuse 2. Discharge to sanitary sewer	POTW	
Pumped groundwater, infiltration/ foundation drainage (contaminated)	1. Recycle/reuse (landscaping, etc.) 2. Treat if necessary; discharge to sanitary sewer 3. Treat and discharge to storm drain	Reg. Bd. POTW Reg. Bd.	
Fire fighting flows	If contamination is present, Fire Dept. will attempt to prevent flow to stream or storm drain		

DISCHARGE/ACTIVITY	BUSINESS/COMMERCIAL Disposal Priorities	Approval	RESIDENTIAL Disposal Priorities
Other Wastes (cont'd)			
Kitchen Grease	1. Provide secondary containment, collect, send to recyler. 2. Provide secondary containment, collect, send to POTW via hauler.	POTW	1. Collect, solidify, dispose as trash
Restaurant cleaning of floor mats, exhaust filters, etc.	1. Clean inside building with discharge through grease trap to sanitary sewer. 2. Clean outside in container or bermed area with discharge to sanitary sewer.		
Clean-up wastewater from sewer back-up	1. Follow this procedure: a. Block storm drain, contain, collect, and return spilled material to the sanitary sewer. b. Block storm drain, rinse remaining material to collection point and pump to sanitary sewer. (no rinse-water may flow to storm drain)		

BMP'S FOR

EROSION
&
SEDIMENTATION
CONTROL

5. *BMPs FOR EROSION AND SEDIMENTATION CONTROL*

INTRODUCTION

This chapter describes specific Best Management Practices (BMPs) for common construction activities that result in erosion of the construction site and the generation of sediment which impacts waterways and off-site property. Chapter 2 led you through the steps of identifying activities at your site that can cause erosion, while Chapter 3 provided guidance with BMP selection. This chapter will provide you with the BMPs that best fit your site's needs.

Each fact sheet contains a cover sheet with:

- A description of the BMP
- Suitable Applications
- Installation/Application Criteria
- Requirements
  - Costs, including capital costs, and operations and maintenance (O&M)
  - Maintenance (including administrative and staffing)
- Limitations

The side bar presents information on which BMP objective applies, targeted constituents, and an indication of the level of effort and costs to implement. The remainder of the fact sheet provides further information on some or all of these topics, and provides references for additional guidelines.

Sizing and design criteria for erosion and sedimentation control may be standardized for each local area. This handbook cannot develop specific sizing criteria for all topographies and climates in California. Many local agencies have developed such criteria and should be consulted before sizing specific BMPs. A common design storm for sizing temporary erosion and sedimentation controls is a two-year, 24-hour storm. Sizing criteria given in this handbook assume that such a storm would result in 0.042 ac-ft/ac. of runoff (0.5 inches of runoff). This should be appropriate for sizing controls in most areas. Keep in mind that these controls must also be able to safely contain or

BMPs for Erosion and Sedimentation Control

Site Planning Considerations
- ESC1 Scheduling
- ESC2 Preservation of Existing Vegetation

Vegetative Stabilization
- ESC10 Seeding and Planting
- ESC11 Mulching

Physical Stabilization
- ESC20 Geotextiles and Mats
- ESC21 Dust Control
- ESC22 Temporary Stream Crossing
- ESC23 Construction Road Stabilization
- ESC24 Stabilized Construction Entrance

Diversion of Runoff
- ESC30 Earth Dike
- ESC31 Temporary Drains and Swales
- ESC32 Slope Drain

Velocity Reduction
- ESC40 Outlet Protection
- ESC41 Check Dams
- ESC42 Slope Roughening/Terracing

Sediment Trapping/Filtering
- ESC50 Silt Fence
- ESC51 Straw Bale Barrier
- ESC52 Sand Bag Barrier
- ESC53 Brush or Rock Filter
- ESC54 Storm Drain Inlet Protection
- ESC55 Sediment Trap
- ESC56 Sediment Basin

convey storms larger than the design storm for erosion and sediment control.

These BMP fact sheets are suitable for inclusion in many SWPPPs for erosion and sedimentation control. They may be used to supplement and provide details for erosion and sedimentation controls shown on the project site map. In all cases, however, local erosion and sedimentation criteria and standards supersede the suggested criteria on these fact sheets.

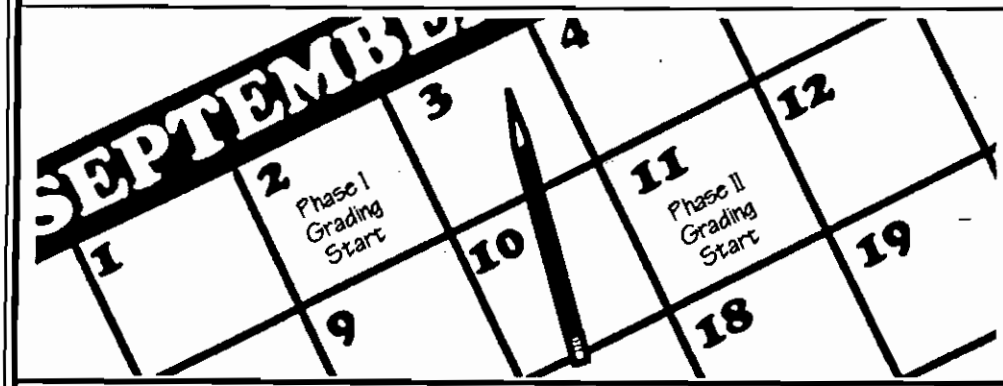
BMPs fact sheets are provided for each of the following BMP categories, and are consistent with Worksheet 5 in Chapter 2.

TABLE 5.1 EROSION AND SEDIMENT CONTROL AND BMP OBJECTIVES

	BMP CATEGORY	BMP OBJECTIVES						
		PRACTICE GOOD HOUSE-KEEPING	CONTAIN WASTE	MINIMIZE DISTURBED AREA	STABILIZE DISTURBED AREA	PROTECT SLOPES AND CHANNELS	CONTROL SITE PERIMETER	CONTROL INTERNAL EROSION
	Site Planning Considerations							
ESC1	Scheduling	✓	✓	✓	✓	✓	✓	✓
ESC2	Preservation of Existing Vegetation			✓	✓	✓	✓	
	Vegetative Stabilization							
ESC10	Seeding and Planting				✓	✓		
ESC11	Mulching				✓	✓		
	Physical Stabilization							
ESC20	Geotextiles and Mats				✓	✓		
ESC21	Dust Control	✓		✓	✓		✓	
ESC22	Temporary Stream Crossing	✓		✓	✓	✓		
ESC23	Construction Road Stabilization	✓		✓	✓	✓		
ESC24	Stabilized Construction Entrance	✓		✓	✓		✓	
	Diversion of Runoff							
ESC30	Earth Dike		✓			✓	✓	✓
ESC31	Temporary Drains and Swales					✓	✓	✓
ESC32	Slope Drain					✓		
	Velocity Reduction							
ESC40	Outlet Protection					✓		
ESC41	Check Dams (see ESC 53 also)					✓		
ESC42	Slope Roughening/Terracing				✓	✓		

	BMP CATEGORY	BMP OBJECTIVES						
		PRACTICE GOOD HOUSE-KEEPING	CONTAIN WASTE	MINIMIZE DISTURBED AREA	STABILIZE DISTURBED AREA	PROTECT SLOPES AND CHANNELS	CONTROL SITE PERIMETER	CONTROL INTERNAL EROSION
	Sediment Trapping/Filtering							
ESC50	Silt Fence						✓	✓
ESC51	Straw Bale Barrier						✓	✓
ESC52	Sand Bag Barrier					✓	✓	✓
ESC53	Brush or Rock Filter					✓	✓	✓
ESC54	Storm Drain Inlet Protection						✓	✓
ESC55	Sediment Trap							✓
ESC56	Sediment Basin							✓

BMP: SCHEDULING



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

DESCRIPTION

Sequencing the construction project to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking.

SUITABLE APPLICATIONS

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project. Use of other, more costly yet less effective, erosion and sedimentation controls, may often be reduced through proper construction sequencing.

APPROACH

- Project design considerations: Design project to integrate into existing land contours. Significant regrading of a site will require more costly erosion and sedimentation control measures and may require that on-site drainage facilities be installed.
- Incorporate existing, natural areas: Inventory and evaluate the existing site terrain and vegetation. Disturbance of highly erosive natural areas (e.g., steep, unstable slope areas, watercourses) should be minimized, while protecting other areas may enhance site aesthetics. Construction should not disturb these areas (see ESC2).
- Avoid rainy periods: Schedule major grading operations during dry months. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means (see ESC 10 to 24) or to install temporary sediment trapping devices (see ESC 50 to 56).
- Practice erosion and sediment control year round: Erosion may be caused during dry seasons by "freak" rainfall, wind and vehicle tracking. Therefore, keep the site stabilized year-round, and retain wet season sediment trapping devices.
- Minimize soil exposed at one time: Schedule projects to disturb only small portions of the site at any one time. Complete grading as soon as possible. Immediately stabilize the disturbed portion before grading the next portion. Practice staged seeding—revegetate cut and fill slopes as the work progresses.
- Trenching: Close and stabilize open trenches as soon as possible. Sequence trenching projects so that most open portions of the trench are closed before new trenching is begun.

REQUIREMENTS

- Cost
  - Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost-effectiveness of scheduling techniques should be compared with the other, less effective erosion and sedimentation controls to achieve a cost-effective balance.

Targeted Pollutants

- ○ Sediment
- ○ Nutrients
- ○ Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

- ● Likely to Have Significant Impact
- ○ Probable Low or Unknown Impact

Implementation Requirements

- ○ Capital Costs
- ○ O&M Costs
- ○ Maintenance
- ○ Training
- ○ Suitibility for Slopes >5%

● High ○ Low

ESC1

Best Management Practices

LIMITATIONS

There are no significant limitations to the use of this BMP.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona - 1992.

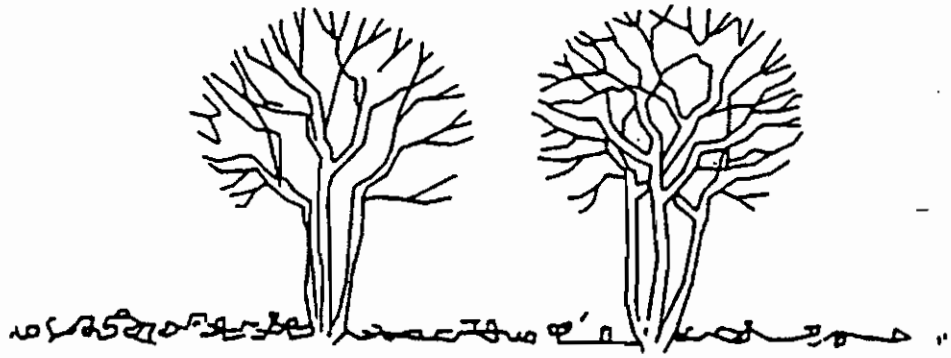
Erosion and Sediment Control Guidelines for Developing Areas in Texas, U.S. Department of Agriculture, Soil Conservation Service, Fort Worth, Texas - 1976.

Storm Water Management for Construction Activites. Developing Pollution Prevention Plans and Best Management Practices, U.S. Environmental Protection Agency, Office of Water (EPA 832-R-92-005) - September, 1992.

Virginia Erosion and Sediment Control Handbook, Third Edition, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation - 1992.

ESC1

BMP: PRESERVATION OF EXISTING VEGETATION



GENERAL DESCRIPTION

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs and/or grasses that serve as erosion controls.

SUITABLE APPLICATIONS

- Areas within site where no construction activity occurs, or occurs at a later date.
- Sensitive areas where natural vegetation exist and should be preserved, such as: steep slopes, watercourses, and building sites in wooded areas.
- Areas where local, state and federal government requires preservation, such as: vernal pools, wetlands, marshes, certain oak trees, etc.

INSTALLATION/APPLICATION CRITERIA

- Clearly mark, flag or fence vegetation or areas where vegetation should be preserved.
- Prepare landscaping plans which include as much existing vegetation as possible and state proper care of this vegetation both during and after construction.
- Define and protect with berms, fencing, signs, etc., a setback area from vegetation to be preserved. Setback area size should be based on the location, species, size, age and potential impact of adjacent construction activities or permanent improvements.
- Proposed landscaping plans which do not include plant species that compete with the existing vegetation.
- Do not locate construction traffic routes, spoil piles, etc., where significant adverse impact on existing vegetation may occur.

REQUIREMENTS

- Maintenance
  - Inspection and maintenance requirements for protection of vegetation are low.
  - During construction the limits of grading or disturbance should be clearly marked at all times.
  - Irrigation or maintenance of native trees or vegetation should conform to specifications on the Landscape Plan.
- Cost
  - There is little cost associated with preserving existing vegetation if properly planned during the project design, and may yield aesthetic benefits which enhance property values.

LIMITATIONS

- Requires forward planning by the owner/developer, contractor and design staff.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactorily for the planned development.

Objectives

Housekeeping Practices

Contain Waste

Minimize Disturbed Areas

Stabilize Disturbed Areas

Protect Slopes/Channels

Control Site Perimeter

Control Internal Erosion

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ○ *O&M Costs*
- ○ *Maintenance*
- ○ *Training*
- ● *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC2

Best Management Practices

Additional Information — Preservation of Existing Vegetation

The best way to prevent excessive erosion is to not disturb the land. On a construction site, where extensive land disturbance is necessary, a reasonable BMP would be to not disturb land in sensitive areas of the site which need not be altered for the project to be viable (e.g., natural watercourses, steep slopes), and to design the site to incorporate particularly unique or desireable existing vegetation into the site landscaping plan. Clearly marking and leaving a buffer area around these unique areas will both help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping in naturally vegetated areas.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to insure the survival of desirable vegetation for shade, beautification, and erosion protection. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. Also, vegetation helps to keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

The following criteria may be used for deciding which vegetation will remain on the site:

- Aesthetic values: Consideration should be given to foliage, flowering habits, bark and crown characteristics (for trees).
- Freedom from disease and rot.
- Life span of trees: Short-lived trees need not be preserved.
- Environmental values: Habitat; screening; and buffers.
- Sudden exposure: Save vegetation which grows in direct sunlight and is able to withstand radiated heat from proposed buildings and pavement.
- Space needed: Sufficient space must be provided between the vegetation and any structures, electric and telephone lines, water and sewer lines, driveways and streets. Mark trees and shrubs with bright paint or ribbon so there is no doubt as to which trees and shrubs are to be left and protected from damage during construction.

Saving existing vegetation and mature trees on-site, beautifies the area and may save money by reducing new landscaping requirements. Mature trees also increase property values and satisfy consumer aesthetic needs.

Preserving and protecting existing vegetation can often result in more stable soil conditions during construction. Careful site planning and identification of plantings to preserve can provide erosion and sedimentation controls during construction, and contribute to the aesthetics of the development. For example, in Sacramento County a tree ordinance has been adopted that protects the native California Oak tree. Provisions to protect the tree and its root system during construction must be specified in the project plans, and an area must be provided where the soil stability may not be disturbed. No grading or construction storage within the tree dripline is allowed.

Installation/Application

Building sites may be planned to integrate existing vegetation and trees. Construction impacts must be considered. Trench width for pipe construction projects and the location of permanent structures, such as buildings, needs to be considered when preserving existing vegetation, including mature trees and their root system. Native vegetation should be preserved since it is able to adapt to the climate. The USDA Soil Conservation Service should be contacted about existing vegetation for sites throughout California. Mature trees are generally preferable to newly planted trees because of the greater soil stabilization provided by the extensive root system of a mature tree.

ESC2

Best Management Practices

Additional Information — Preservation of Existing Vegetation

Methods for protecting existing vegetation and trees:

- Stake off root system limits (drip line of tree). Some counties limit construction within 5 feet of the tree drip line.
- Fence off the area to be preserved or along the tree drip line.
- Flag or mark trees to remain in place.
- Tree wells and retaining walls (permanent) help preserve existing vegetation, but must be large enough to protect the root system (see below).
- For the California Oak tree, no trenching or irrigation should be allowed within the driplines of the tree, since both these activities are detrimental to the preservation of the tree.
- Where grading under trees is necessary, excavation and fill should be limited to 1 foot within the driplines.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

County of Sacramento Tree Preservation Ordinance - September 1981.

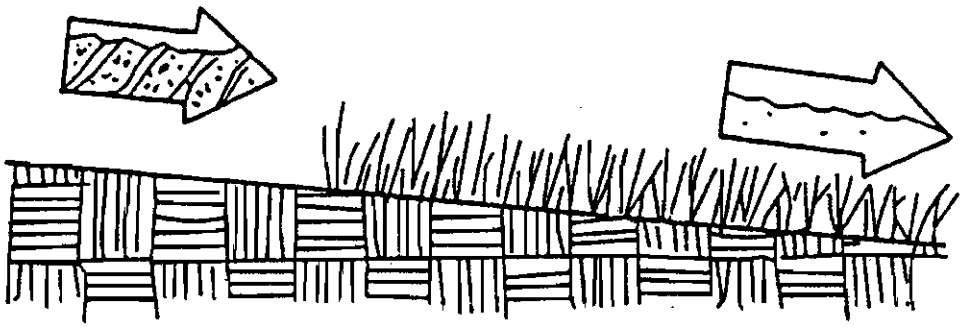
Stormwater Management Water for the Puget Sound Basin, Washington State Department of Ecology, The Technical Manual - February 1992, Publication # 91-75.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC2

Best Management Practices

BMP: SEEDING AND PLANTING



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas* (●)
- *Protect Slopes/Channels* (●)
- *Control Site Perimeter*
- *Control Internal Erosion*

GENERAL DESCRIPTION

Seeding of grasses and plantings of trees, shrubs, vines and ground covers provide long-term stabilization of soil. In some areas, with suitable climates, grasses can be planted for temporary stabilization.

SUITABLE APPLICATIONS

- Appropriate for site stabilization both during construction and post-construction.
- Any graded/cleared areas where construction activities have ceased.
- Open space cut and fill areas.
- Steep slopes.
- Spoil piles.
- Vegetated swales.
- Landscape corridors.
- Stream banks.

INSTALLATION/APPLICATION CRITERIA

Type of vegetation, site and seedbed preparation, planting time, fertilization and water requirements should be considered for each application.

Grasses:

- Ground preparation: fertilize and mechanically stabilize the soil.
- Tolerant of short-term temperature extremes and waterlogged soil conditions.
- Appropriate soil conditions: shallow soil base, good drainage, slope 2:1 or flatter.
- Develop well and quickly from seeds.
- Mowing, irrigating, and fertilizing are vital for promoting vigorous grass growth.

Trees and Shrubs:

- Selection Criteria: vigor, species, size, shape & wildlife food source.
- Soil conditions: select species appropriate for soil,drainage & acidity.
- Other Factors: wind/exposure, temperature extremes, and irrigation needs.

Vines and Ground Covers:

- Ground preparation: lime and fertilizer preparation.
- Use proper seeding rates.
- Appropriate soil conditions: drainage, acidity, slopes.
- Generally avoid species requiring irrigation.

Targeted Pollutants

- ● *Sediment*
- ◒ *Nutrients*
- ◒ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ◒ *O&M Costs*
- ◒ *Maintenance*
- ◒ *Training*
- ◒ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC10

Best Management Practices

BMP: SEEDING AND PLANTING (Continue)

REQUIREMENTS

- Maintenance
  - Shrubs and trees must be adequately watered and fertilized and if needed pruned.
  - Grasses may need to be watered and mowed.
- Cost: Average annual cost for installation and maintenance (2-year useful life, source: EPA, 1992)
  - Seeding: $300 per acre, appropriate for flat slopes and stable soils.
  - Seeding with Mulching: $1,100 per acre, appropriate for moderate to steep slopes and/or erosive soils.
  - Trees, shrubs, vines, and ground cover: Cost, applicability based on species used and terrain features.

LIMITATIONS

- Permanent and temporary vegetation may not be appropriate in dry periods without irrigation.
- Fertilizer requirements may have potential to create storm water pollution if improperly applied.

ESC10

Best Management Practices

Additional Information — Seeding and Planting

Permanent seeding of grasses, sodding, and planting of trees, shrubs, vines and ground covers can provide long-term stabilization of soil. Permanent seeding and planting contributes to long-term site aesthetics and helps reduce erosion by reducing the velocity of runoff, allowing infiltration to occur, filtering sediments, and by holding soil particles in place.

Seeding and planting should be applied as soon as final grading is done to all graded and cleared areas of the construction site where plant cover is ultimately desired. For example, vegetation may be established along landscaped corridors and buffer zones where they may act as filter strips (see TC6 in Chapter 5 of the Municipal Handbook). Additionally, vegetated swales, steep and/or rocky slopes and stream banks can also serve as appropriate areas for seeding and plantings.

Installation/Application Criteria

Application of appropriate vegetation must consider: the seedbed or plantbed, proper seasonal planting times, water requirements fertilizer requirements and availability of the selected vegetation within the project's region. Permanent plantings during the construction stage of projects require careful coordination between the local agency inspectors, project managers, construction managers, and landscape contractor. Protocols for coordination and implementation procedures regarding site access, construction staging, and short- and long-term planting areas should be developed prior to the construction bid process. Where possible, these protocols should be established by and remain the responsibility of the site owner.

Because of the many available types of plants and ground covers and because site conditions and land use vary so widely within California, a set of general guidelines is included for installation/application of grasses, trees and shrubs, vines and ground covers. However, your local municipality, Soil Conservation Service, agricultural extention, or other resources should be consulted on appropriate species, planting requirements, and maintenance needs for your climate and soils.

Grasses

Grasses, depending on the type, provide short-term soil stabilization during construction or can serve as long- term/ permanent soil stabilization for disturbed areas. In general, grasses provide low maintenance to areas that have been cleared, graded and mechanically stabilized.

Selection:

The selection of the grass type is determined by the climate, irrigation, mowing frequency, maintenance effort and soil-bed conditions. Although grasses provide quick germination and rapid growth, they also have a shallow root system and are not as effective in stabilizing deep soils, where trees, shrubs and deep rooted ground covers may be more appropriate. Several grasses are adaptable to the various California climates. The figure at the end of these fact sheets shows appropriate grasses for regions within California. Blue grass is well adapted throughout California except for in the valley regions. The blue grass is found on dry, sandy soils that have good drainage. Bermuda grass, on the other hand is well adapted in the valley region where soils are dry, coarse and heavier. Specific seed mix and/or varieties for each site should be provided by an approved/qualified plant materials specialist.

ESC10

Best Management Practices

Additional Information — Seeding and Planting

Planting:
The following steps should be followed to ensure established growth:

1. Select the proper grass for the site.
2. Prepare the seedbed; soil should be fertilized and contain good topsoil or soil at least a 2:1 or flatter slope.
3. Broadcast the seedings in the late fall or early spring. In the late fall, seedings should be planted by mid- September to have established grass by the October rainy season.
4. Initial irrigation will be required often for most grasses, with follow-up irrigation and fertilization as needed. Mulching may be required in dry climates or during drought years.

Trees & Shrubs

Selection:
Trees and shrubs, when properly selected, are low maintenance plantings that stabilize adjacent soils, moderate the adjacent temperatures, filter air pollutants, and serve as a barrier to wind. Some desirable characteristics to consider in selecting trees and shrubs include: vigor, species, age, size and shape, and use as a wildlife food source and habitat.

Trees and shrubs to be saved should be clearly marked so that no construction activity will take place within the dripline of the plant. The sites for new plantings should be evaluated. Consider the prior use of the land: adverse soil conditions such as poor drainage or acidity; exposure to wind; temperature extremes; location of utilities, paved areas, and security lighting and traffic problems.

Transplanting:
Time of Year - Late fall through winter (November to February) is the preferred time for transplanting in most of California.

Preparation - Proper digging of a tree/shrub includes the conservation of as much of the root system as possible. Soil adhering to the roots should be damp when the tree is dug, and kept moist until re-planting. The soil ball should be 12 inches in diameter for each inch of diameter of the trunk.

Site preparation - Refer to landscape plans and specifications for site and soil preparation, and for ability to coordinate construction strategy with permanent vegetation.

Supporting the trunk - Many newly planted trees/shrubs need artificial support to prevent excessive swaying.

Watering - Soil around the tree should be thoroughly watered after the tree is set in place. When the soil becomes dry, the tree should be watered deeply, but not often. Mulching around the base of the tree is helpful in preventing roots from drying out.

Vines & Ground Covers

Selection:
Vines, ground covers, and low growing plants, that can quickly spread, come in many types, colors, and growth habits. Some are suitable only as part of a small maintained landscape area, while some can stabilize large areas with little maintenance. Flowers, which provide little long-term erosion control may be planted to add color and varietal appearances.

ESC10

Best Management Practices

Additional Information — Seeding and Planting

Caution should be exercised in the non-native vegetation because of impacts to native vegetation on adjacent lands. For example, species that may be planted at the construction site can quickly spread and compete with originally undisturbed vegetation such as the California Poppy and California buckwheat, both of which complete poorly with introduced grasses (e.g., planting wild oats is illegal in California). In addition to stabilizing disturbed soil, vines and ground covers can perform the following functions:

1. Provide attractive cover that does not need mowing.
2. Help to define traffic areas and control pedestrian movement.

Site Preparation:
Ground covers are plants that naturally grow very close together, causing severe competition for space nutrients and water. Soil for ground covers should be well prepared. The entire area should be spaded, disced, or rototilled to a depth of six to eight inches. Two to three inches of organic material, such as good topsoil or peat, should be spread over the entire area.

Planting:
The following steps will help ensure good plant growth.

1. Make the plantings following the contours of the land.
2. Dig the holes 1/3 larger than the plant root ball.
3. Know what depth to place the plants.
4. Use good topsoil or soil mixture with a lot of organic matter.
5. Fill hole 1/3 to 1/2 full, shake plants to settle soil among roots, then water.
6. Leave saucer-shaped depression around the plant to hold water.
7. Water thoroughly and regularly.
8. Space plants according to the type of plant and the extent of covering desired.

Materials:
There are many different species of vines and ground covers from which to choose, but care must be taken in their selection. It is essential to select planting materials suited to both the intended use and specific site characteristics. The plants discussed in this handbook are those which are known to be adapted to California, and commonly available from commercial nurseries. Additional information can be obtained from local nurserymen, landscape architects, and extension agents. An approved low water use plant list may be obtained from the State Department of Water Resources or the Soils Conservation Service.

Requirements
Maintenance

General requirements include:

- Grass maintenance should be minimal to none. Irrigation and regular fertilizing may be required for some types of grasses. Mowing is only required in areas where aesthetics or fire hazards are a concern.
- Young trees should receive an inch of water each week for the first two years after planting. The tree should be watered deeply, but not more often than once per week.
- Transplanted trees should be fertilized on an annual basis.
- Proper pruning, watering, and application of fertilizer is necessary to maintain healthy and vigorous shrubs. A heavy layer of mulch applied around the shrubs reduces weeds and retains moisture.
- Trim old growth as needed to improve the appearance of ground covers. Most covers need once-a-year trimming to promote growth.

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Best Management Practices

Additional Information — Seeding and Planting

Limitations

- Construction activities are likely to injure or kill trees unless adequate protective measures are taken. Direct contact by equipment is the most obvious problem, but damage is also caused by root stress from filling, excavation, or compacting too close to trees.
- Temporary seeding can only be viable when adequate time is available for plants to grow and establish.
- Over fertilizing of plants may cause pollution of storm water runoff.
- Irrigation source and supply may be limiting.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, September 1992.

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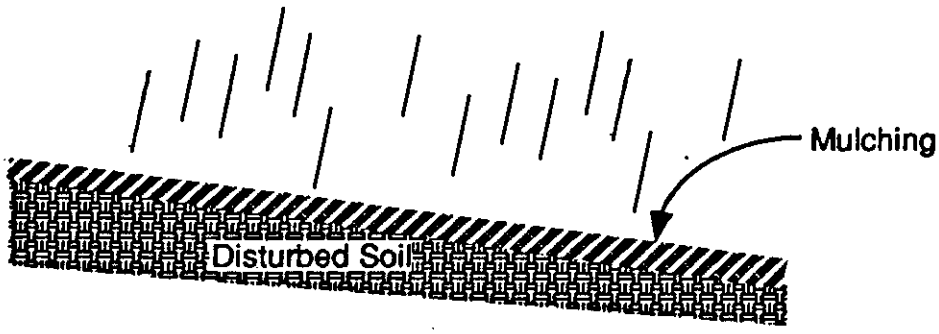
ESC10

Best Management Practices

BMP: MULCHING



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

GENERAL DESCRIPTION

Mulching is used to temporarily and permanently stabilize cleared or freshly seeded areas. Types of mulches include organic materials, straw, wood chips, bark or other wood fibers, decomposed granite, and gravel.

SUITABLE APPLICATIONS

- Temporary stabilization of freshly seeded and planted areas.
- Temporary stabilization during periods unsuitable for growing vegetation.
- Temporary stabilization of areas that cannot be seeded or planted (e.g., insufficient rain, steep slope).
- Mulches such as gravel and decomposed soils may be used as post-construction BMPs, particularly in arid regions.

INSTALLATION/APPLICATION CRITERIA

Mulch prevents erosion by protecting the soil surface and fostering growth of new seedings that do not stabilize by themselves.

- May be used with netting to supplement soil stabilization.
- Apply to planting areas where slopes are 2:1 or greater.
- Binders may be required for steep areas, or if wind and runoff is a problem.
- Type of mulch, binders, and application rates should be recommended by manufacturer/contractor.

REQUIREMENTS

- Maintenance
  - Must be inspected weekly and after rain for damage or deterioration.
- Cost: Average annual cost for installation and maintenance (3-4 month useful life, source: EPA, 1992)
  - Straw Mulch: $7,500 per acre.
  - Wood Fiber Mulch: $3,500 per acre.
  - Jute Netting: $12,500 per acre.

LIMITATIONS

- Wood fiber mulches should be used only in areas with over 20 inches annual precipitation.
- Organic mulches are not permanent erosion control measures.
- Mulches tend to lower the soil surface temperature, and may delay germination of some seeds.
- Permanent mulches for arid regions should include gravel and decomposed soils.

Targeted Pollutants

- ● *Sediment*
- ◒ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ◒ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ● *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC11

Best Management Practices

Additional Information — Mulching

Mulching protects the soil from rainfall impact; increases infiltration; conserves moisture around trees, shrubs and seedings; prevents compaction and cracking of soil; and aids plant growth for seedings and plantings by holding the seeds, fertilizers and topsoil in place until growth occurs. Mulches include organic materials, straw, wood chips, bark or other wood fibers, decomposed granite and gravel. A variety of nettings or mats of organic or non-organic materials and chemical soil stabilization are practices that may be used conjunctively with mulching.

Mulching may be applied to all graded and cleared areas of the construction site:

- Areas which have been permanently seeded to assist in retaining moisture, and to hold seedings;
- Areas which need temporary soil surface protection because seeding cannot occur due to the season;
- Areas between trees, shrubs and certain ground covers;
- Areas where climatic conditions require a soil moisture retention aid to avoid cracking of the soil and associated compaction, and require soil temperature modification.

Installation/Application Criteria

Only a set of general guidelines is included for application and installation of mulching on disturbed lands because of the various climates, soil conditions and land uses in California. Installation of mulch consists of furnishing all materials, preparing the soil surface and applying the mulch to all soil surface areas designated on the project plans or established by the site engineer.

Materials

Organic mulch materials, such as straw, wood chips, bark and wood fiber, have been found to be most effective where re-vegetation will be provided by reseeding. The choice of mulch should be based on the size of the area, site slopes, surface conditions such as hardness and moisture; weed growth and availability of mulch materials.

Wood Fiber Mulches: Wood fiber mulches consist of specially prepared wood fiber processed to contain no growth germination inhibiting factors. The mulch should be from virgin wood, and be manufactured and processed so the fibers will remain in uniform suspension in water under agitation to form a homogenous slurry. The fiber lengths should be as long as possible to increase the effectiveness for erosion control. Wood fiber mulching should not be used in areas of extremely hot summer and late fall seasons because of fire danger. When used as a tackifier with straw mulch, wood fiber mulches are good for steep slopes and severe climates. The California Office of the Soils Conservation Service recommends a non-toxic mulch green dye be used to provide a visual aid in metering applications.

Wood Chips and Bark Chips: Wood and bark chips are suitable for application in landscaped areas that will not be closely mowed. Wood chips do not require tacking, but do require nitrogen treatment (12 pounds/ton) to prevent nutrient deficiency. Bark chips do not require additional nitrogen fertilizer. When the wood source is near the project site, wood and bark chips can be very inexpensive. Caution must be used in areas of steep slopes, since both wood and bark chips tend to wash down slopes exceeding 6 percent.

Straw Mulch: Straw mulch is a good short-term protection most commonly used with seeding. The mulch should be from the current season's crop. A letter of certification from the supplier should be required to show that the straw was baled less than 12 months from the delivery date. Wheat or oat straw is recommended.

Emulsified Asphalt: Asphalt is used to adhere the mulch to the ground surface, preventing the mulch from blowing or washing off. The type and quantity of asphalt used should not result in a storm water pollution problem.

Binder: Binder should be free flowing, noncorrosive powder produced from natural plant gum such as those marketed under M-Binder, M145 Binder, or AZ-TAC. Synthetic, spray-on materials are not recommended since they tend to create an impervious surface, and may enter the stormwater sewer system via discharge runoff.

ESC11

Best Management Practices

Additional Information — Mulching

Preparations/Methods and Equipment

Straw Mulch: Should be applied in an even, uniform manner, either by hand or by mulch blowing equipment. Straw mulches must be anchored to prevent the mulch from being blown or washed off the site. Anchoring is achieved in two ways:

- Crimping: The mulch is anchored by running a heavy disc with flat, dull, serrated, closely-spaced blades over the mulched soil. Effective crimping embeds the mulch about 2 inches into the soil without completely covering it. The disc should be run once or twice across the soil. About 2 1/2 tons of straw mulch per acre should be applied if the mulch is anchored by crimping.
- Tacking: Achieved using a emulsified asphalt or binder either independently or followed by crimping. If tacked, straw mulch may be applied at a rate of 1 3/4 ton per acre, and tacked with emulsified asphalt at a rate of 500 gallons per acre.

Wood Fiber Mulch: Typically applied with a hydroseeder at a rate of about 1000 to 1500 pounds per acre, or as a slurry consisting of at least 150 pounds of binder, 400 pounds of wood fiber mulch, and 200 gallons of water per acre.

Requirements

Maintenance: Mulched areas require frequent inspection for damage and deterioration. Requirements will vary greatly based on the type of mulch used and the type of vegetation to be established. Vegetative mulches are usually not intended to be permanent; but are extended only as a base for re-seeding or re-vegetation. Where a permanent anchor for vegetation is required, along steep slopes or areas of higher velocity flows, then a geotextile mat or net is recommended (see ESC20).

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Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, September 1992.

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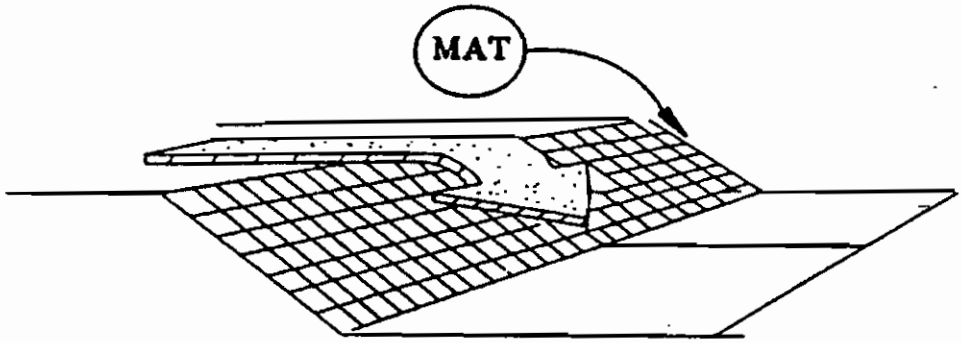
ESC11

Best Management Practices

BMP: GEOTEXTILES AND MATS



Objectives

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Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ● *Capital Costs*
- ◒ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ● *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC20

Best Management Practices

GENERAL DESCRIPTION

Mattings made of natural or synthetic material which are used to temporarily or permanently stabilize soil.

SUITABLE APPLICATIONS

Typically suited for post-construction site stabilization, but may be used for temporary stabilization of highly erosive soils.

- Channels and streams.
- Steep slopes.

INSTALLATION/APPLICATION CRITERIA

Mattings may be applied to disturbed soils and where existing vegetation has been removed. The following organic matting materials provide temporary protection until permanent vegetation is established, or when seasonal circumstances dictate the need for temporary stabilization until weather or construction delays are resolved.

- Jute mattings.
- Straw mattings.

The following synthetic mattings may be used for either temporary or post-construction stabilization, both with and without vegetation

- Excelsior matting.
- Glass fiber matting.
- Staples.
- Mulch nettings.

REQUIREMENTS

- Maintenance
  - Inspect monthly and after significant rainfall.
  - Re-anchor loosened matting and replace missing matting and staples as required.
- Cost
  - Relatively high compared to other BMPs.

LIMITATIONS

- Mattings are more costly than other BMP practices, limiting their use to areas where other BMPs are ineffective (e.g., channels, steep slopes).
- May delay seed germination, due to reduction in soil temperature.
- Installation requires experienced contractor to ensure soil stabilization and erosion protection.

Additional Information — Geotextiles and Mats

Mattings are used to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Additionally, mattings may be used to stabilize soils until vegetation is established. This practice may be used alone or with a mulch during the establishment of protective cover on critical slopes (see ESC11, Mulching).

Suitable Applications

Mattings are commonly applied on short, steep slopes where erosion hazard is high and vegetation will be slow to establish. Mattings are also used on stream banks where moving water at velocities between 3 fps and 6 fps is likely to wash out new vegetation, and in areas where the soil surface is disturbed and where existing vegetation has been removed. Matting may also be used when seeding cannot occur (e.g., late season construction and/or the arrival of an early rain season). Erosion control matting should be considered when the soils are fine grained and potentially erosive.

The following natural or synthetic mattings are commonly used:

Jute Mat - should be cloth of a uniform plain weave of undyed and unbleached single jute yarn, 48" in width, and weighing an average of 1.2 pounds per linear yard of cloth with a tolerance of plus or minus five (5) percent, with approximately 78 warp ends per width of cloth and 41 weft ends per linear yard of cloth. The yarn should be of a loosely twisted construction having an average twist of not less than 1.6 turns per inch and shall not vary in thickness by more than its normal diameter.

Straw Mat - should be a machine produced mat consisting of 70% (±3%) agricultural straw and 30% (±3%) coconut fiber. The blanket should be of consistent thickness with the straw and coconut fiber evenly distributed over the entire area of the mat. The blanket should be covered on the top side with polypropylene netting having an approximate 5/8" x 5/8" mesh containing ultraviolet additives to resist breakdown, and on the bottom with a polypropylene netting with an approximate " x " mesh. The blanket should be sewn together with cotton thread.

Excelsior Mat - should be wood excelsior, 48 inches in width plus or minus one inch and weighing 0.8 pound per square yard plus or minus ten percent. The excelsior material should be covered with a netting to facilitate handling and to increase strength.

Glass Fiber Matting - should be of bonded textile glass fibers with an average fiber diameter of eight to twelve microns, two to four inch strands of fiber bonded with phenol formaldehyde resin. Mat should be roll type, water permeable, minimum thickness inch, maximum thickness inch, density not less than three pounds per cubic foot.

Staples for anchoring soil stabilizing materials should be Number 11 gauge wire or heavier. Their length should be six to ten inches, with longer staples used in loose, unstable soils.

Other Mulch Netting - such as paper, plastic, cotton or fiber glass matting should be installed according to the manufacturer's recommendations.

Installation/Application Criteria

Organic matting materials have been found to be effective where re-vegetation will be provided by re-seeding. The choice of matting should be based on the size of area, side slopes, surface conditions such as hardness and moisture; weed growth and availability of materials. Matting strengths and uses vary, therefore, manufacturer's specifications must be followed. Proper installation of mattings is critical in order to obtain firm, continuous contact with the soil.

ESC20

Best Management Practices

Additional Information — Geotextiles and Mats

Site Preparation: After the site has been shaped and graded to the approved design, prepare a friable seed bed relatively free from clods and rocks more than 1 inches in diameter and any foreign material that will prevent contact of the protective mat with the soil surface.

Planting: Fertilize and seed in accordance with seeding specifications or other types of landscaping plans. When using jute matting on a seeded area, apply approximately half the seed before laying the mat and the remainder after laying the mat. The protective matting can be laid over areas where grass has been planted and the seedlings have emerged. Where vines or other ground covers are to be planted, lay the protective matting first and then plant through matting according to design of planting.

Erosion Stops: Erosion stops are made of glass fiber strips, excelsior matting strips or tight-folded jute matting blanket or strips for use on steep, highly erodible watercourses. The stops are placed in narrow trenches six to twelve inches deep across the channel and left flush with the soil surface. They are to cover the full cross section of designed flow.

Laying and Securing Matting: Before laying the matting, all erosion stops should be installed and the friable seed bed made free from clods, rocks, and roots. The surface upon which the separation fabric will be placed should be compacted and finished according to the requirements of the manufacturer's recommendations.

Most matting comes with the manufacturer's recommendations for installation. Most channels will require multiple widths of matting, and the matting should be unrolled starting at the upper end of the channel, allowing a four inch overlap of mattings along the center of the channel. To secure, bury the top ends of the matting in a narrow trench, a minimum of six inches deep. Backfill trench and tamp firmly to conform to channel cross section. Secure with a row of staples about four inches down slope from the trench with staples twelve inches apart.

Where matting crosses erosion stops, reinforce with a double row of staples at six inch spacing, using a staggered pattern on either side of the erosion stop. When the matting is overlapped, the discharge end of the matting liner should be similarly secured with a double row of staples.

Mechanical or manual laydown equipment should be capable of handling full rolls of fabric, and laying the fabric smoothly, without wrinkles or folds. The equipment should meet the fabric manufacturer's recommendations or equivalent standards.

Final Check: Check the following after the mating is installed:

- Make sure matting is uniformly in contact with the soil.
- All lap joints are secure.
- All staples are flush with the ground.
- All disturbed areas seeded.

Limitations

Properly installed mattings provide excellent erosion control but do so at relatively high cost. This high cost typically limits the use of mattings to areas of concentrated channel flow and steep slopes.

Installation is critical and requires experienced contractors. The contractor should install the matting material in such a manner that continuous contact between the material and the soil occurs, otherwise the material will not stabilize the soil and erosion will occur beneath the material. Ultraviolet protection may be required on some geotextiles. Matting strengths and uses vary; the manufacturer's specifications should be followed.

ESC20

Best Management Practices

Additional Information — Geotextiles and Mats

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, September 1992.

Guides for Erosion and Sediment Controls in California, USDA Soils Conservation Service - January 1991.

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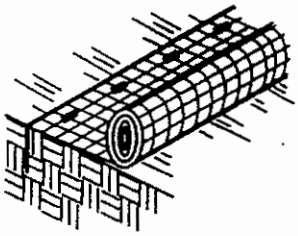
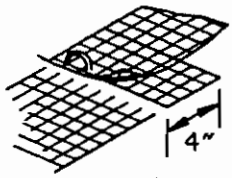
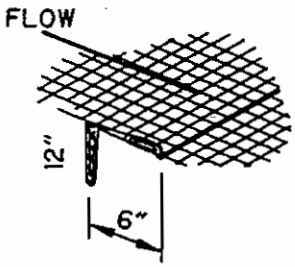
Best Management Practices



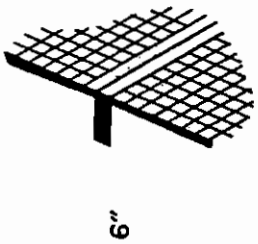
ANCHOR SLOT: BURY THE UP-CHANNEL END OF THE NET IN A 12" DEEP TRENCH. TAMP THE SOIL FIRMLY. STAPLE AT 12" INTERVALS ACROSS THE NET.



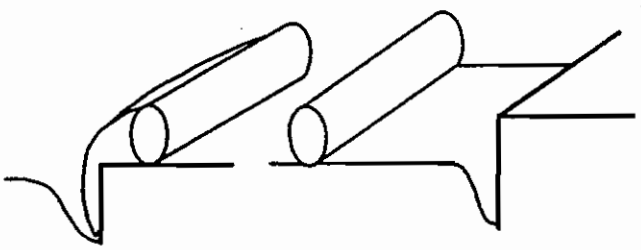
OVERLAP: OVERLAP EDGES OF THE STRIPS AT LEAST 4". STAPLE EVERY 12" DOWN THE CENTER OF THE STRIP.



JOINING STRIPS: INSERT THE NEW ROLL OR NET IN A TRENCH, AS WITH THE ANCHOR SLOT. OVERLAP THE UP-CHANNEL END OF THE PREVIOUS ROLL 18" AND TURN THE END OF THE PREVIOUS ROLL, JUST BELOW THE ANCHOR SLOT, LEAVING 6" OVERLAP.



CHECK SLOTS: ON ERODIBLE SOILS OR STEEP SLOPES, CHECK SLOTS SHOULD BE MADE EVERY 15 FEET. INSERT A FOLD OF THE NET INTO A 6" TRENCH AND TRAMP FIRMLY. STAPLE AT 12" INTERVALS ACROSS THE NET. LAY THE NET SMOOTHLY ON THE SURFACE OF THE SOIL - DO NOT STRETCH THE NET, AND DO NOT ALLOW WRINKLES.



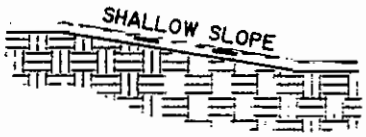
ANCHORING ENDS AT STRUCTURES: PLACE THE END OF THE NET IN A 12" SLOT ON THE UP-CHANNEL SIDE OF THE STRUCTURE. FILL THE TRENCH AND TAMP FIRMLY. ROLL THE NET UP THE CHANNEL. PLACE STAPLES AT 12" INTERVALS ALONG THE ANCHOR END OF THE NET.

INSTALLATION OF NETTING AND MATTING

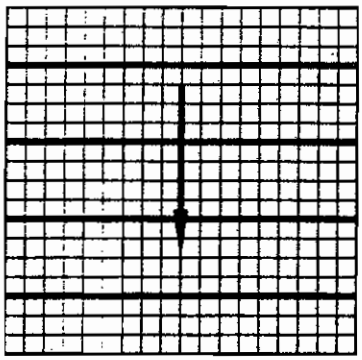
ESC20

Additional Information — Geotextiles and Mats

ON SHALLOW SLOPES, STRIPS OF NETTING MAY BE APPLIED ACROSS THE SLOPE.



SECTION

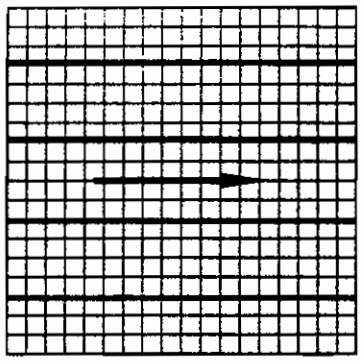


(SHALLOW SLOPES)

PLAN

ON STEEP SLOPES, APPLY STRIPS OF NETTING PARALLEL TO THE DIRECTION OF FLOW AND ANCHOR SECURELY.

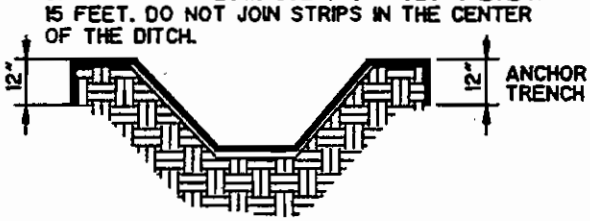
SECTION



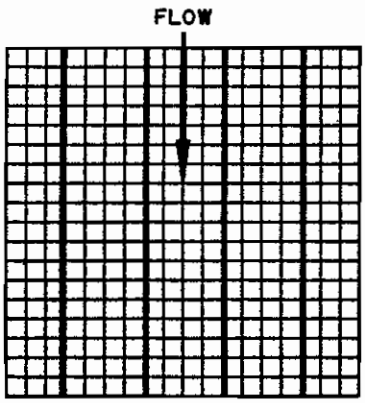
(STEEP SLOPE)

PLAN

IN DITHCHES, APPLY NETTING PARALLEL TO THE DIRECTION OF FLOW. USE CHECK SLOTS EVERY 15 FEET. DO NOT JOIN STRIPS IN THE CENTER OF THE DITCH.

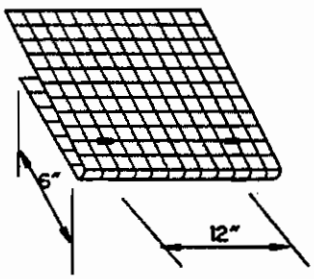


SECTION

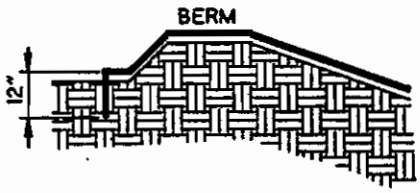


(DITCH)

PLAN



BRING NETTING DOWN TO A LEVEL BEFORE TERMINATING THE INSTALLATION. TURN THE END UNDER 6" AND STAPLE AT 12" INTERVALS.

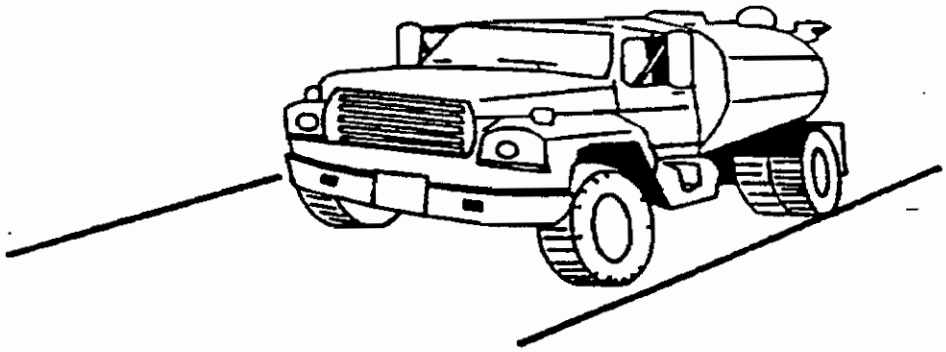


WHERE THERE IS A BERM AT THE TOP OF THE SLOPE, BRING THE MATTING OVER THE BERM AND ANCHOR IT BEHIND THE BERM WITH A 12" ANCHOR TRENCH.

ESC20

ORIENTATION OF NETTING AND MATTING

BMP: DUST CONTROLS



Objectives

- (●) Housekeeping Practices
- Contain Waste
- (●) Minimize Disturbed Areas
- (●) Stabilize Disturbed Areas
- Protect Slopes/Channels
- (●) Control Site Perimeter
- Control Internal Erosion

GENERAL DESCRIPTION

Dust control measures are used to stabilize soil from wind erosion, and reduce dust generated by construction activities.

SUITABLE APPLICATIONS

- Clearing and grading activities.
- Construction vehicle traffic on unpaved roads.
- Drilling and blasting activities.
- Sediment tracking onto paved roads.
- Soil and debris storage piles.
- Batch drop from front end loaders.
- Areas with unstabilized soil.
- Final grading/site stabilization usually is sufficient to control post-construction dust sources.

INSTALLATION/APPLICATION CRITERIA

- Schedule construction activities to minimize exposed area (See ESC 1).
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering (See ESC 10 and 11).
- Identify and stabilize key access points prior to commencement of construction (See ESC 24).
- Minimizing the impact of dust by anticipating the direction of prevailing winds.
- Direct most construction traffic to stabilized roadways within the project site (See ESC 23).

REQUIREMENTS

- Maintenance
  - Most dust control measures require frequent, often daily, attention.
- Cost
  - Installation costs for water/chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

LIMITATIONS

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Overwatering may cause erosion.
- Oil should not be used for dust control because the oil may migrate into drainageway and/or seep into the soil.
- Certain chemically-treated subgrades may make soil water repellant, increasing runoff.

Targeted Pollutants

- (●) Sediment
- (○) Nutrients
- (◒) Toxic Materials
- (◒) Oil & Grease
- (○) Floatable Materials
- (○) Other Construction Waste

(●) Likely to Have Significant Impact
(○) Probable Low or Unknown Impact

Implementation Requirements

- (○) Capital Costs
- (◒) O&M Costs
- (◒) Maintenance
- (○) Training
- (○) Suitability for Slopes >5%

(●) High (○) Low

ESC21

Best Management Practices

Additional Information — Dust Controls

California's mediterranean climate, with short wet seasons and long hot dry seasons, allow the soils to thoroughly dry out. During these dry seasons, construction activities are at their peak, and disturbance and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities. Los Angeles, the North Coast and Sacramento, among others have enacted dust control ordinances for construction activities that cause dust to be transported beyond the construction project property line. Recently, the State Air Resourees Control Board has, under the authority of the Clean Air Act, started to address air quality in relation to inhalable particulate matter less than 10 microns (PM-10). 90% of these small particles are considered to be dust. Existing dust control regulations by local agencies, municipal departments, public works department, and/or public health departments are in place in some regions within California. For jurisdictions that have no formal dust control regulations and/or standards, Sections 10, 17 and 18 of CalTrans' Standard Specifications provide detailed provisions for dust control practices.

Many local agencies require dust control in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. The following are measures that local agencies may have already implemented as requirements for dust control from contractors:

- Construction & Grading Permits: Require provisions for dust control plans;
- Opacity Emission Limits: Enforce compliance with California air pollution control laws;
- Increase overall enforcement activities: Priority given to cases involving citizen complaints;
- Maintain Field Application Records: Require records of dust control measures from contractor;
- Stormwater Pollution Prevention Plan: (SWPPP): Integrate dust control measures into SWPPP.

Dust Control Practices

Dust control BMP's generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. Table ESC21.1 shows which Dust Control BMPs apply to site conditions which cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel or asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching and sand fences can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting on-site vehicle traffic to 15 miles per hour, and controlling the number and activity of vehicles on a site at any given time.

Many of the reasonably available control measures for controlling dust from construction sites can also be implemented as BMPs for storm water pollution prevention. Those BMPs include:

- Pave, vegetate, or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for wet suppression or chemical stabilization of exposed soils.
- Provide for rapid clean-up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas.
- Stabilize unpaved haul roads, parking and staging areas. Reduce speed and trips on unpaved roads.
- Implement dust control measures for material stockpiles.
- Prevent drainage of sediment laden storm water onto paved surfaces.
- Stabilize abandoned construction sites using vegetation or chemical stabilization methods.
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For the chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. The types of chemicals available and recommendations for their use are tabulated in Table ESC 21.2, Commonly Used Chemicals for Dust Control.

ESC21

Best Management Practices

Additional Information — Dust Controls

In addition, there are many other BMPs identified in this handbook that provide dust control including:

- Seeding and Plantings (ESC 10)
- Mulching (ESC 11)
- Construction Road Stabilization (ESC 23)
- Stabilized Construction Entrances (ESC 24)

Limitations

- Oil treated subgrades should not be used because the oil may migrate into drainageways and/or seep into the soil.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration, and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- Asphalt, as a mulch tack or chemical mulch, requires a 24 hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, 1992.

CalTrans, Standard Specifications, Sections 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative".

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Sacramento County, Winterization Ordinance & Dust Control Ordinance (example).

USDA Soil Conservation Service, "Guides for Erosion and Sediment Control".

ESC21

Best Management Practices

TABLE ESC 21.1 DUST CONTROL BMPs FOR GIVEN SITE CONDITIONS

SITE CONDITION	DUST CONTROL BMPs								
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt Surfacing	Sand Fences	Temporary Gravel Construction Entrances/Equipment Wash Down	Haul Truck Covers	Minimize Extent of Area Disturbed
Disturbed Areas not Subject to Traffic	X	X	X	X	X				X
Disturbed Areas Subject to Traffic			X	X	X				X
Material Stock Pile Stabilization			X	X		X			X
Demolition			X				X	X	
Clearing/Excavation			X	X					X
Truck Traffic on Unpaved Roads			X	X	X			X	
Mud/Dirt Carry-Out					X		X		

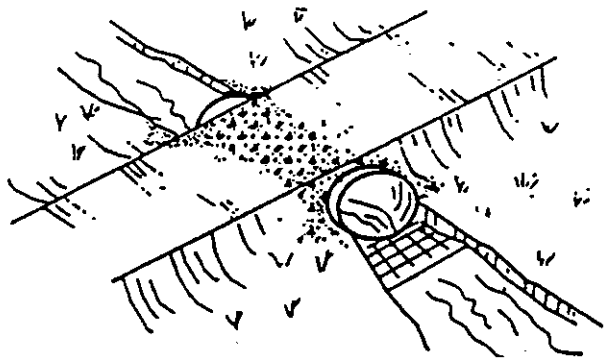
TABLE ESC 21.2 COMMONLY USED CHEMICALS FOR DUST CONTROL

	SALTS	ORGANIC, NON PETROLEUM-BASED	PETROLEUM BASED PRODUCTS[1]
CHEMICAL TYPES	• Calcium Chloride[2] • Magnesium Chloride • Natural Brines	• Calcium Lignosulfonate • Sodium Lignosulfonate • Ammonium Lignosulfonate	• Bunker Oil • Asphalt Primer • Emulsified Asphalt
LIMITATIONS	Can lose effectiveness in dry periods with low humidity. Leaches from road in heavy rain Not recommended for gravel road surfaces with low fines. Recommended 10-20% fines.	Not affected by dry weather and low humidity. Leached from road in heavy rain if not sufficiently cured. Best performance on gravel roads with high surface fines (10-30%) and dense compact surface with loose gravel.	Generally effective regardless of climatic conditions may pothole in wet weather. Best performance on gravel roads with 5-10% fines.
COMMENTS	Calcium Chloride is popular. May become slippery when wet on gravel surfaces with high fines.	Ineffective on gravel surfaces low in fines. May become slippery when wet on gravel surfaces with high fines content.	Creates a hardened crust.

[1] Motor oils and oil treatments are not recommended due to adverse effects on plant life and groundwater.

[2] Not recommended due to adverse effects on plant life.

BMP: TEMPORARY STREAM CROSSING



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ○ Toxic Materials
- ◒ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ○ O&M Costs
- ◒ Maintenance
- ○ Training
- ○ Suitability for Slopes >5%

● High ○ Low

GENERAL DESCRIPTION

A temporary access stream crossing is a temporary culvert, ford or bridge placed across a waterway to provide access for construction purposes for a period of less than one year. Temporary access crossings are not intended to be used to maintain traffic for the general public.

SUITABLE APPLICATIONS

Temporary stream crossings should be installed at all designated crossings of perennial and intermittent streams on the construction site, as well as for dry channels which may be significantly eroded by construction traffic.

INSTALLATION/APPLICATION CRITERIA

Requires knowledge of stream flows and soil strength and should be designed under the direction of a California registered engineer with knowledge of both hydraulics and construction loading requirements for structures.

REQUIREMENTS

- Maintenance
  - Inspect weekly and after each significant rainfall, including assessment of foundations.
  - Periodically remove silt from crossings.
  - Replace lost aggregate from inlets and outlets of culverts.
- Cost
  - CalTrans Construction Cost Index for temporary bridge crossing is $45-$95 per square feet.

LIMITATIONS

- May be an expensive for a temporary improvement.
- Requires other BMPs to minimize soil disturbance during installation and removal.
- Fords should only be used in dry weather.

ESC22

Best Management Practices

Additional Information — Temporary Stream Crossing

A temporary access stream crossing is a culvert, ford, or bridge placed across a waterway to provide access for construction for a period of less than one year. Temporary access crossings are not intended to be used for general public traffic.

The purpose of this BMP is to provide a safe, erosion-free access across a stream for construction equipment. Minimum standards and specifications for the design, construction, maintenance, and removal of the structure should be established by an engineer registered in California. Temporary stream crossings may be necessary to prevent construction equipment from causing erosion of the stream and tracking sediment and other pollutants into the stream.

Temporary stream crossings are used as access points to construction sites when other detour routes may be too long or burdensome for the construction equipment. Often heavy construction equipment must cross streams or creeks, and detour routes may impose too many constraints such as being too narrow or poor soil strength for the equipment loadings. Additionally, the contractor may find a temporary stream crossing more economical for light-duty vehicles to use for frequent crossings, and may have less environmental impact than construction of a temporary access road.

Installation/Application

Temporary access stream crossings should be sized and installed according to the drainage design criteria of the local municipality. Design criteria should be based on standard engineering practices for culvert design with provisions for minimizing impacts on disturbed crossing areas. Three types of temporary access stream crossings may be considered:

Temporary Access Culvert: A temporary access culvert is effective in controlling erosion but will cause erosion during installation and removal. A temporary culvert can be easily constructed and allows for heavy equipment loads.

Temporary Access Ford: A temporary access ford provides little sediment and erosion control and is ineffective in controlling erosion in the stream channel. A temporary ford is the least expensive stream crossing and allows for maximum load limits. It also offers very low maintenance. Fords are more appropriate during the dry season and in arid areas of California.

Temporary Access Bridge: With the appropriate materials and designs, a temporary access bridge causes the least erosion of the stream channel crossing during its installation and removal.

During the long summer construction season in California, rainfall is infrequent and many streams are dry. Under these conditions, a temporary access ford may be sufficient. A ford is not appropriate if construction will continue through the winter rainy season, if summer thunderstorms are likely, or if the stream flows during most of the year. Temporary access culverts and bridges should then be considered and, if used, should be sized to pass a significant design storm (i.e., at least a 10-year storm). The temporary stream crossing should be protected against erosion, both to prevent excessive sedimentation in the stream and to prevent washout of the crossing (and, consequently, costly construction delays).

Limitations

Special care must be taken when crossing an environmentally sensitive waterway. Oils or other potentially hazardous materials shall not be used for surface treatments. Street runoff should not be allowed to spill down crossing sideslopes. Construction in watercourses should be at or near the natural elevation of the stream bed to prevent any potential flooding upstream of the crossing. In addition, the following limitations may apply:

ESC22

Additional Information — Temporary Stream Crossing

- May be expensive temporary cost
- Increased soil disturbance upon installation and removal
- Temporary culverts need regular maintenance and can cause erosion if the culvert becomes clogged.
- A temporary ford offers little if any erosion control in flowing streams and can often make erosion worse. Fords should only be used in the dry season on dry streams.

Construction in waterways is subject to additional permit requirements. Contact the local municipal storm water agency for additional information.

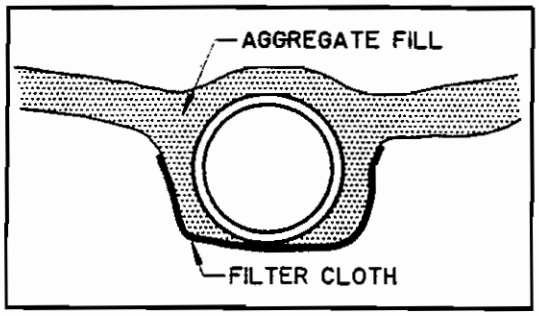
REFERENCES

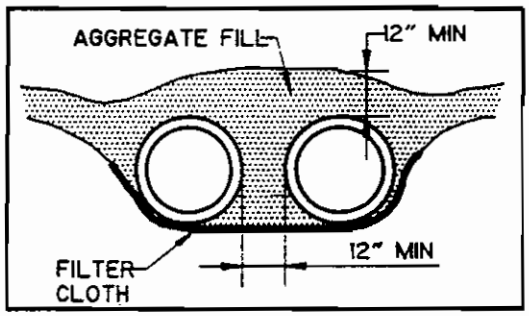
Bank and Shore Protection, CalTrans - November 1970.

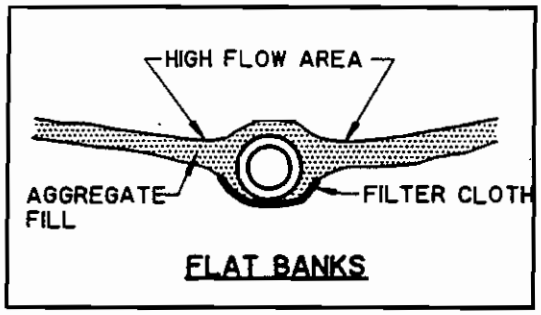
Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September, 1992.

ESC22

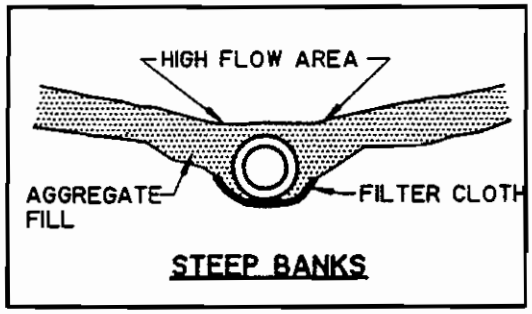
Additional Information — Temporary Stream Crossing



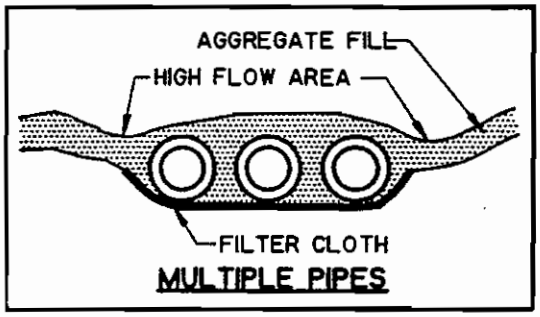




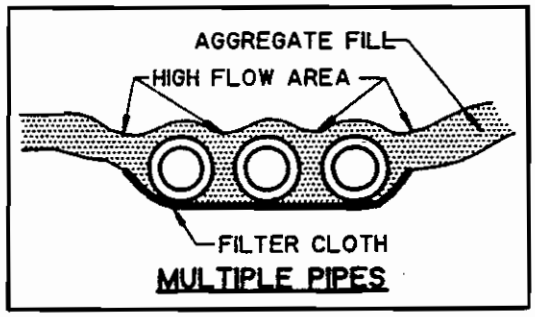
FLAT BANKS



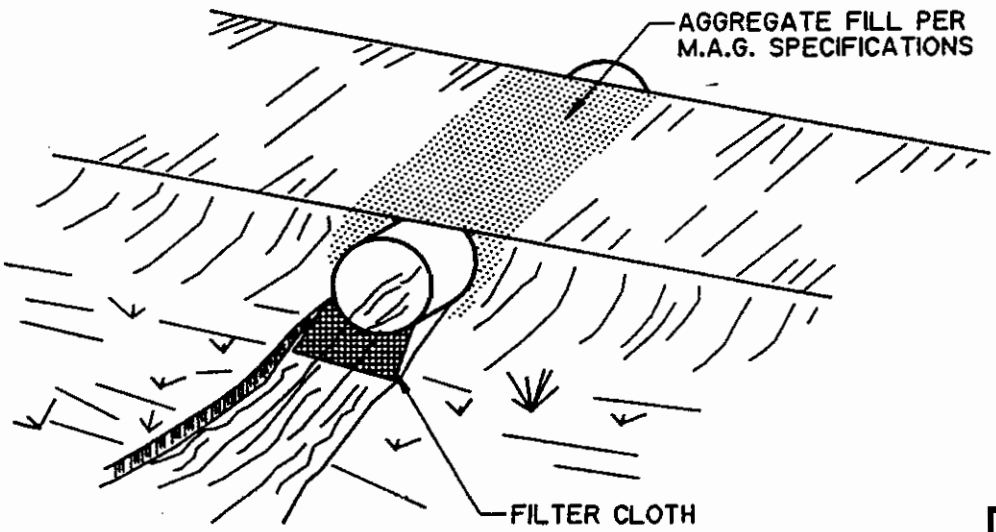
STEEP BANKS



MULTIPLE PIPES

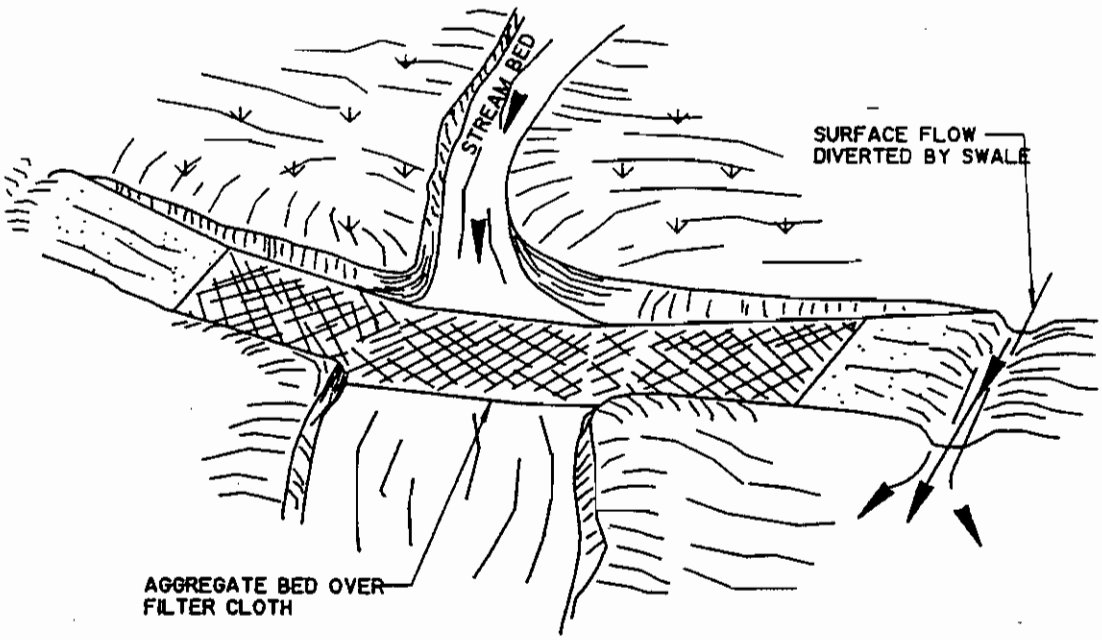


MULTIPLE PIPES

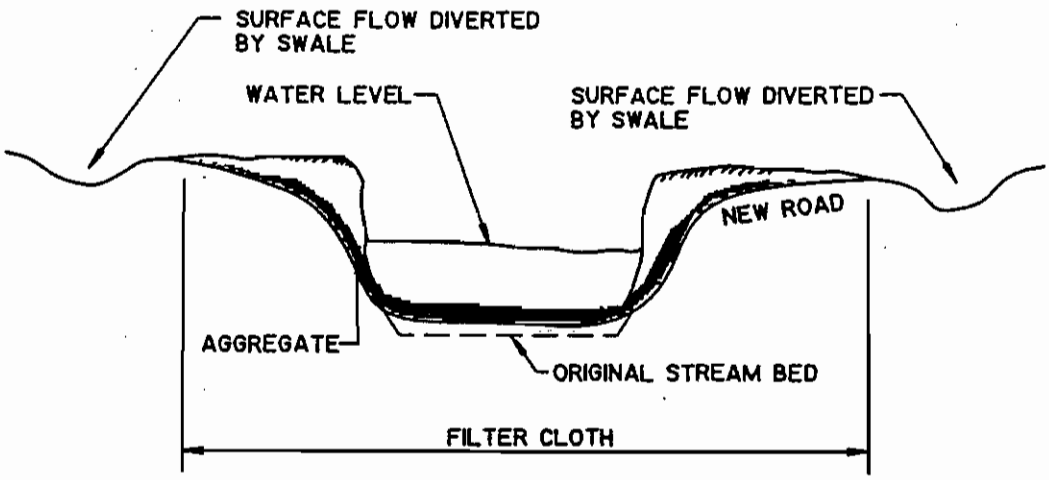


TEMPORARY ACCESS CULVERT

ESC22



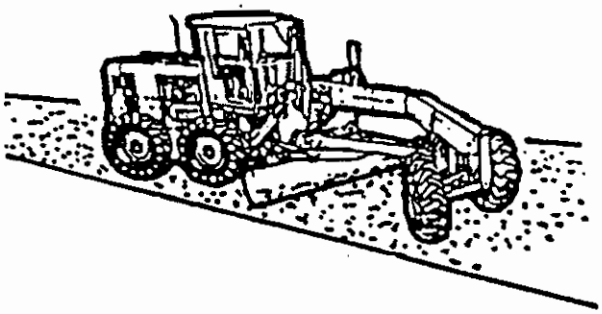
AGGREGATE APPROACH
5 : 1 MAXIMUM, SLOPE ON ROAD



TEMPORARY ACCESS FORD

ESC22

BMP: CONSTRUCTION ROAD STABILIZATION



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

GENERAL DESCRIPTION

Access roads, subdivision roads, parking areas, and other on-site vehicle transportation routes should be stabilized immediately after grading and frequently maintained to prevent erosion and control dust.

SUITABLE APPLICATIONS

- Temporary construction traffic.
- Phased construction projects and off-site road access.
- Detour roads.
- Construction during wet weather.

INSTALLATION/APPLICATION CRITERIA

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15 percent.
- Gravel roads should be a minimum 4-inch thick, 2-3 inch coarse aggregate base applied immediately after grading, or as recommended by soils engineer.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (see Dust Control ESC 21).

REQUIREMENTS

- Maintenance
  - Periodically apply additional aggregate on gravel roads.
  - Active dirt construction roads are commonly watered three or more times per day during the dry season.
  - Inspect weekly, and after each rain.
  - Repair any eroded areas immediately.
- Cost
  - Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay.
  - No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

LIMITATIONS

- The roadway must be removed or paved when construction is complete.
- Certain chemical stabilization methods may cause storm water or soil pollution and should not be used (see Dust Control ESC 21).
- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ○ Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ◒ O&M Costs
- ◒ Maintenance
- ○ Training
- ◒ Suitability for Slopes >5%

● High ○ Low

ESC23

Best Management Practices

Additional Information — Construction Road Stabilization

Areas which are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires which generate significant quantities of sediment that may pollute nearby streams or be transported off-site on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces on-site erosion but can significantly speed on-site work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather.

Installation/Application Criteria

Where feasible, alternative routes should be made for construction traffic; one for use in dry condition, the other for wet conditions which incorporate the measures listed for this BMP. Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and/or on slopes greater than 5 percent.

When gravel road is needed, apply a minimum 4-inch course of 2 to 4-inch crushed rock, gravel base, or crushed surfacing base course immediately after grading or the completion of utility installation within the right-of-way. Chemical stabilization may also be used upon compacted native sub-grade (see the Dust Control BMP ESC 21). These chemical controls should be applied per the manufacturer's directions.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15 percent. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section, or one side in the case of super-elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment-laden water from entering the storm sewer system (see "Storm Drain Inlet Protection" ESC 54).

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, June1981.

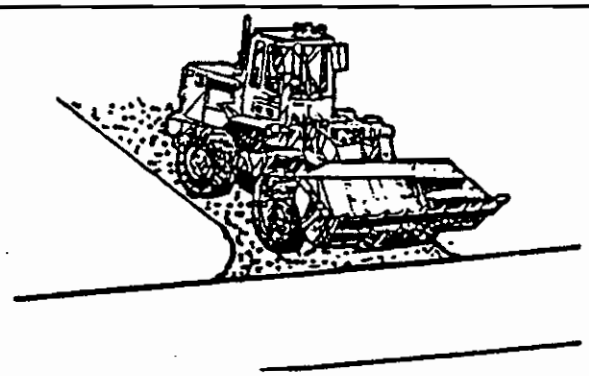
Stormwater Management Water for the Puget Sound Basin, Washington State Department of Ecology, The Technical Manual - February 1992, Publication # 91-75.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC23

BMP: STABILIZED CONSTRUCTION ENTRANCE



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

GENERAL DESCRIPTION

The construction entrance practice is a stabilized pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk or parking area. Stabalizing the construction entrance significantly reduces the amount of sediment (dust, mud) tracked off-site, especially if a washrack incorporated for removing caked on sediment.

SUITABLE APPLICATIONS

- All points of construction ingress and egress.
- Unpaved areas where sediment tracking occurs from site onto paved roads.

INSTALLATION/APPLICATION CRITERIA

- Construct on level ground where possible.
- Stones should be 1-3 inches.
- Minimum depth of stones should be 6 inches or as recommended by soils engineer.
- Length should be 50-foot minimum, and 30-foot minimum width.
- Provide ample turning radii as part of entrance.

REQUIREMENTS

- Maintenance
  - Inspect monthly and after each rainfall.
  - Replace gravel material when surface voids are visible.
  - Remove all sediment deposited on paved roadways within 24 hours.
  - Remove gravel and filter fabric at completion of construction
- Cost: Average annual cost for installation and maintenance (Source: EPA, 1992)
  - Without Wash Rock: $1500 each.
  - With Wash Rock: $2200 each.

LIMITATIONS

- Requires periodic top dressing with additional stones.
- Should be used in conjunction with street sweeping on adjacent public right-of-way.

Targeted Pollutants

- ◒ Sediment
- ◒ Nutrients
- ◒ Toxic Materials
- ◒ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

- ● Likely to Have Significant Impact
- ○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ○ O&M Costs
- ○ Maintenance
- ○ Training
- ○ Suitability for Slopes >5%

● High ○ Low

ESC24

Best Management Practices

Additional Information — Stabilized Construction Entrance

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets. Reducing trackout of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving, a stabilized construction entrance should be used at all points of construction ingress and egress. NPDES permits require that appropriate measures be implemented to prevent trackout of sediments onto paved roadways, which is a significant source of sediments derived from mud and dirt carryout from the unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be build on the level ground. Advantages of the Stabilized Construction Entrance is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance.

The aggregate for a stabilized construction entrance aprons should be 1 to 3 inches in size, washed, well-graded gravel or crushed rock. Minimum apron dimensions of 30 ft. x 50 ft. and 6 inches deep is adequate for two-way ingress/egress traffic.

The entrance must be properly graded to prevent runoff from leaving the construction site.
When wash areas are provided, washing is done on a reinforced concrete pad (if significant washing is necessary) or in an area stabilized with crushed stone which drains into a properly constructed sediment trap or basin (ESC 55 and 56). Sediment barriers are provided to prevent sediments from entering into the stormwater sewer system, ditch, or waterway.

Limitations

- Construct on level ground.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.
- Requires periodic top dressing with additional stones.
- Should be used in conjunction with street sweeping on adjacent public right-of-way.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, June 1981.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April, 1992.

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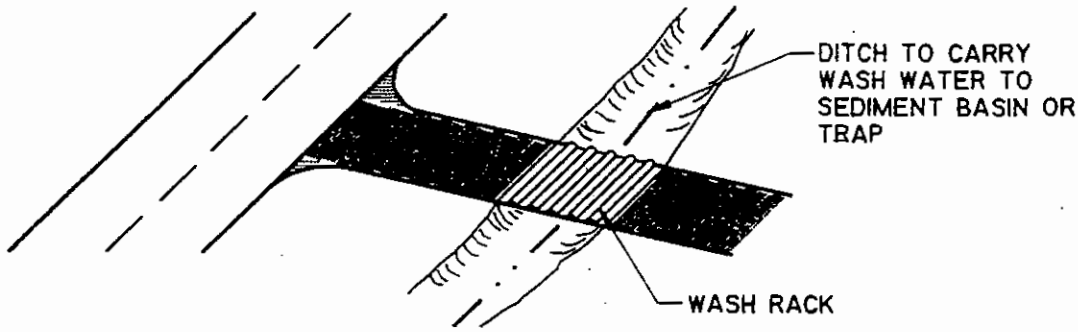
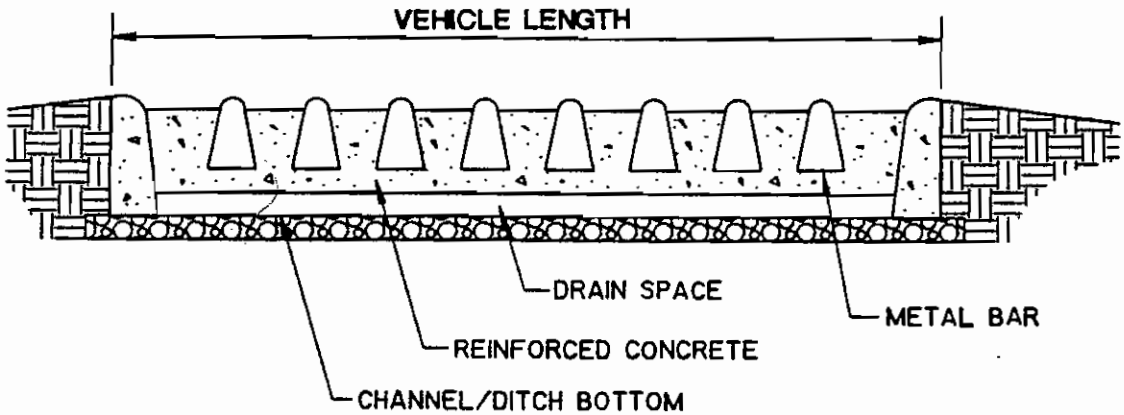
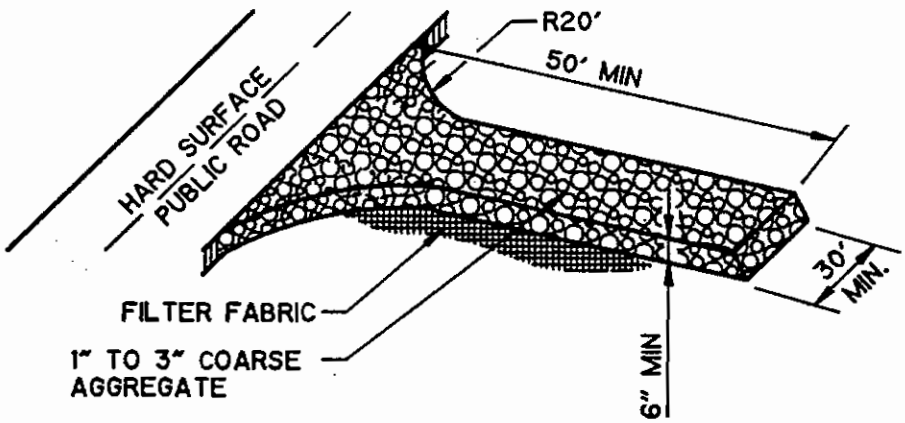
ESC24

Additional Information — Stabilized Construction Entrance





WASH RACK (SCHEMATIC)

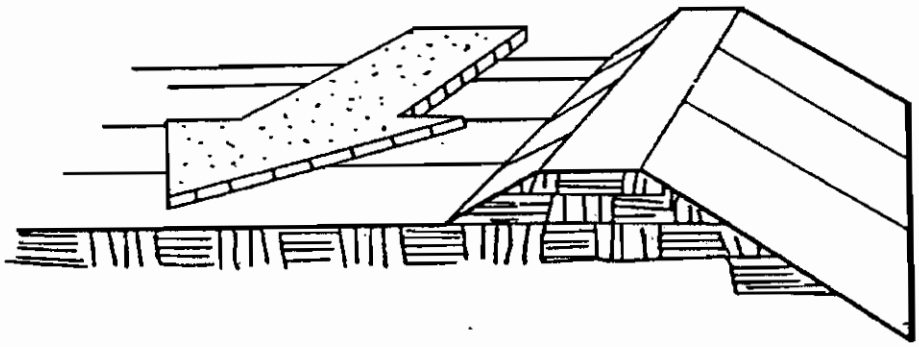


STABILIZED CONSTRUCTION ENTRANCE

ESC24

Best Management Practices

BMP: EARTH DIKE



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

GENERAL DESCRIPTION

The temporary earth dike is a temporary berm or ridge of compacted soil, used to divert runoff or channel water to a desired location.

SUITABLE APPLICATIONS

Earth dikes are typically used to divert concentrated runoff through disturbed areas into another BMP (e.g., sediment basins), to divert runoff away from disturbed or unstable slopes, to divert runoff from off-site and undisturbed areas around disturbed areas, and as a containment for construction materials and wastes. The dikes should remain in place until the disturbed areas are permanently stabilized. The dikes must be on-site and must safely convey anticipated flood flows.

INSTALLATION/APPLICATION CRITERIA

- All dikes should be compacted by earth-moving equipment.
- All dikes should have positive drainage to a stabilized outlet.
- Top width may be wider and side slopes may be flatter at crossings for construction traffic.
- Dikes should direct sediment-laden runoff into a sediment trapping device.
- Dikes should be stabilized with vegetation, chemicals, or physical devices.

REQUIREMENTS

- Maintenance
  - Inspect periodically and after every significant rainfall; repair as necessary.
- Cost
  - Cost ranges from $15 to $55 per foot for both earthwork and stabilization and depends on availability of material, site location, and access.

LIMITATIONS

Dikes should not be used for drainage areas greater than 10 acres, or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted storm water may cause downstream flood damage.
- Dikes should not be constructed of soils which may be easily eroded.
- Regrading the site to remove the dike may add additional cost.

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ◒ Toxic Materials
- ◒ Oil & Grease
- ○ Floatable Materials
- ◒ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ○ O&M Costs
- ◒ Maintenance
- ○ Training
- ◒ Suitability for Slopes >5%

● High ○ Low

ESC30

Best Management Practices

Additional Information — Earth Dike

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert storm water to a sediment trapping device or stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off-site and from undisturbed areas away from disturbed areas, and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff; a dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

- The advantages of the temporary earth dike include the ability to handle flows from large drainage areas.
- Once stabilized, earth dikes require relatively little maintenance. Additionally, the earth dikes are relatively inexpensive to install since the soil material required for construction may be available on-site, and can be constructed as part of the initial grading operations, while the equipment is on-site.
- Uses on-site materials.

Installation/Application Criteria

Temporary earth dikes are a practical, inexpensive BMP used to divert storm water runoff. Temporary diversion dikes should be installed in the following manner:

1. All dikes should be compacted by earth-moving equipment.
2. All dikes should have positive drainage to an outlet.
3. All dikes should have 2:1 side slopes, 18 inches minimum height, and a minimum top width of 24 inches. Top width may be wider and side slopes may be flatter at crossings for construction traffic.
4. The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a sediment trap (ESC 55) or sediment basin (ESC 56) when either the dike channel or the drainage area above the dike are not adequately stabilized.
5. Temporary stabilization may be achieved using seed and mulching for slopes less than 5%, and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
6. If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

CHANNEL GRADE	RIPRAP STABILIZATION
0.5-1.0%	4" Rock
1.1-2.0%	6" Rock
2.1-4.0%	8" Rock
4.1-5.0%	8-12" Riprap

7. The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
8. Filter cloth may be used to cover dikes in use for long periods.
9. Construction activity on the earth dike should be kept to a minimum.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

"Draft - Sedimentation and Erosion Control, An Inventory of Current Practices", U.S.E.P.A., April, 1990.

ESC30

Best Management Practices

Additional Information — Earth Dike

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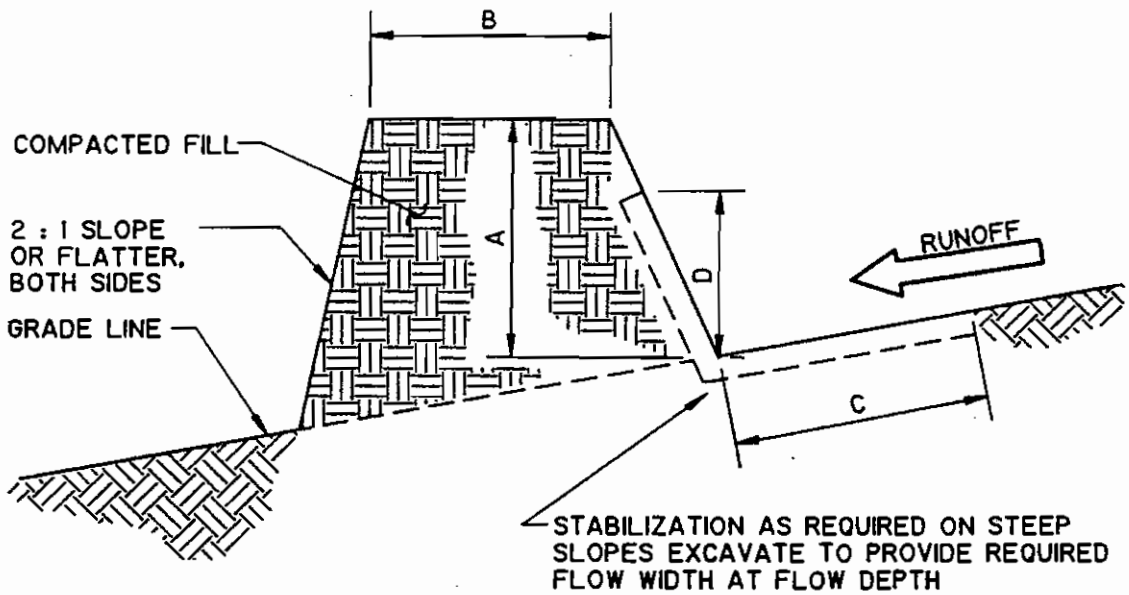
Best Management Practices

Additional Information — Earth Dike



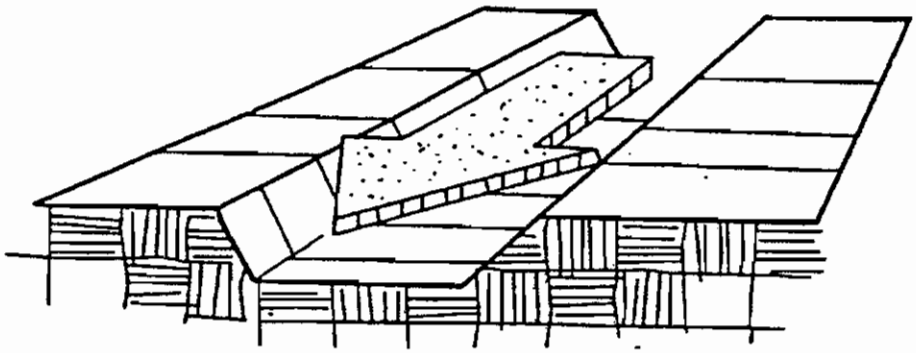
REQUIREMENTS BASED ON UPSTREAM DRAINAGE AREA

	DIKE 1 (5 ACRES OR LESS)	DIKE 2 (5-10 ACRES)
A-DIKE HEIGHT	18"	36"
B-DIKE WIDTH	24"	36"
C-FLOW WIDTH	4'	6'
D-FLOW DEPTH	8"	15"

TEMPORARY DIVERSION DIKE

ESC30

BMP: TEMPORARY DRAINS AND SWALES



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ○ *O&M Costs*
- ○ *Maintenance*
- ○ *Training*
- ◒ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC31

Best Management Practices

GENERAL DESCRIPTION

Temporary drains and swales are used to divert off-site runoff around the construction site, divert runoff from stabilized areas around disturbed areas, and direct runoff into sediment basins or traps.

SUITABLE APPLICATIONS

Temporary drains and swales are appropriate for diverting any upslope runoff around unstabilized or disturbed areas of the construction site:

- Prevent slope failures.
- Prevent damage to adjacent property.
- Prevents erosion and transport of sediments into water ways.
- Increases the potential for infiltration.
- Diverts sediment-laden runoff into sediment basins or traps.

INSTALLATION/APPLICATION CRITERIA

Temporary drainage swales will effectively convey runoff and avoid erosion if built properly:

- Size temporary drainage swales using local drainage design criteria.
- A permanent drainage channel must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drain/swale should conform to predevelopment drainage patterns and capacities.
- Construct the drain/swale with an uninterrupted, positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drain or swale can reach an erosive velocity.

REQUIREMENTS

- Maintenance
  - Inspect weekly and after each rain.
  - Repair any erosion immediately.
  - Remove sediment which builds up in the swale and restricts its flow capacity.
- Cost
  - The cost of a drainage swale increases with drainage area and slope. Typical. swales for controlling internal erosion are inexpensive.

LIMITATIONS

- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.

Additional Information — Temporary Drains and Swales

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike (see ESC30) at the top of a slope can safely divert runoff to a location where it can safely be brought to the bottom of the slope (see Pipe Slope Drain ESC32). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded, and remain in place until post-construction BMPs are installed and/or the slopes are stabilized.

Diversion practices concentrate the volume of surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. A swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization, if significant erosion will occur. Any drain or swale which conveys sediment-laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

Installation/Application Criteria

Diversion drains or swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost-effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drains or swales should be designed as follows:

- No more than 5 acres may drain to a temporary drain or swale
- Place the drain or swale above, not on, a cut and fill slope
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 inches
- Side slopes should be 2:1 or flatter
- Drain or swale should be layed at a grade of at least 1 percent, but not more than 15 percent
- The swale must not be overtopped by the 10-year, 24-hour storm, irrespective of the design criteria stated above
- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built
- Compact any fill material along the path of the swale
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- The cost of swales and other diversion devices is generally included in the earthwork cost, as a separate item under the grading budget of the project construction contract.

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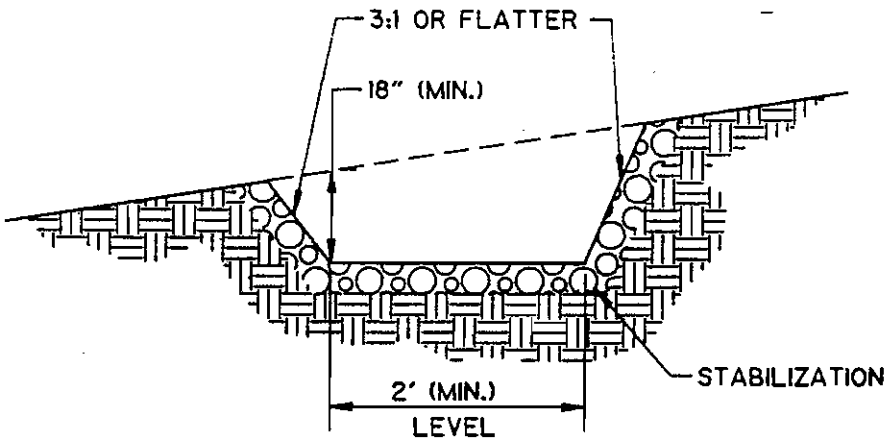
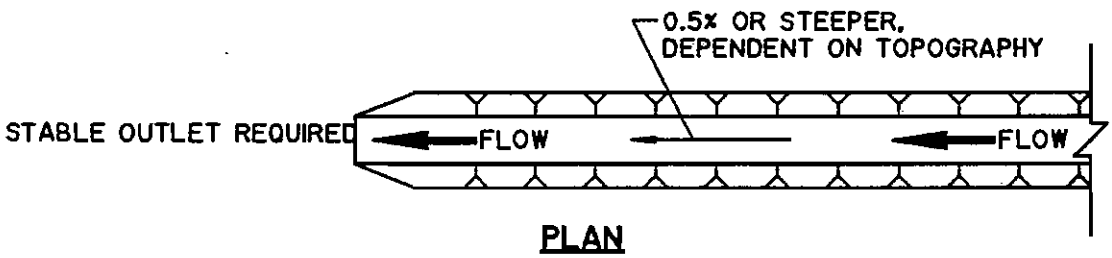


CROSS SECTION

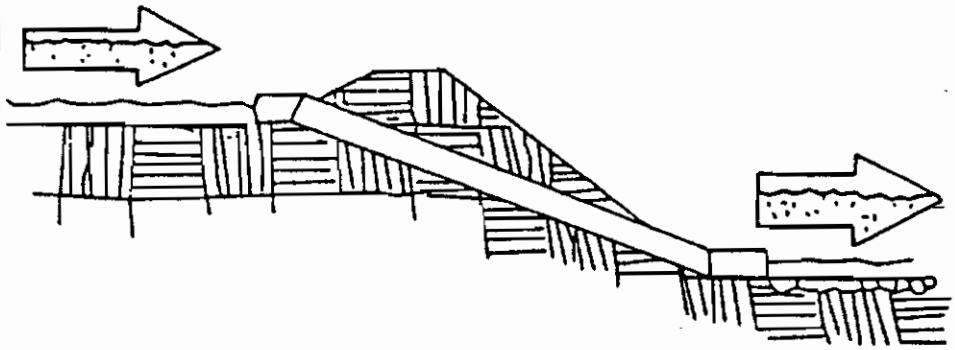


PLAN

TEMPORARY DRAINAGE SWALE

ESC31

BMP: SLOPE DRAIN



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

GENERAL DESCRIPTION

A temporary pipe or lined channel to drain the top of a slope to a stable discharge point at the bottom of a slope without causing erosion.

SUITABLE APPLICATIONS

- Where concentrated flow of surface runoff must be conveyed down a slope in order to prevent erosion.
- Drainage for top of slope diversion dikes or swales.
- Emergency spillway for a sediment basin.
- Drainage for top of cut/fill slopes where water can accumulate.

The types of slope drain can include:

- Pipe drops.
- Flexible downdrains.
- Sectional downdrains.
- Lined terrace drains.

INSTALLATION/APPLICATION CRITERIA

- Secure inlet and surround with dikes to prevent gully erosion, and anchor pipe to slope.
- Size to convey at least the peak of a 10-year, 24-hour storm (See local flood control agency for requirements).
- Stabilize outlet.

REQUIREMENTS

- Maintenance
  - Structure must be inspected regularly and after storms.
  - Inlet must be free of undercutting and no water should circumvent the entry.
  - Outlet should not produce erosion; velocity dissipators must be maintained.
  - Pipe anchors must be checked to ensure that the pipe remains anchored to the slope.
- Cost
  - CalTrans Cost Schedule gives regional cost ranges.

LIMITATIONS

- Maximum drainage area per slope drain is 5 acres. (For large areas use a paved chute, rock lined channel or additional pipes.)
- Clogged slope drains will force water around the pipe and cause slope erosion.
- Dissipation of high flow velocities at the pipe outlet is required to avoid downstream erosion.
- Failure can result in flooding and severe erosion.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ◒ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC32

Best Management Practices

Additional Information — Slope Drain

The slope drain may be a rigid pipe, such as corrugated metal, a flexible conduit, or a lined terrace drain with the inlet placed on the top of a slope. The drain conveys concentrated runoff down to the bottom of the slope. The BMP typically is used in combination with a diversion control, such as a temporary dike or swale, at the top of the slope, and serves as a temporary BMP to reduce or eliminate slope erosion until permanent BMPs are installed and the slope is stabilized.

The slope drain is applicable for any construction site where concentrated surface runoff can accumulate and must be conveyed down the slope in order to prevent erosion. The slope drain is effective because it prevents the stormwater from flowing directly down the slope by confining all the runoff into an enclosed pipe or channel. Due to the time lag between grading slopes and installation of permanent storm water collection systems and slope stabilization measures, temporary provisions to intercept runoff are sometimes necessary. Particularly in steep terrain, slope drains can protect unstabilized areas from erosion. Typical uses include:

- Emergency spillway for a sediment basin.
- Drainage for top of cut/fill slopes where storm water can accumulate and must be conveyed down the slope.

Installation/Application Criteria

Temporary slope drains are highly effective in eliminating slope erosion. Installation and maintenance requirements are small, especially when flexible pipe is used. General criteria:

- Gully erosion is the major problem with slope drains. Inlet structures must be securely entrenched and compacted to avoid severe gully erosion.
- The drain must be securely anchored to the slope and must be adequately sized to carry the capacity of the design storm and associated forces.
- The outlet must be stabilized with rip-rap, concrete or other type of energy dissipator, or directed into a stable sediment trap or basin.
- A debris rack is recommended at the inlet, and should be encouraged for larger pipes and at the outlet as a safety device to prevent small children from entering the pipe.

Materials:

Material selection and criteria for the pipe slope drain is often established by the local municipality. Soil type, rainfall patterns, construction schedule, and available supply are some of the factors to be considered. The following types of slope drains are commonly used:

- Rigid Pipe: This type of slope drain is also known as a pipe drop. The pipe usually consists of corrugated metal pipe or rigid plastic pipe. The pipe is placed on undisturbed or compacted soil and secured into the slope. One foot minimum cover is required on the pipe, and concrete thrust blocks must be used when required by the municipality or warranted by the calculated thrust forces. Collars should be properly installed and secured with metal strappings or watertight collars.
- Flexible Pipe: The flexible pipe slope drain consists of a flexible conduit of heavy duty material. The conduit material is securely anchored into the slope and connections are watertight. The conduit should be securely fastened to the metal inlet and outlet conduit sections with metal strappings or water tight collars.
- Sectional Downdrains: The sectional downdrain consists of pre-fabricated, sectional conduit of half-round or third-round material. The sectional downdrain performs similar to a flume or chute. The pipe must be placed on undisturbed or compacted soil and secured into the slope.
- Concrete-lined Terrace Drain: This is a concrete channel for draining water from a terrace on a slope to the next level. These drains are after permenant structures which should be designed according to local drainage design criteria.

ESC32

Best Management Practices

Additional Information — Slope Drain

Design:
Unless specified by the local municipality, the capacity for temporary drains should be sufficient to handle the peak runoff from a 10-year, 24-hour rainfall event. The pipe size may be computed using the Rational Method or a method established by the local municipality. Higher flows must be safely stored or routed to prevent any offsite concentration of flow, and any erosion of the slope.

As a guide, temporary pipe slope drains should not be sized smaller than shown in the following table:

MINIMUM PIPE DIAMETER	MAXIMUM DRAINAGE AREA (ACRES)
12"	0.5
18"	1.5
21"	2.5
24"	3.5
30"	5.0

Permanent improvements must be designed and installed if the drainage area is greater than 5 acres.

The following additional design criteria should be considered:

- Construct the pipe slope drain entrance of a standard flared end section with a minimum 6-inch metal toe plate to prevent runoff from undercutting the pipe inlet. The slope of the entrance is usually at least 3 percent.
- Thoroughly compact the soil around and under the pipe and entrance section.
- Securely fasten the slope drain sections together, have gasketed watertight fittings, and securely anchored into the soil.
- Secure the flared inlet section to the slope drain and have watertight connecting bands.
- Use interceptor dikes to direct runoff into a slope drain. The height of the dike should be at least 1 foot higher at all points than the top of the inlet pipe.
- If the pipe slope drain is conveying sediment-laden water, direct all flows into a sediment trap (ESC55) or sediment basin (ESC56).
- Unless the pipe directly enters a sediment trap/basin, stabilize the area below the outlet with a riprap apron.

Limitations
Installation is critical for effective use of the pipe slope drain to minimize potential gully erosion. Maximum drainage area per pipe slope drain is 5 acres. For larger areas use a paved chute, rock lined channel or additional pipes. (See the local municipality for drainage requirements)

- During large storms, pipe slope drains may become clogged or overcharged, forcing water around the pipe and causing extreme slope erosion.
- Structures for dissipation of high flow velocities at the pipe outlet must be constructed to avoid downstream erosion.
- Failure of this type of temporary structure may result in flooding and severe erosion.
- If the sectional downdrain is not sized correctly, the runoff can spill over the drain sides causing gully erosion, and potential failure of the structure.

ESC32

Best Management Practices

Additional Information — Slope Drain

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

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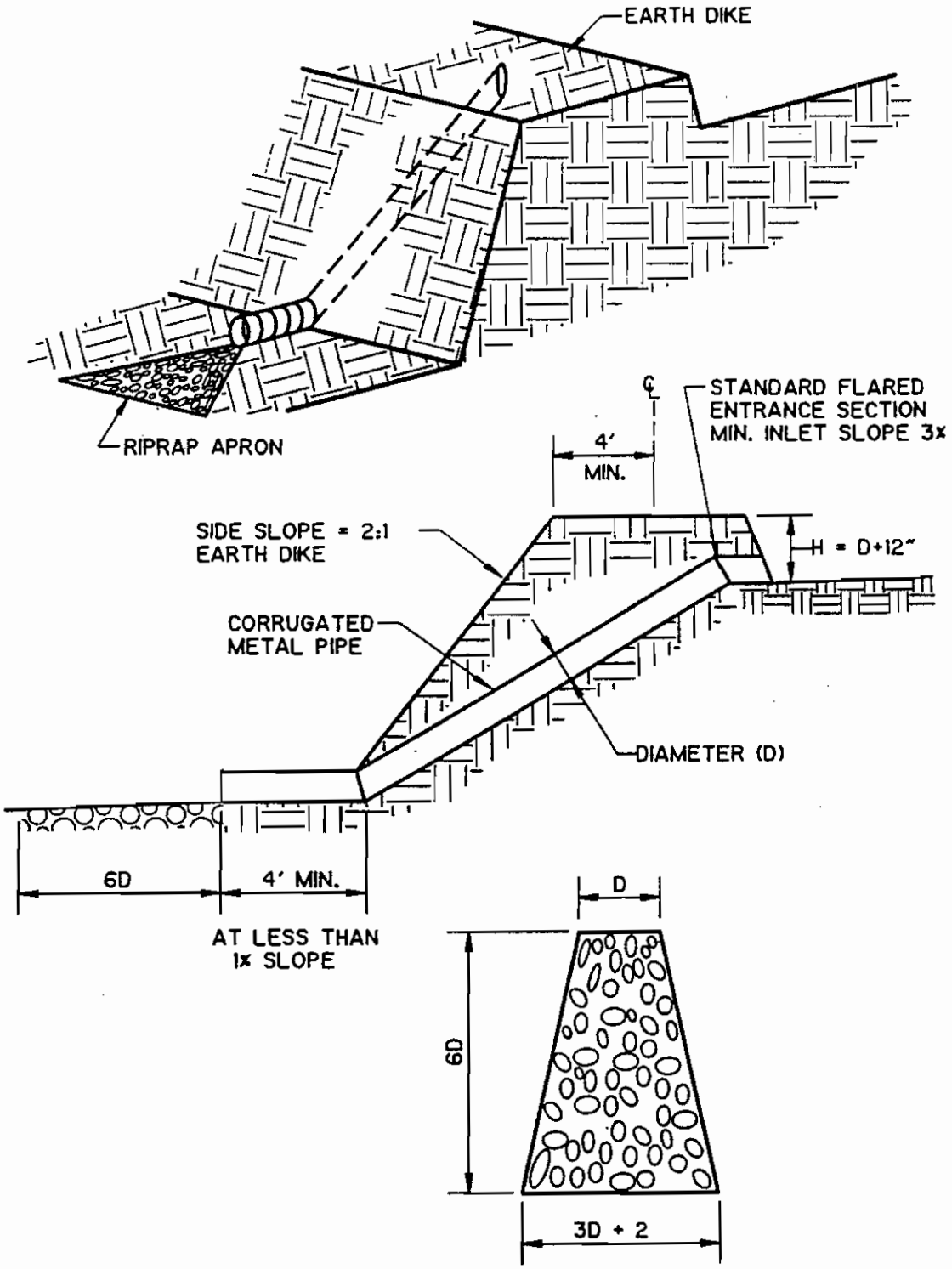
ESC32

Additional Information — Slope Drain



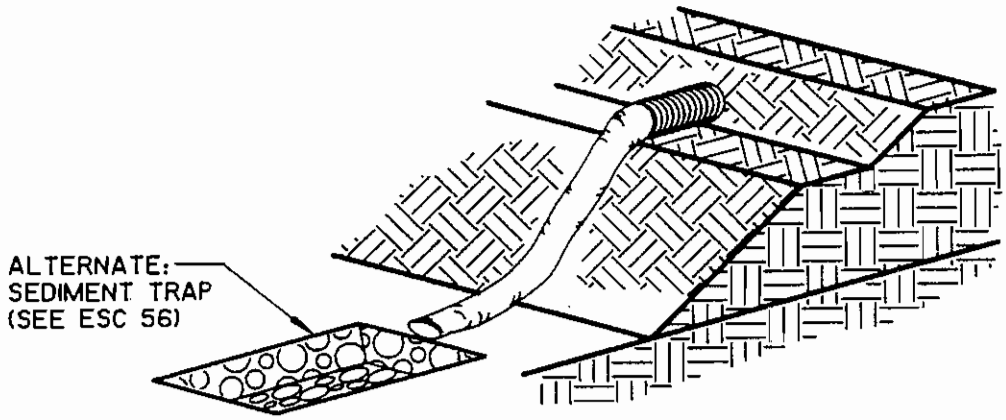
RIPRAP SHOULD CONSIST OF 6" DIAMETER STONE PLACED AS SHOWN AND SHOULD BE A MINIMUM OF 12" IN THICKNESS.

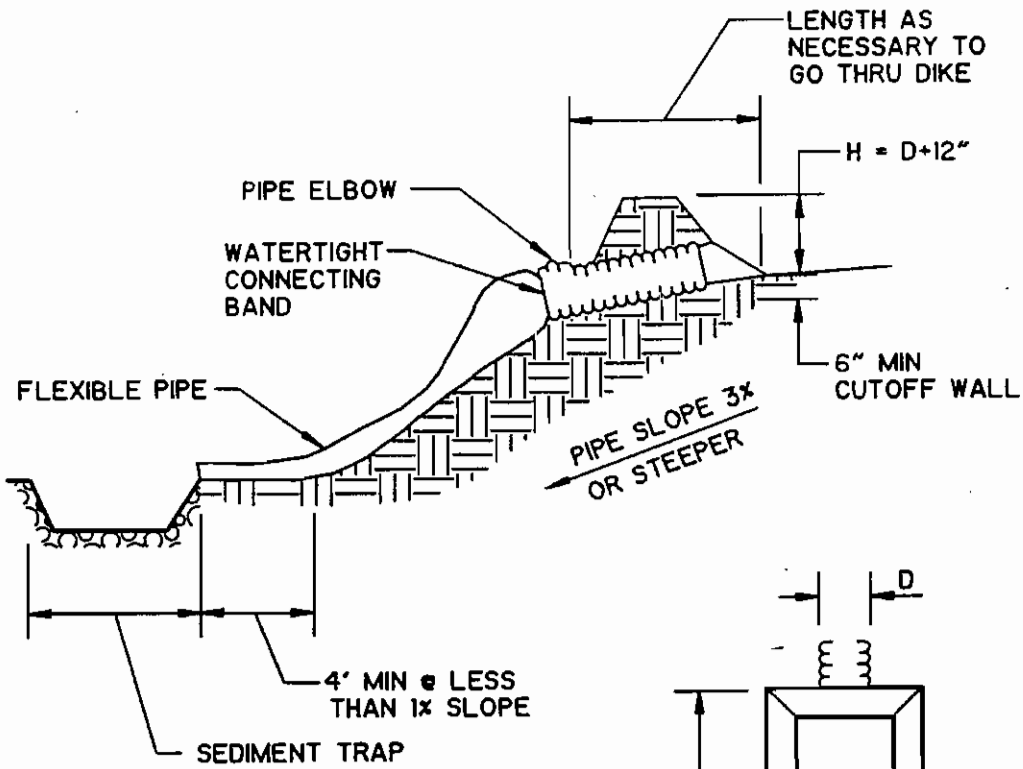
PIPE SLOPE DRAIN (RIGID)

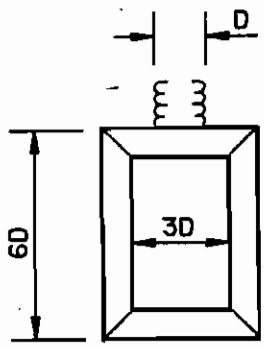
ESC32

Best Management Practices

Additional Information — Slope Drain







RIPRAP SHOULD CONSIST OF 6" DIA STONE PLACED AS SHOWN. DEPTH OF APRON SHOULD EQUAL THE PIPE DIA AND RIPRAP SHALL BE A MINIMUM OF 12" IN THICKNESS.

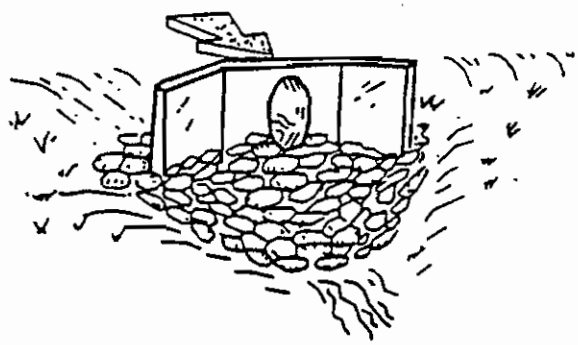
ALTERNATIVE SEDIMENT TRAP: RIPRAP PLAN

PIPE SLOPE DRAIN (FLEXIBLE)

ESC32

Best Management Practices

BMP: OUTLET PROTECTION



Objectives

Housekeeping Practices
Contain Waste
Minimize Disturbed Areas
Stabilize Disturbed Areas
Protect Slopes/Channels
Control Site Perimeter
Control Internal Erosion

GENERAL DESCRIPTION

Rock outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble which is placed at the outlet of a pipe to prevent scour of the soil caused by high pipe flow velocities, and to absorb flow energy to produce non-erosive velocities.

SUITABLE APPLICATIONS

- Wherever discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the next downstream reach.
- Rock outlet protection is best suited for temporary use during construction because it is usually less expensive and easier to install than concrete aprons or energy dissipators.
- A sediment trap below the pipe outlet is recommended if runoff is sediment laden.
- Permanent rock riprap protection should be designed and sized by the engineer as part of the culvert, conduit or channel design.
- Grouted riprap should be avoided in areas of freeze and thaw because the grout will break up.

INSTALLATION/APPLICATION CRITERIA

Rock outlet protection is effective when the rock is sized and placed properly. When this is accomplished, rock outlets do much to limit erosion at pipe outlets. Rock size should be increased for high velocity flows. General recommendations for rock size and length of outlet protection mat are presented in the additional information sheet. Best results are obtained when sound, durable, angular rock is used. CalTrans Standard Specifications or the local municipality can provide additional specifications for constructing outlet protection devices.

REQUIREMENTS

- Maintenance
  - Inspect after each significant rain for erosion and/or disruption of the rock, and repair immediately.
  - Grouted or wire-tied rock riprap can minimize maintenance requirements.
- Cost
  - CalTrans Cost Schedule gives regional cost ranges.

LIMITATIONS

- Large storms often wash away the rock outlet protection and leave the area susceptible to erosion.
- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC40

Best Management Practices

Additional Information — Outlet Protection

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the inlet or outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipators. It also serves to trap sediment and reduce flow velocities.

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat is shown in the rock outlet protection figure. Best results are obtained when sound, durable, angular rock is used. Rock depth and outlet protection length are governed by the discharge pipe size, but hydraulic calculations and velocities should be used to determine length. Your local municipality or CalTrans should be consulted for appropriate sizing criteria in your area.

REFERENCES

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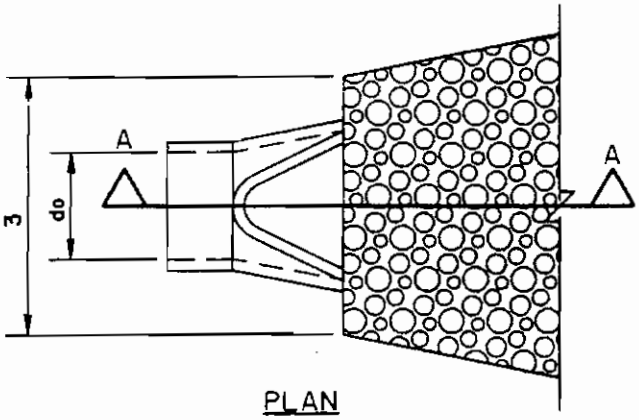
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC40

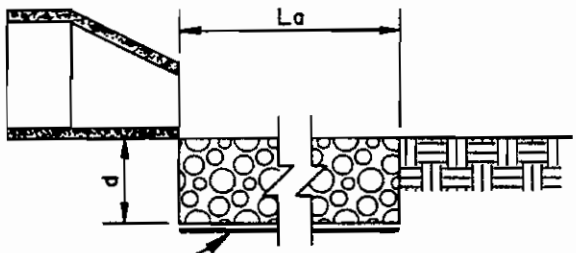
Best Management Practices

Additional Information — Outlet Protection



PLAN

La = LENGTH OF APRON
do = INSIDE PIPE DIAMETER
w = APRON WIDTH
d = APRON THICKNESS



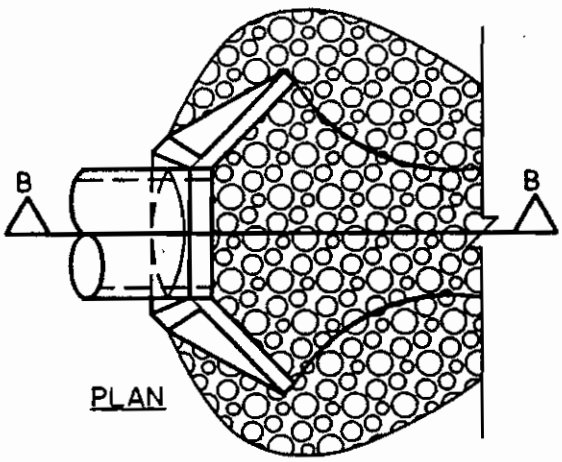
FILTER FABRIC

SECTION A-A

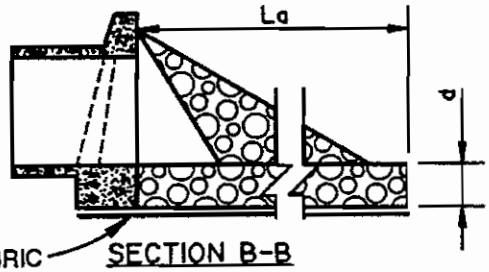
PIPE OUTLET TO FLAT AREA WITH NO DEFINED CHANNEL

NOTES

1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, OR CONCRETE
2. PIPE DIAMETER, APRON DIMENSIONS, AND AVERAGE ROCK SIZE FOR RIPRAP ARE BASED ON THE DESIGN FLOW RATE AND VELOCITY. La AND ROCK SIZE MUST BE SET TO SLOW THE FLOW TO NON-EROSIVE VELOCITIES (e.g., LESS THAN 10 fps). SEE CALTRANS AND LOCAL AGENCY DESIGN CRITERIA FOR APPROPRIATE SIZING CRITERIA.
3. d = 1.5 TIMES THE MAXIMUM ROCK SIZE DIAMETER BUT NOT LESS THAN 6 INCHES.



PLAN



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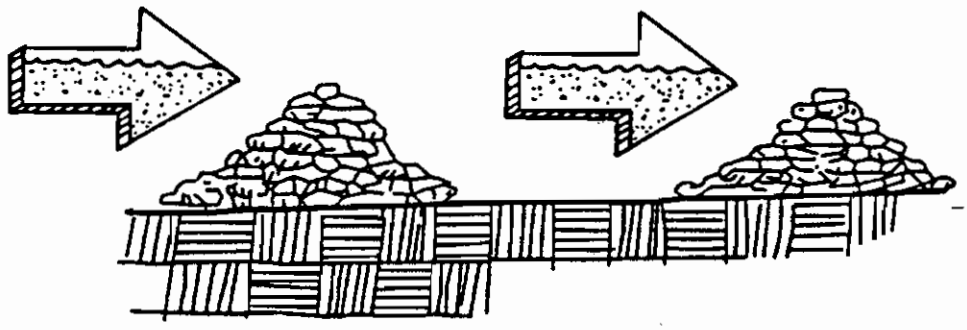
SECTION B-B

PIPE OUTLET TO WELL-DEFINED CHANNEL

PIPE OUTLET CONDITIONS

ESC40

BMP: CHECK DAMS



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

GENERAL DESCRIPTION

Small temporary dams constructed across a swale or drainage ditch. Check dams reduce the velocity of concentrated stormwater flows, thereby reducing erosion of the swale or ditch, and promoting sedimentation behind the dam. If properly anchored, brush or rock filter berms (ESC53) may be used for check dams.

SUITABLE APPLICATIONS

- Used to prevent erosion by reducing the velocity of channel flow in small intermittent channels and temporary swales.
- May also promote sedimentation behind the dam, but should not be considered to be a primary sediment trapping device because subsequent storms will scour and resuspend much of the trapped sediment.

INSTALLATION/APPLICATION CRITERIA

- Check dams should be placed at a distance and height to allow small pools to form between each one.
- Backwater from a downstream check dam should reach the toe of the upstream check dam.
- Major floods (2 year storm or larger) should safely flow over the check dam without an increase in upstream flooding or destruction of the checkdam.
- Primarily used in small, steep channels where velocities exceed 2 fps.
- Used in steep terrain where velocity reduction is required.
- A deep sump may be provided immediately upstream of the check dam to capture excessive sediment.
- Check dams may be built of rocks or logs, which are secured against damage during significant floods.

REQUIREMENTS

- Maintenance
  - Inspect for sediment buildup behind the check dam and signs of erosion around the check dam after each rain.
  - Remove accumulated sediment whenever it reaches one-half the sump depth.
- Cost
  - See CalTrans Cost Schedule for regional cost data.

LIMITATIONS

- Use only in small open channels which drain 10 acres of less.
- Not to be used in live streams.
- Do not install in lined or vegetated channels.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC41

Best Management Practices

Additional Information — Check Dams

Check dams create small pools in swales and ditches which drain 10 acres or less. These pools reduce the velocity of storm water flows, thus reducing erosion of the swale/ditch. Sedimentation also occurs in these small pools, but probably results in little net sediment removal because of the small detention time and probable scour during longer storms. A sediment trap (ESC55) may be placed immediately upstream of the check dam to increase sediment removal efficiency (but never in a natural stream or channel). Check dams should not be placed in swales/ditches with a base flow during some or all of the year.

Installation/Application Criteria

Check dams must be sized and constructed correctly and maintained properly, or they will be either washed out or cause flooding. Check dams can be constructed of either rock or logs. Use of other natural materials available on-site that can withstand the stormwater flow velocities is acceptable, such as pea-gravel filled in sand bags. Check dams should not be constructed from straw bales or silt fences, since concentrated flows quickly wash out these materials.

A sediment trap (ESC55) may be installed immediately upstream of the check dam, but may be of limited effectiveness if channel flows are large enough to scour the trap during moderate to large storms. Maximum velocity reduction is achieved if the toe of the upstream dam is at the same elevation as the top of the downstream dam. The center section of the dam should be lower than the edge sections so that the check dam will act like a weir during major floods.

Rock check dams are usually constructed of appropriately 8"-12" rock. The rock is placed either by hand or mechanically, but never just dumped into the channel. The dam must completely span the ditch or swale to prevent washout. The rock used must be large enough to stay in place given the expected design flow through the channel.

Log check dams are usually constructed of 4 to 6-inch diameter logs. The logs should be embedded into the soil at least 18 inches.

If grass is planted to stabilize the ditch or swale, the check dam should be removed when the grass has matured (unless the slope of the swale is greater than 4 percent).

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Mariposa County, Arizona, September 1992.

"Draft - Sedimentation and Erosion Control, An Inventory of Current Practices", U.S.E.P.A., April, 1990.

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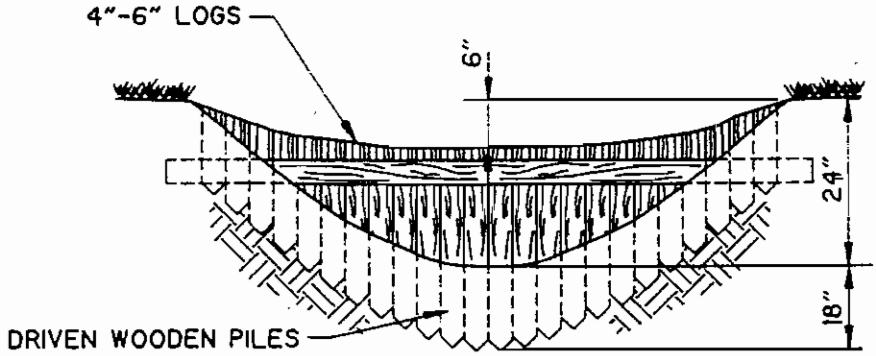
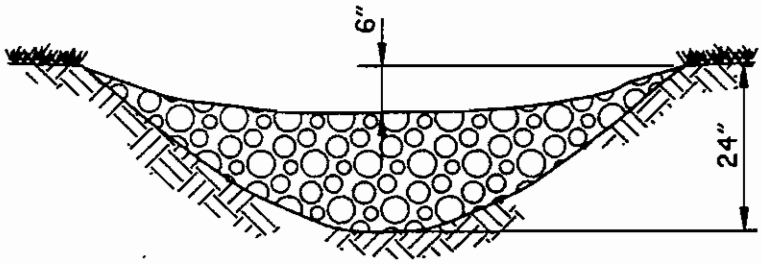
ESC41

Best Management Practices

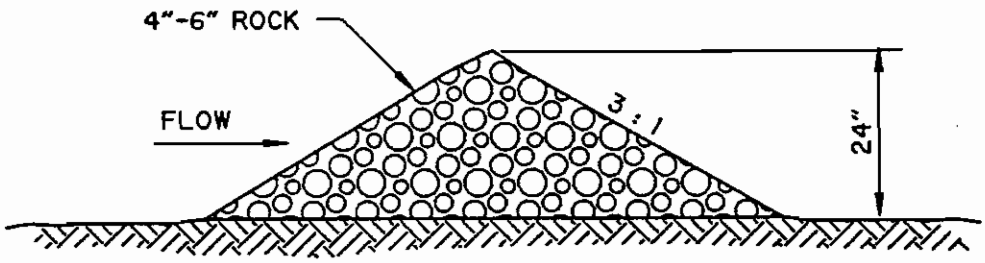
Additional Information — Check Dams



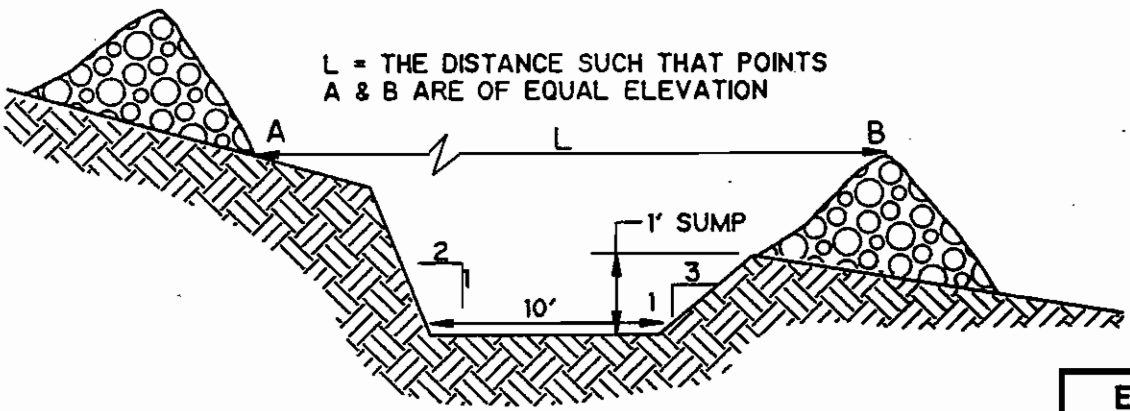
LOG CHECK DAM



ROCK CHECK DAM



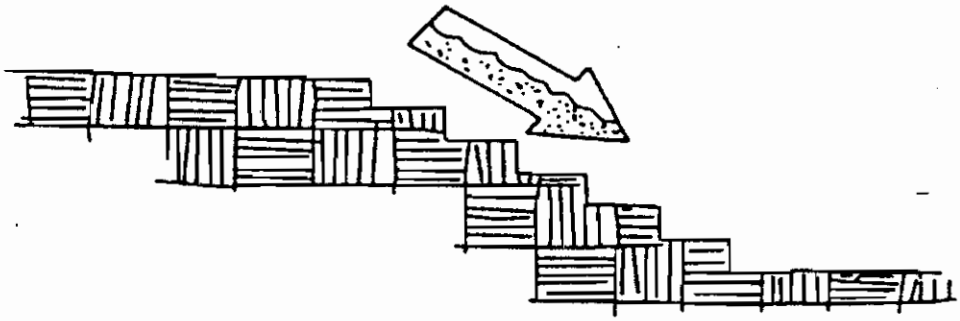
ROCK CHECK DAM CROSS-SECTION



SPACING BETWEEN CHECK DAMS

ESC41

BMP: SLOPE ROUGHENING/TERRACING



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas* (●)
- *Protect Slopes/Channels* (●)
- *Control Site Perimeter*
- *Control Internal Erosion*

GENERAL DEFINITION

Slope roughening/terracing creates microclimates for establishing vegetation, reduces runoff velocity, increases infiltration, and provides small depressions for trapping sediment.

SUITABLE APPLICATIONS

- Any cleared area prior to seeding and planting.
- Required for cleared, erodible slopes steeper than 3:1 and higher than 5 feet prior to seeding and planting.

INSTALLATION/APPLICATION CRITERIA

Slope roughening/terracing is performed in several ways:

- Stair-step grading.
- Grooving.
- Furrowing.
- Tracking.
- Rough grading.
- No grading.

REQUIREMENTS

- Maintenance
  - Inspect roughened slopes weekly and after rainfall for excessive erosion.
  - Revegetate as quickly as possible.
- Cost (source: EPA, 1992)
  - Surface Roughening: Performed at no (e.g., rough grading) to low (e.g., tracking) cost.
  - Terracing: Average annual cost is $4 per linear foot (2 year useful life).

LIMITATIONS

- Roughening is of limited effectiveness on its own, but is used to speed revegetation.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ○ *O&M Costs*
- ○ *Maintenance*
- ○ *Training*
- ● *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC42

Best Management Practices

Additional Information — Slope Roughening/Terracing

Slope roughening/terracing creates uneven depressions, steps or grooves on the soil surface to aid in establishment of vegetation, reduce runoff velocity, increase infiltration, and provide for sediment trapping.

Surface roughening may be applied to all slopes steeper than 3:1, and greater than 5 vertical feet, providing some instant erosion protection on bare soil while vegetative cover is being established. It is an inexpensive, simple and short-term erosion control measure for roadway cut slopes.

Terracing usually is a more permanent measure used to stabilize a steep slope. Terraces should be designed by a registered professional engineer and included in the project construction plans. Local design criteria should be used.

Installation/Application

Graded areas with smooth, hard surfaces give a false impression of "finished grading" and a job well done. It is difficult to establish vegetation on such surfaces due to reduced water infiltration and the potential for erosion. Rough slope surfaces with uneven soil and rocks left in place may appear unattractive or unfinished at first, but they encourage water infiltration, speed the establishment of vegetation, and decreased runoff velocity. Rough, loose soil surfaces give lime, fertilizer, and seed some natural coverage. Niches in the surface provide microclimates which generally provide a cooler and more favorable moisture level than hard flat surfaces; this aids seed germination.

There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends upon the type of slope. Roughening methods include stair-step grading, grooving, and tracking. Factors to be considered in choosing a method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.

1. Disturbed areas which will not require mowing may be stair-step graded, grooved, or left rough after filling.
2. Graded areas steeper than 3:1 should be stair-stepped with benches (See figure at end of fact sheet). The stair-steping will help vegetation become attached and also trap soil eroded from the slopes above. Stair-step grading is particularly appropriate in soils containing large amounts of soft rock. Each "step" catches material which sloughs from above, and provides a level site where vegetation can become established. Stairs should be wide enough to work with standard earth moving equipment.
3. Areas which will be mowed (there areas should have slopes less than 3:1) may have small furrows left by disking, harrowing, raking, or seed-planting machinery operated on the contour.
4. It is important to avoid excessive compacting of the soil surface when scarifying. Tracking with bulldozer treads is preferable to not roughening at all, but is not as effective as other forms of roughening, as the soil surface is severely compacted and runoff is increased. Tracking can be accomplished in a variety of ways, including "track walking," or driving a crawler tractor up and down the slope, in leaving a pattern of cleat imprints parallel to slope contours.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

Handbook of Steel, Drainage & Highway Construction, American Iron and Steel Institute, 1983.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April, 1992.

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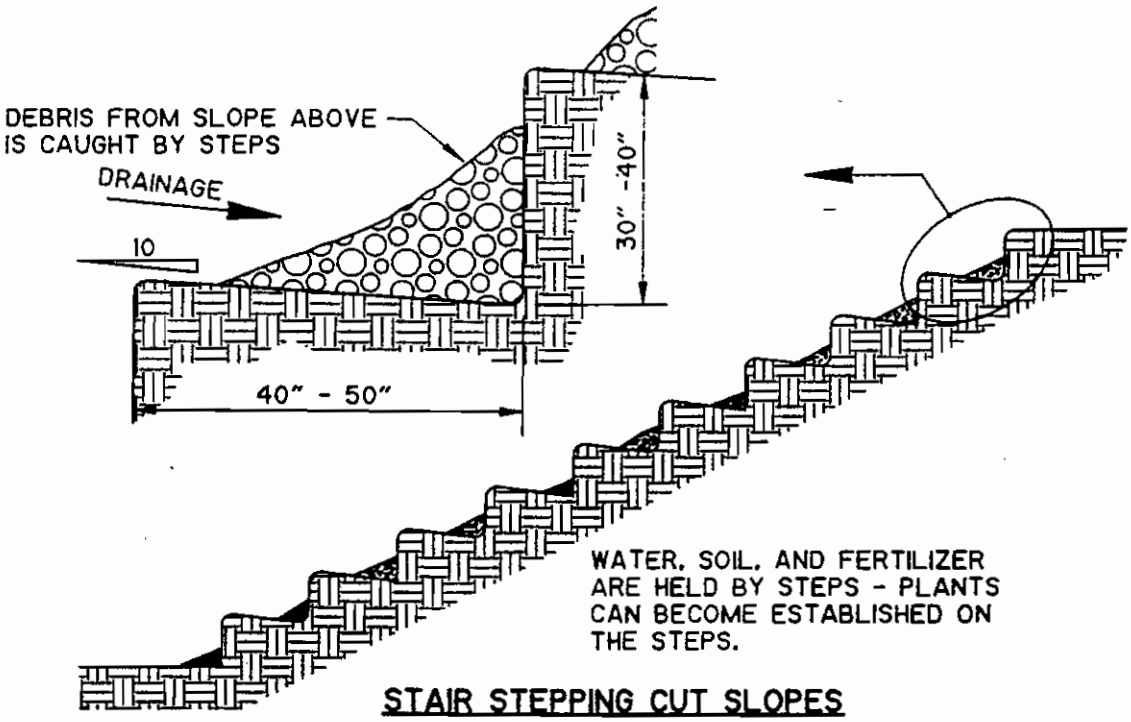
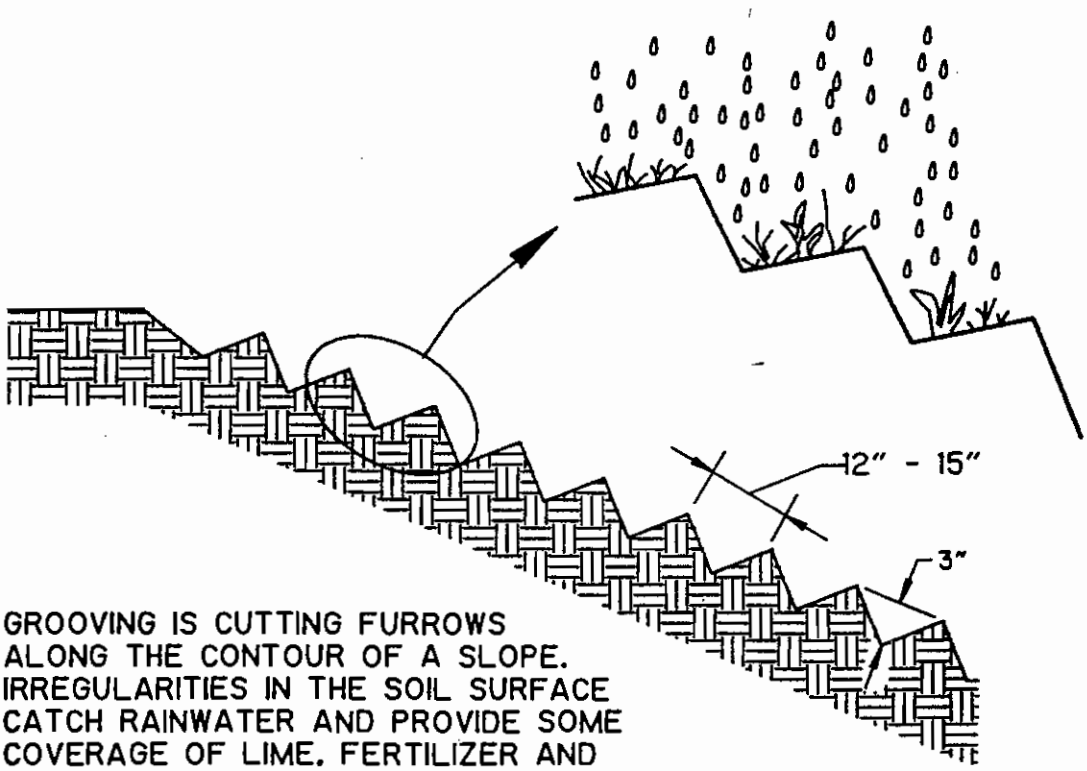
ESC42

Additional Information — Slope Roughening/Terracing



STAIR STEPPING CUT SLOPES



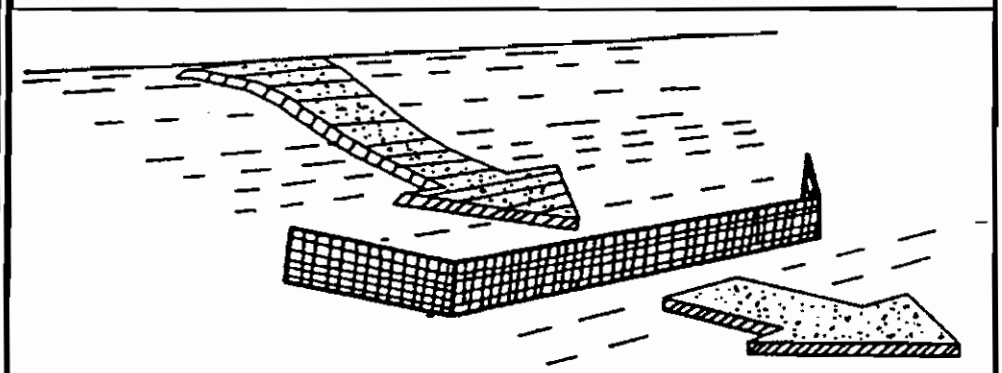
GROOVING IS CUTTING FURROWS ALONG THE CONTOUR OF A SLOPE. IRREGULARITIES IN THE SOIL SURFACE CATCH RAINWATER AND PROVIDE SOME COVERAGE OF LIME, FERTILIZER AND SEED.

GROOVING SLOPES

ESC42

STAIR-STEPPING CUT SLOPES AND GROOVING SLOPES

BMP: SILT FENCE



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter* (●)
- *Control Internal Erosion* (●)

GENERAL DESCRIPTION

A silt fence is made of a filter fabric which has been entrenched, attached to supporting poles, and sometimes backed by a wire fence for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

SUITABLE APPLICATIONS

- Along the perimeter of the site.
- Below the toe of a cleared slope.
- Along streams and channels.
- Around temporary spoil areas.
- Across swales with catchments less than 1 acre.
- Below other small cleared areas.

INSTALLATION/APPLICATION

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 feet at any point.
- No more than 1 acre, 100 ft., or 0.5 cfs of concentrated flow should drain to any point along the silt fence.
- Turn ends of fence uphill.
- Provide area behind the fence for runoff to pond and sediment to settle (approx. 1200 sq. ft. per acre draining to the silt fence).
- Select filter fabric which retains 85% of the soil, by weight, based on sieve analysis, but is not finer than an equivalent opening size of 70.

REQUIREMENTS

- Maintenance
  - Inspect weekly and after each rainfall.
  - Repair wherever fence is damaged.
  - Remove sediment when it reaches 1/3 the height of the fence.
- Cost (source: EPA, 1992)
  - Average annual cost for installation and maintenance (assumes 6 month useful life): $7 per lineal foot ($850 per drainage acre)

LIMITATIONS

- Do not use where 85% of the soil, by weight, passes through a No. 200 sieve because the filter fabric will clog.
- Do not place fence on a slope, or across any contour line.
- Do not use in streams, channels, or anywhere flow has concentrated.
- Do not use in locations where ponded water may cause flooding.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ◒ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC50

Best Management Practices

Additional Information — Silt Fence

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and, depending upon the strength of the fabric used, supported with wire fence. Silt fences trap sediment in two ways: (1) by intercepting and detaining small amounts of sediment from disturbed areas during construction operations in order to promote sedimentation behind the fence; and (2) by decreasing the velocity of low flows (up to 0.5 cfs) in swales.

Silt fences may be used for perimeter control, placed upstream of the point(s) of discharge of sheet flow from a site. They may also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion, and perpendicular to minor swales or ditch lines for up to one acre contributing drainage areas. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows.

Installation/Application

Planning:

Silt fences are generally most effective when the following placement criteria are followed:

- Limit the upstream drainage area to 1 acre or less when used alone or in combination with sediment basin in a larger site.
- The maximum slope perpendicular to the fence line should be 1:1.
- Limit the maximum sheet or overland flow path length to any point along the fence to 100 feet.
- Limit the concentrated flows reaching the fence to 0.5 cfs.

Silt fences are preferable to straw barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw barriers, there are many instances where silt fences have been improperly installed. The following installation methods can improve performance and should be followed:

- Construct the silt fence along a level contour.
- Silt fences should remain in place until the disturbed area is permanently stabilized.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 sq. ft. of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent storm water from flowing around the fence.
- Leave an undisturbed or stabilized area immediately downslope from the fence.
- Do not place in live streams or intermittently flowing channels.

Design:

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet will have openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. standard sieve No. 200, select the EOS to retain 85 percent of the soil. The EOS should not be finer than EOS 70.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 [0.0083 in. (0.21 mm.)] except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

ESC50

Best Management Practices

Additional Information — Silt Fence

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100 [0.0059 in. (0.15 mm.)]. If 85 percent or more of a soil, by weight, passes through the openings in a No. 200 sieve [0.0029 in. (0.074 mm.)], filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large, and they would clog the fabric quickly if the EOS was small enough to capture the soil.

The fence should be supported by a wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0° F. to 120° F.

Installation Guidelines:
Filter fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- Posts should be spaced a maximum of 6 feet apart and driven securely into the ground a minimum of 30 inches.
- A trench should be excavated approximately 8 inches wide and 12 inches deep along the line of posts and upslope from the barrier.
- When standard strength filter fabric is used, a wire mesh support fence should be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wires or hog rings. The wire should extend into the trench a minimum of 4 inches.
- The standard strength filter fabric should be stapled or wired to the fence, and 40 inches of the fabric should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the wire mesh support fence may be eliminated and the filter fabric stapled or wired directly to the posts.
- Avoid the use of joints. The filter fabric should be purchased in a continuous roll, then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 inch overlap, and both ends securely fastened to the post.
- The trench should be backfilled with compacted native material.

Requirements
Maintenance:

Inspect monthly during dry periods and immediately after each rainfall. Repair as necessary. Sediment must be removed when it reaches approximately one third the height of the fence, especially if heavy rains are expected.

Filter fences should not be removed until the upslope area has been permanently stabilized.

Limitations
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Filter fences are not practical where large flows of water are involved, hence the need to restrict their use to drainage areas of one acre or less, and flow rates of less than 0.5 cfs.
- Problems may arise from incorrect selection of pore size and/or improper installation.
- Do not allow water depth to exceed 1.5 ft. at any point.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.

ESC50

Best Management Practices

Additional Information — Silt Fence

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September1992.

Environmental Action Manual, City of Austin, Texas, 1989.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, Jun 1981.

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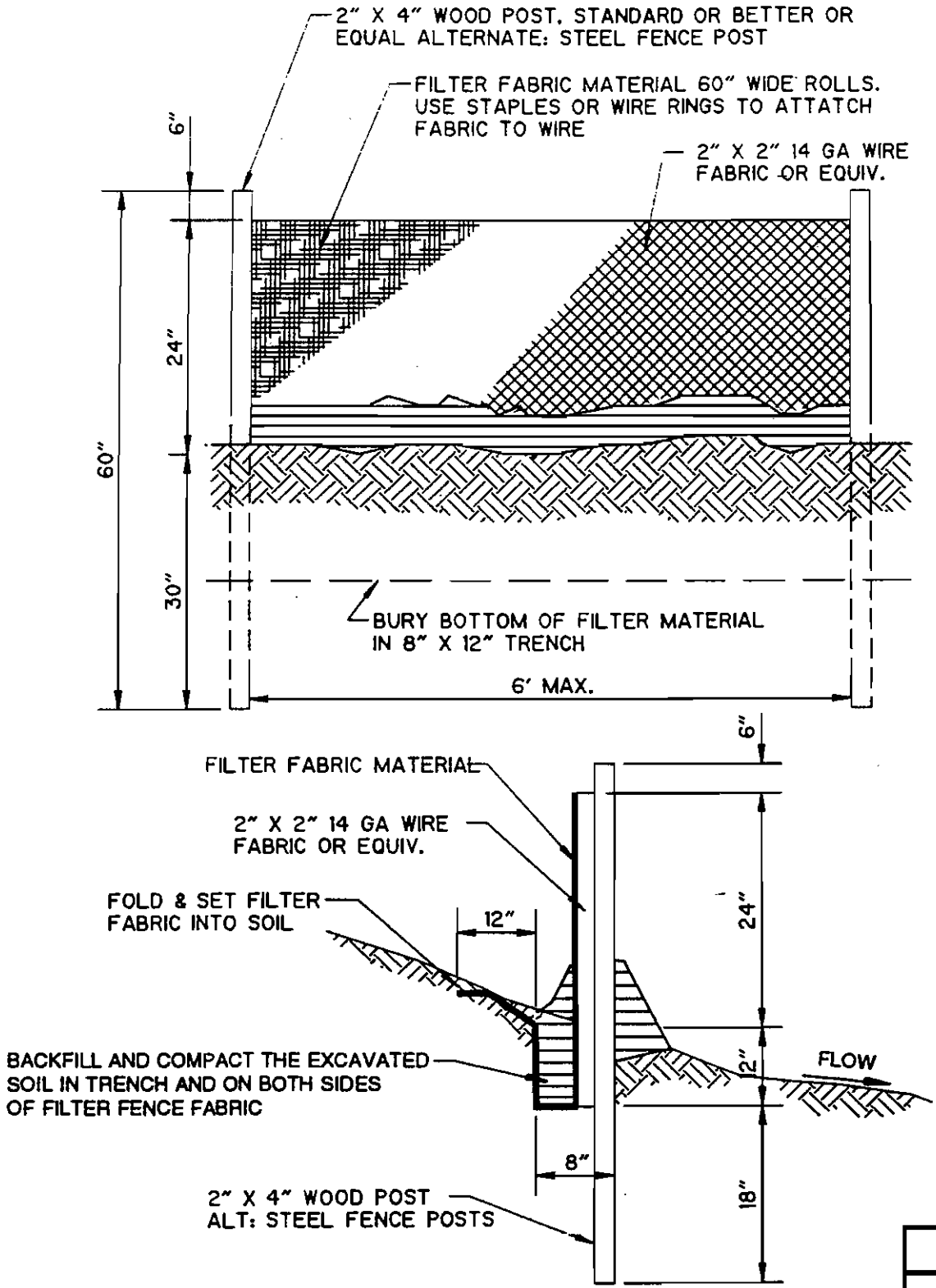
ESC50

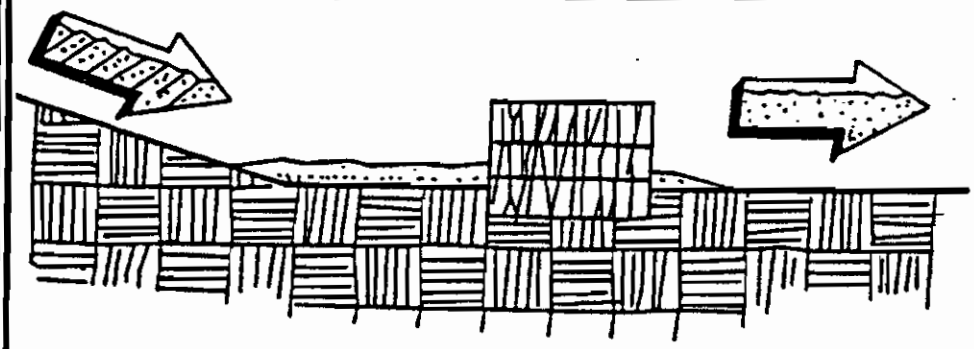
Additional Information — Silt Fence



SILT FENCE

ESC50

BMP: STRAW BALE BARRIERS



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter* (●)
- *Control Internal Erosion* (●)

GENERAL DEFINITION

A straw bale barrier consists of straw bales placed end to end along a level contour in a shallow trench and staked to hold them in place. The barrier detains runoff, creating a pond behind the barrier where sedimentation occurs.

SUITABLE APPLICATIONS

- Along the perimeter of the site.
- Along streams and channels.
- Across swales with small catchments.
- Around temporary spoil areas.
- Below other small, cleared areas.

INSTALLATION/APPLICATION CRITERIA

- Use primarily in areas where sheet or rill flow occurs.
- No more than 1/4 acre per 100 feet of barrier should drain to the barrier.
- Install along a level contour.
- Place in a 4-inch deep trench.
- Backfill and compact the excavated soil on the upstream face of the barrier.
- Secure each bale with two stakes.
- Leave enough area (about 1200 sq. ft. per acre) behind the barrier for runoff to pond (no more than 1.5 ft. depth) and sediment to settle.

REQUIREMENTS

- Maintenance
  - Inspect weekly and after each rain.
  - Replace bales which have decomposed or whose bindings have broken.
  - Remove sediment behind the barrier when it reaches a depth of 6 inches.
- Costs (source: EPA, 1992)
  - Average annual cost for installation and maintenance (assumes 3 month useful life): $17 per lineal foot ($6,800 per drainage acre).

LIMITATIONS

- Straw bale barriers are not to be used for extended periods of time because they tend to rot and fall apart.
- Suitable only for sheet flow on slopes of 2% or flatter.
- Not appropriate for large drainage areas, limit to one acre or less.
- Straw bales lose their effectiveness rapidly due to rotting, thus constant maintenance is required.
- Not recommended for concentrated flow, inlet protection, channel flow, and live streams.
- Bale bindings of jute or cotton not recommended.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ● *Capital Costs*
- ● *O&M Costs*
- ● *Maintenance*
- ○ *Training*
- ○ *Suitibility for Slopes >5%*

● *High* ○ *Low*

ESC51

Best Management Practices

- Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainageways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow.

ESC51

Additional Information — Straw Bale Barrier

A straw bale barrier consists of a series of secured anchored bales placed to intercept sediment-laden runoff from small drainage areas of disturbed soil. The barrier ponds runoff and allow sediment to settle. Straw bale dikes should not be used for extended periods of time because they tend to rot and fall apart.

The straw bale barrier is used where there are no concentrations of water in a channel or drainageway, and where erosion would occur from sheet flow. These barriers are typically constructed below disturbed areas subject to sheet flow of runoff.

Installation/Application

Straw bale barriers should be used for drainage areas no more than 1/4 acre per 100 feet of barrier length, with no more than 100 ft upstream of any point along the barrier. The barrier should be placed along a level contour no greater than 2:1. When installed and maintained according to the guidelines on this fact sheet, straw bale dikes remove approximately 67% of the sediment transported in construction site runoff. This optimum efficiency can only be achieved through careful maintenance, with special attention to replacing rotted or broken bales. The barrier should be constructed on a level contour to prevent concentration of flow against a small portion of the barrier.

An effective straw bale barrier should be installed in the following manner:

1. Bales should be placed on the contour and in a row with ends tightly abutting the adjacent bales.
2. Leave area for runoff to pond upstream of the barrier by locating barrier away from the toe of slopes. This also provides access for maintenance.
3. Each bale should be embedded in the soil a minimum of (4) inches and placed so the bindings are horizontal. Bindings placed on soil will soon disintegrate and cause the barrier to fail.
4. Bales should be securely anchored in place by either two stakes or re-bars driven through the bale. The first stake in each bale should be driven toward the previously laid bale at an angle to force the bales together. Stakes should be driven flush with the bale.
5. Backfill and compact the excavated soil along the upstream face of the barrier.
6. Remove the barrier when it has served its usefulness so as not to block or impede storm flow or drainage.

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Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

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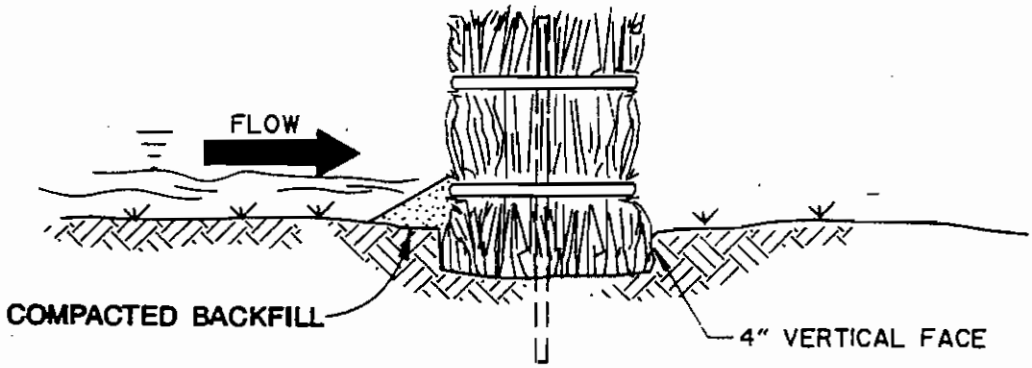
ESC51

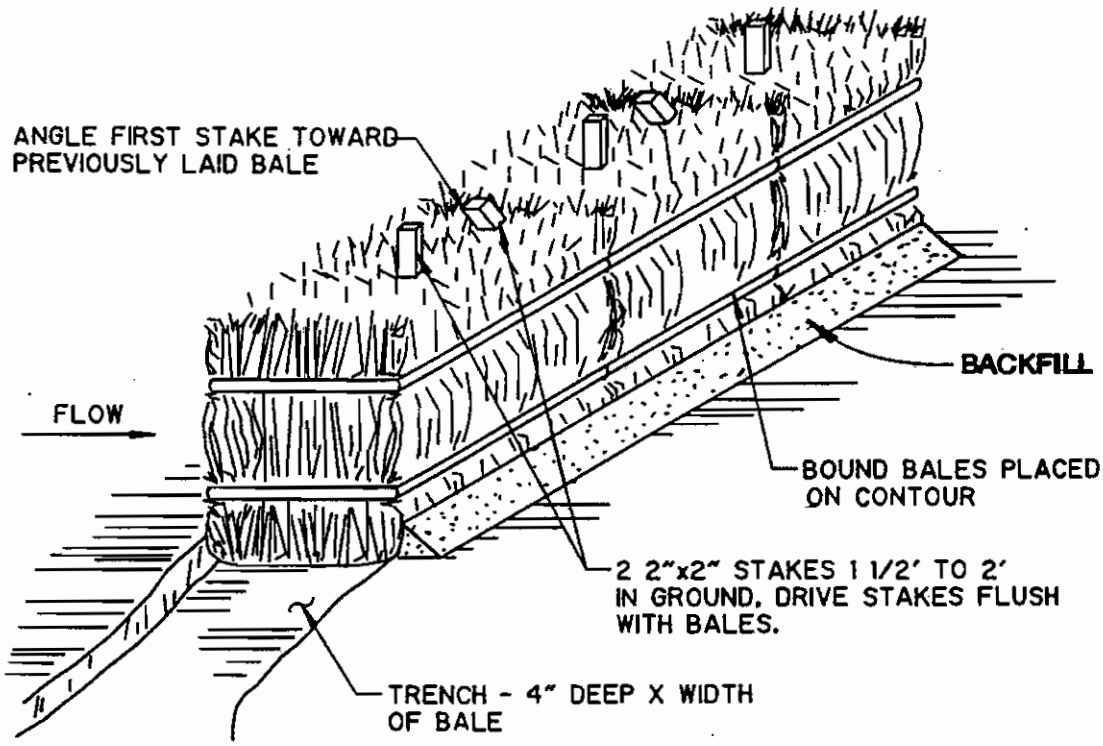
Best Management Practices

Additional Information — Straw Bale Barrier



• PROMOTES ON SITE SEDIMENTATION BY CREATING A TEMPORARY POND.

BEDDING DETAIL



SUBSTITUTION OF STEEL BARS FOR WOODEN STAKES IS NOT RECOMMENDED DUE TO POTENTIAL FOR DAMAGING CONSTRUCTION EQUIPMENT

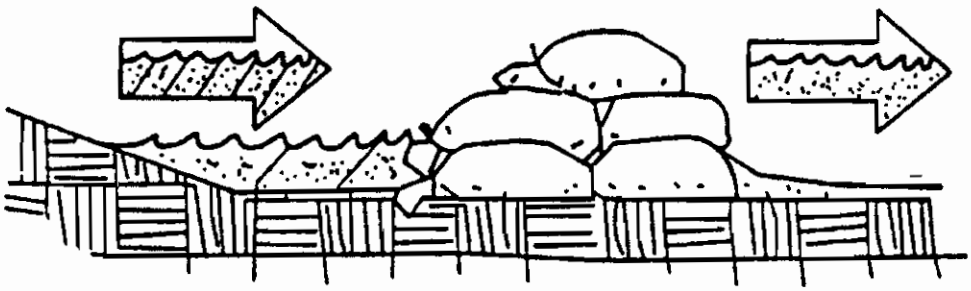
ANCHORING DETAIL

STRAW BALE BARRIERS

ESC51

Best Management Practices

BMP: SAND BAG BARRIER



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ● *Capital Costs*
- ○ *O&M Costs*
- ○ *Maintenance*
- ○ *Training*
- ◒ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC52

Best Management Practices

GENERAL DEFINITION

Stacking sand bags along a level contour creates a barrier which detains sediment-laden water, ponding water upstream of the barrier and promoting sedimentation.

SUITABLE APPLICATIONS

- Along the perimeter of the site.
- Check dams across streams and channels.
- Along streams and channels.
- Barrier for utility trenches in a channel.
- Across swales with small catchments.
- Division dike or berm.
- Below the toe of a cleared slope.
- Create a temporary sediment trap.
- Around temporary spoil areas.
- Below other small cleared areas.

INSTALLATION/APPLICATION CRITERIA

- May be used in drainage areas up to 5 acres.
- Install along a level contour.
- Base of sand bag barrier should be at least 48 inches wide.
- Height of sand bag barrier should be at least 18 inches high.
- 4 inch PVC pipe may be installed between the top layer of sand bags to drain large flood flows.
- Provide area behind barrier for runoff to pond and sediment to settle, size according to sediment trap BMP criteria (ESC55).
- Place <u>below</u> the toe of a slope.
- Use sand bags large enough and sturdy enough to withstand major flooding.

REQUIREMENTS

- Maintenance
  - Inspect after each rain.
  - Reshape or replace damaged sand bags immediately.
  - Remove sediment when it reaches six inches in depth.
- Cost
  - Sand bag barriers are more costly, but typically have a longer useful life than other barriers.

LIMITATIONS

- Sand bags are more expensive than other barriers, but also more durable.
- Burlap should not be used for sand bags.

Additional Information — Sand Bag Barrier

Suitable Applications

Sand bag berms may be used during construction activities in stream beds and utility construction in channels, temporary channel crossing for construction equipment, etc. Sand bag berms may also be installed parallel to roadway construction. Sand bag berms may also be used to create temporary sediment traps, retention basins and in place of straw bales or silt fences. Examples of applications include:

- Check dams across stream channels.
- Barriers for utility trenches or other construction in a stream channel.
- At temporary channel crossings.
- May be used on a slope where straw bales and silt fences are not appropriate.
- As a diversion dike.
- Embankment for a temporary sediment basin or retention basin.
- Sediment barriers near the toe of slopes.
- At construction perimeter.

Advantages

- Provides a semi-permeable barrier in potentially wet areas.
- More permanent than silt fences or straw bales.
- Allows for easy relocation on site to meet changing needs during construction.

Installation/Application

Sand bag barriers may be used for sediment trapping in locations where silt fences and straw bale barriers are not strong enough. In addition, sand bag barriers are appropriate to use when construction of check dams or sumps in a stream is undesirable. The sand bag berms can provide the same function as a check dam without disturbing the stream or vegetation. The sand bag berm will also allow a small sediment retention area to be created prior to construction of final detention basins. For installation of a sand bag berm, the following criteria should be observed:

- Drainage Area - Up to five (5) acres.
- Height of Berm - 18 inches minimum height, measured from the top of the existing ground at the upslope toe to the top of the barrier.
- Width of Berm - 48 inches minimum width measured at the bottom of the barrier; 18 inches at the top.
- Sand bag Size - Length 24 to 30 inches, width 16 to 18 inches and thickness six (6) to eight (8) inches. Weight 90 to 125 pounds.
- Sand bag Material - Polypropylene, polyethylene or polyamide woven fabric, minimum unit weight four (4) ounces per square yard, mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70 percent. Use of burlap is discouraged since it rots and deteriorates easily.
- Grade of Sand - Coarse sand, gravel.
- Runoff water should be allowed to flow over the tops of the sand bags or through four (4) inch polyvinyl chloride pipes embedded below the top layer of bags.
- Area behind the sand bag barrier should be established according to sizing criteria for sediment trap BMP (ESC55).

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Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

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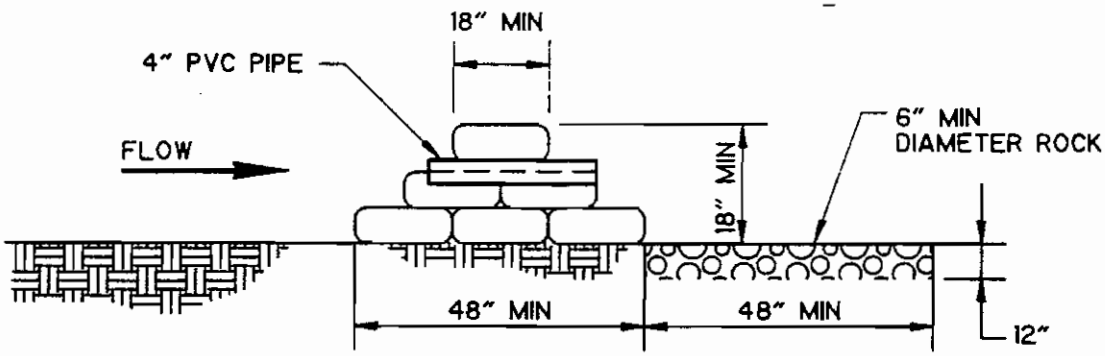
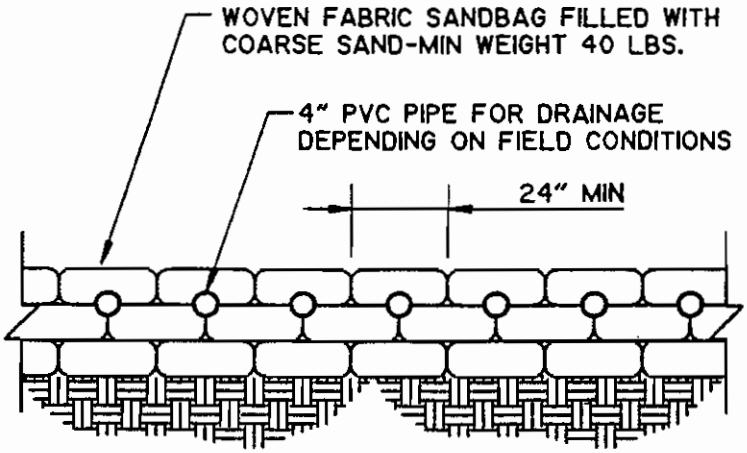
ESC52

Additional Information — Sand Bag Barrier



CROSS-SECTION

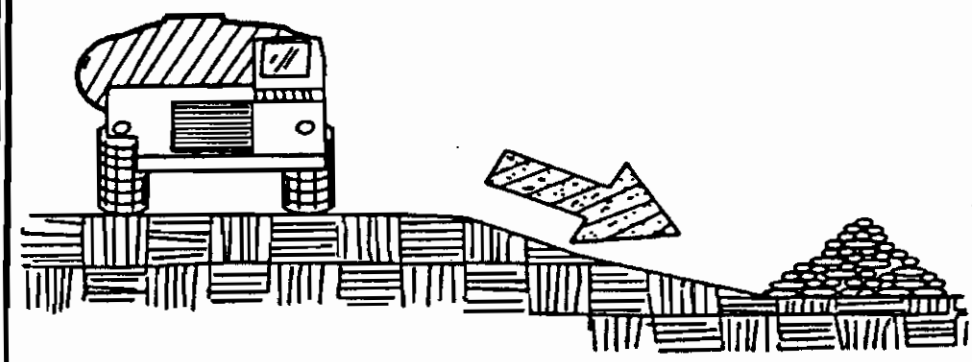


FRONT VIEW

SAND BAG BERM

ESC52

BMP: BRUSH OR ROCK FILTER



Objectives

- Housekeeping Practices
- Contain Waste
- Minimize Disturbed Areas
- Stabilize Disturbed Areas
- Protect Slopes/Channels
- Control Site Perimeter
- Control Internal Erosion

GENERAL DEFINITION

A rock filter berm is made of rock 3/4 to 3 inches in diameter and placed along a level contour where sheet flow may be detained and ponded, promoting sedimentation. A brush barrier is composed of brush (usually obtained during the site clearing) wrapped in filter cloth and anchored to the toe of the slope. If properly anchored brush or rock filters may be used for sediment trapping and velocity reduction. See Check Dam BMP (ESC41) for more information.

SUITABLE APPLICATIONS

- As check dams across mildly sloped construction roads.
- Below the toe of slopes.
- Along the site perimeter.
- Along streams and channels.
- Around temporary spoil areas.
- Below other small cleared areas.
- At sediment traps at culvert/pipe outlets.

INSTALLATION/APPLICATION CRITERIA

- Use principally in areas where sheet or rill flow occurs.
- For rock filter, use larger rock and place in a staked, woven wire sheathing if placed where concentrated flows occur.
- Install along a level contour.
- Leave area behind berm where runoff can pond and sediment can settle.
- Drainage area should not exceed 5 acres.

REQUIREMENTS

- Maintenance
  - Inspect monthly and after each rainfall.
  - If berm damaged, reshape and replace lost/dislodged rock.
  - Remove sediments when depth reaches 1/3 of berm height, or 1 ft.
- Cost
  - Brush filter: Low to moderate cost if debris from on-site clearing and grubbing is used.
  - Rock filter: Expensive, since off-site materials, hand construction and demolition/removal are usually required.

Targeted Pollutants

- ● Sediment
- ○ Nutrients
- ○ Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

● Likely to Have Significant Impact
○ Probable Low or Unknown Impact

Implementation Requirements

- ◒ Capital Costs
- ◒ O&M Costs
- ○ Maintenance
- ○ Training
- ◒ Suitability for Slopes >5%

● High ○ Low

ESC53

Best Management Practices

LIMITATIONS

- Rock berms may be difficult to remove.
- Removal problems limit their usefulness in landscaped areas.
- Not appropriate for drainage areas greater than 5 acres.
- Runoff will pond upstream of the filter, possibly causing flooding if sufficient space does not exist.

ESC53

Additional Information — Brush or Rock Filter

Rock Filter

A rock filter consists of open graded rock installed at the toe of a slope, along the perimeter of a developing or disturbed area, and as a checkdam across construction roads. Their purpose is to intercept sediment laden runoff from disturbed areas of the site, allow the runoff to pond, promote sedimentation behind the filter, and slowly release the water as sheet flow.

Rock filters are appropriate where a temporary measure is needed to prevent sediments from entering right-of-ways of traffic areas such as near the toe of slopes, incorporated into temporary stabilized construction entrances (ESC 26), or at other locations along the construction site perimeter. Rock filters may also be used as check dams across one or more lanes of construction traffic temporary roads, or unsurfaced rights of way subject to construction traffic.

Advantages of the rock filters are that they may be less costly than other temporary barriers, and are relatively efficient at sediment removal.

Installation/Application:

Planning:

- Rock filters should be placed along a level contour to intercept sheet flow.
- Allow ample room for ponding, sedimentation, and access by sediment removal equipment between the berm and the toes of slopes.
- Flow through the filter should occur as sheet flow into an undisturbed or stabilized area.
- Installation in stream beds requires large rock, staking of woven wire sheathing, and daily inspection.

Design & Sizing Criteria:

The following design criteria are commonly used to construct filters:

- In Non-Traffic Areas:
  - Maximum flow-through rate per square foot of filter = 60 gpm
  - Height = 18 inches minimum
  - Top width = 24 inches minimum
  - Side slopes = 2:1 or flatter
  - Woven wire sheathing (poultry netting) is recommended in areas of concentrated flow. The wire should be 1 inch diameter hexagonal mesh, galvanized 20 gauge.
  - Build the filter along on a level contour.
  - Rock: 3/4 to 3 inches open graded for sheet flow, 3 to 5 inches open graded for concentrated flow.

- In Construction Traffic Areas:
  - Height = 12" maximum
  - Provide multiple filters in series, spaced as shown.
    - Every 300 ft on slopes less than 5 percent
    - Every 200 ft on slopes 5 to 10 percent
    - Every 100 ft on slopes greater than 10 percent.

Brush Filter

Brush filters trap and filter sediments in a manner similar to other barriers in this handbook (e.g., silt fence, straw bale barrier, rock filter), but have the advantage of being constructed from brush cleared from the site and usually disposed off-site at a cost.

ESC53

Additional Information — Brush or Rock Filter

Steps in Construction of a Brush Filter:

1. Stack the brush at the toe of a slope or along the perimeter of the site just outside the limits of clearing and grabbing. The brush may be stacked up to 15 ft. high and 15 ft. wide.
2. Construct a trench 1 to 3 ft. deep immediately upslope from the brush.
3. Place filter fabric over the brush filter and in the trench, extending 1 to 2 ft. upslope of the trench.
4. Backfill the trench with aggregate or compacted soil. The trench should be deep enough and backfill material sufficient to hold the barrier in place during a storm.

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Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September1992.

Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

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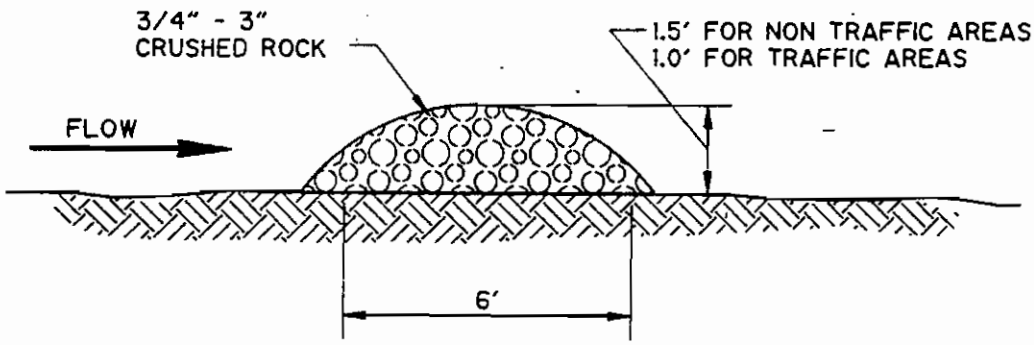
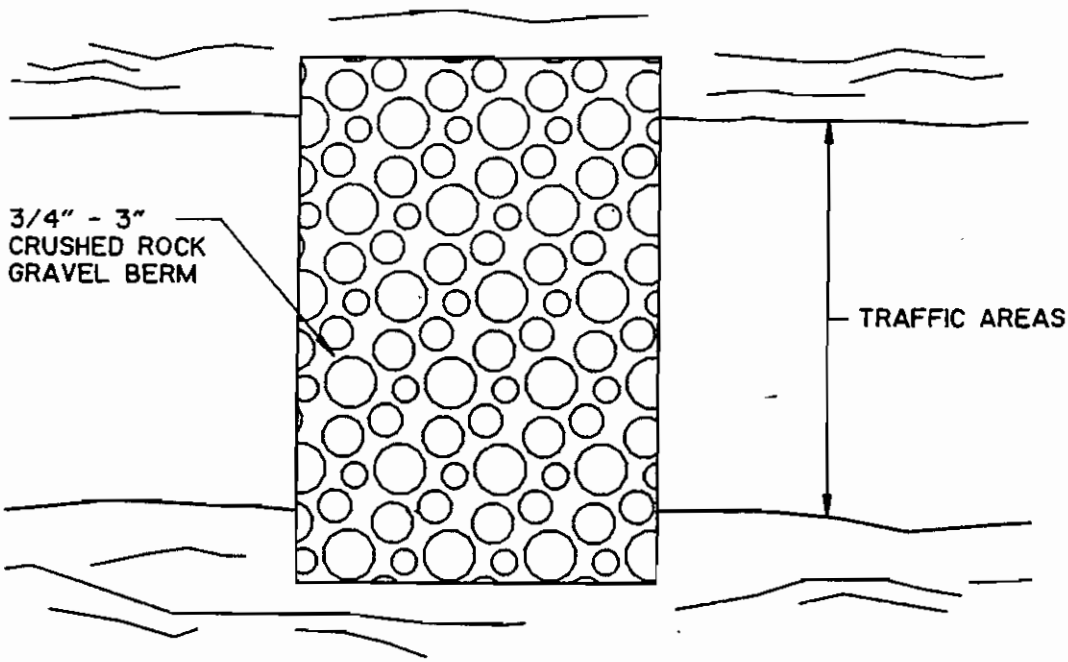
ESC53

Additional Information — Brush or Rock Filter



SECTION

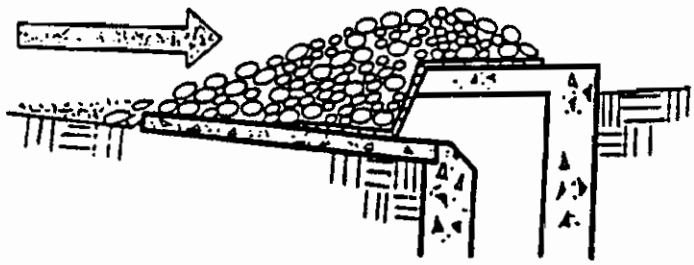


PLAN

GRAVEL FILTER BERM

ESC53

BMP: STORM DRAIN INLET PROTECTION



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabilize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter* (●)
- *Control Internal Erosion* (●)

GENERAL DEFINITION

Devices of various designs which detain sediment-laden runoff and allow the sediment it to settle prior to discharge into a storm drain inlet or catch basin.

SUITABLE APPLICATIONS

- Every storm drain inlet receiving sediment-laden runoff should be protected, either by covering the inlet or promoting sedimentation upstream of the inlet.

INSTALLATION/APPLICATION

- Five types of inlet protection are presented below, however, it is recognized that other effective methods and proprietary device, exist and may be selected:
  - Filter Fabric Fence: Appropriate for drainage basins less than one acre with less than a 5 percent slope.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
  - Gravel and Wire Mesh Filter: Used on curb or drop inlets where construction equipment may drive over the inlet.
  - Sand bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (see Sediment Trap ESC 55).
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Use only for drainage areas smaller than one acre unless a sediment trap first intercepts the runoff.
- Provide area around the inlet for water to pond without flooding structures and property.

REQUIREMENTS

- Maintenance
  - Inspect weekly and after each rain.
  - Replace clogged filter fabric or stone filters immediately.
  - Remove sediment when depth exceeds half the height of the filter, or half the depth of the sediment trap.
  - Remove as soon as upstream soils are stabilized and streets are swept.
- Cost (source: EPA, 1992)
  - Average annual cost for installation and maintenance (1 year useful life) is $150 per inlet.

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ○ *Toxic Materials*
- ○ *Oil & Grease*
- ◒ *Floatable Materials*
- ○ *Other Construction Waste*

● *Likely to Have Significant Impact*
○ *Probable Low or Unknown Impact*

Implementation Requirements

- ◒ *Capital Costs*
- ○ *O&M Costs*
- ◒ *Maintenance*
- ○ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC54

Best Management Practices

LIMITATIONS

- Drainage area should not exceed 1 acre.
- Runoff will bypass protected inlets on slopes.
- Ponding will occur at a protected inlet, with possible short-term flooding.
- Straw bales are not effective for inlet protection.

ESC54

Additional Information — Storm Drain Inlet Protection

Storm drain inlet protection consists of a sediment filter or an impounding area around or upstream of a storm drain, drop inlet, or curb inlet. This erosion and sedimentation control BMP prevents excessive sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area.

All on-site storm drain inlets should be protected. Off-site, inlets should be protected in areas where construction activity tracks sediment onto paved areas or where inlets receive runoff from disturbed areas.

Installation/Aplication Criteria

Planning

Large amounts of sediment may enter the storm drain system when storm drains are installed before the upslope drainage area is stabilized, or where construction is adjacent to an existing storm drain. In cases of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through a Temporary Sediment Trap (see ESC 56). Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Inlet protection methods not presented in this handbook should he approved by the local storm water management agency.

General Design and sizing criteria:

- Grates and spaces around all inlets should he sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed)1 to 2 feet with 2:1 side slopes around the inlet.

Installation procedures for filter fabric fence:

a. Place 2 inch by 2 inch wooden stakes around the perimeter of the inlet a maximum of 3 feet apart and drive them at least 8 inches into the ground. The stakes must be at least 3 feet long.
b. Excavate a trench approximately 8 inches wide and 12 inches deep around the outside perimeter of the stakes.
c. Staple the filter fabric (for materials and specifications, see Silt Fence ESC 50) to wooden stakes so that 32 inches of the fabric extends out and can be formed into the trench. Use heavy-duty wire staples at least one inch in length.
d. Backfill the trench with 3/4 inch or less washed gravel all the way around.

Installation procedure for block and gravel filter:

a. Place hardware cloth or comparable wire mesh with one-half inch openings over the drop inlet so that the wire extends a minimum of 1 foot beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place filter fabric over the wire mesh.
b. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 inches, 8 inches, and 12 inches wide. The row of blocks should be at least 12 inches but no greater than 24 inches high.
c. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with one half inch openings.
d. Pile washed stone against the wire mesh to the top of the blocks. Use 3/4 to 3 inch gravel.

Installation procedure for gravel and wire mesh filters:

a. Place wire mesh over the drop inlet so that the wire extends a minimum of 1 foot beyond each side of the inlet structure. Use hardware cloth or comparable wire mesh with one-half inch openings. If more than one strip of mesh is necessary, overlap the strips. Place filter fabric over wire mesh.

ESC54

b. Place 3/4 to 3 inch gravel over the filter fabric/wire mesh. The depth of the gravel should be at least 12 inches over the entire inlet opening (see attached figure).

Installation procedure for sand bag barrier:

a. Use sand bag made of geotextile fabric (not burlap), and fill with 3/4 in. rock or 1/4 in. pea gravel.
b. Construct on gently sloping street.
c. Leave room upstream of barrier for water to pond and sediment to settle.
d. Place several layers of sand bags--overlapping the bags and packing them tightly together.
e. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10-year storm) should not overtop the curb.

Maintenance Requirements

- For filter fabric fences: Inspections should be made on a regular basis, especially after large storm events. If the fabric becomes clogged, it should be replaced. Sediment should be removed when it reaches approximately one-half the height of the fence. If a sump is used, sediment should be removed when it fills approximately one-half the depth of the hole.
- For gravel filters: If the gravel becomes clogged with sediment, it must be carefully removed from the inlet, and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, use the sediment-laden stone instead as fill and put fresh stone around the inlet.
- The inlet protection should be removed 30 days after the upslope area has been fully stabilized. Any sediment around the inlet must be carefully removed and disposed.

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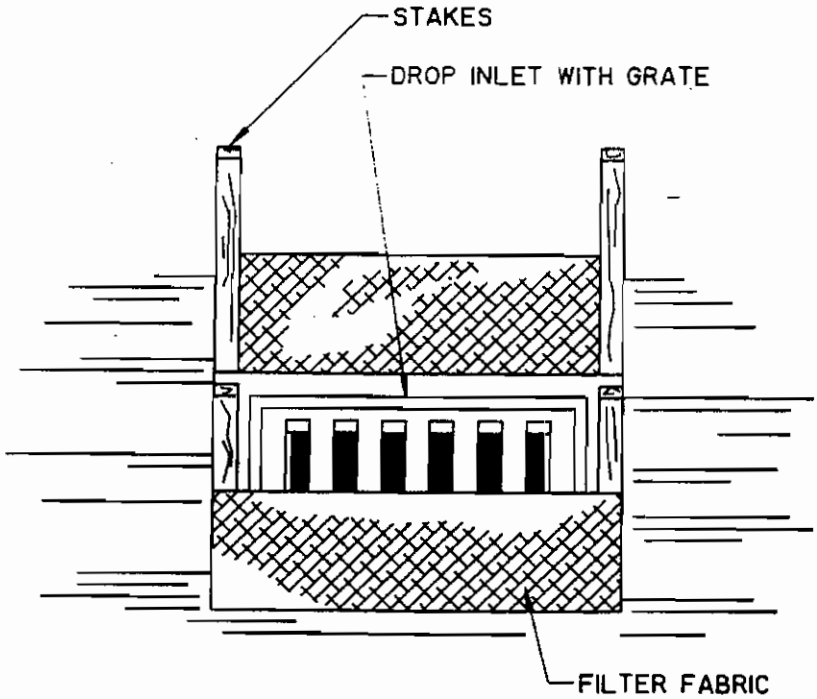
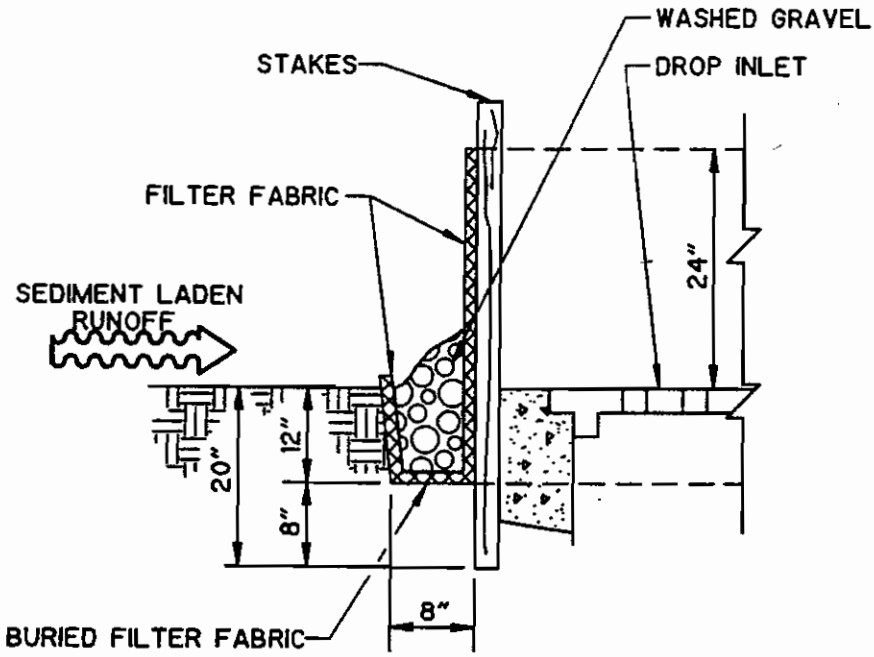
Storm Water Pollution Prevention Handbook, First Edition, State of California, Department of Transportation Division of New Technology, Materials, and Research, October 1992.

ESC54



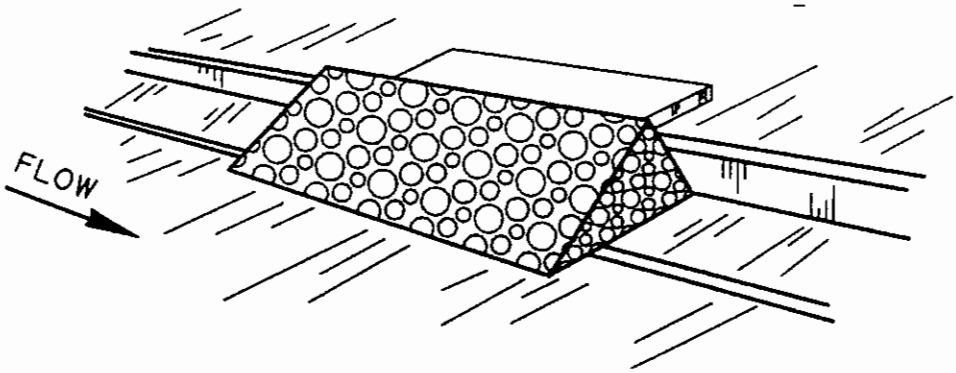
ELEVATION

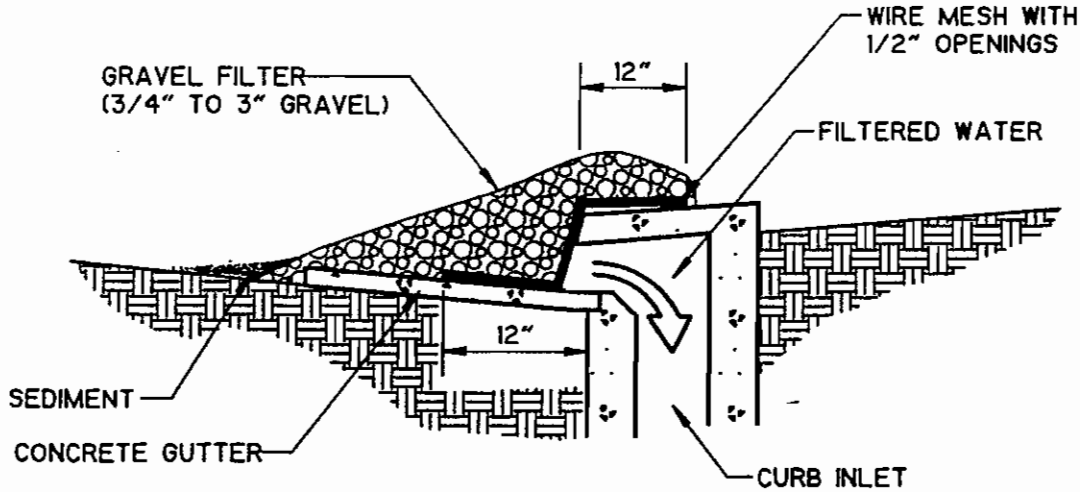


PROFILE

FILTER FABRIC FENCE DROP INLET FILTER

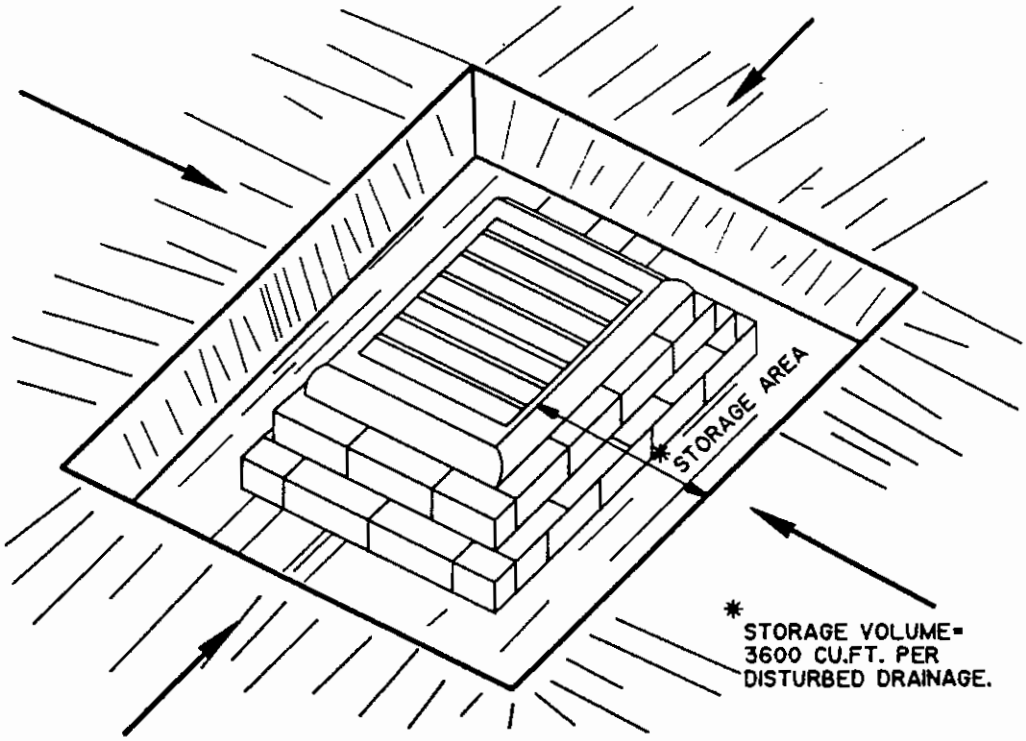
ESC54

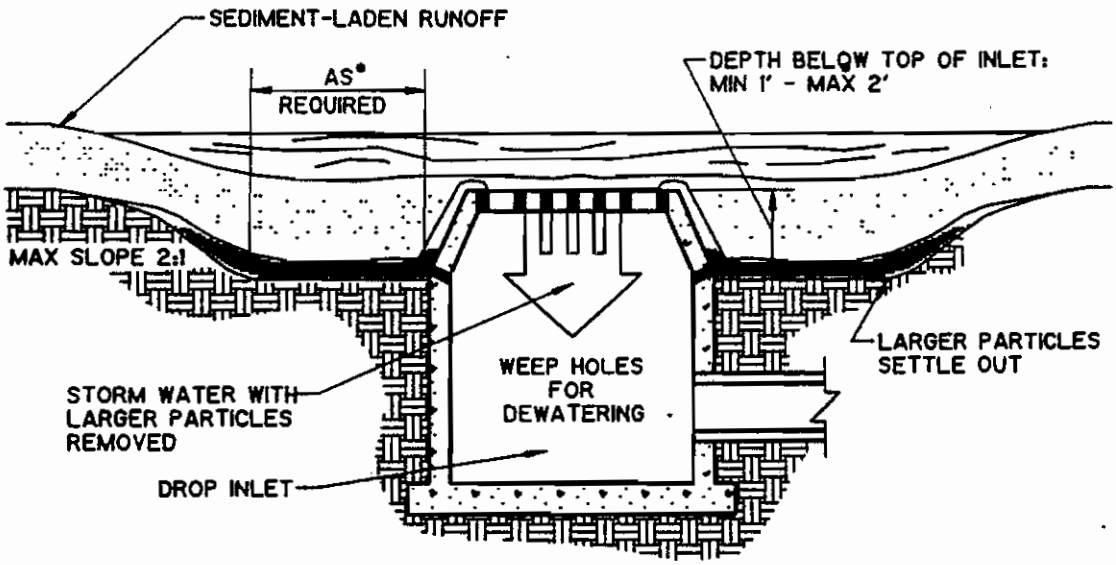




GRAVEL AND WIRE MESH FILTER FOR CURB INLET

ESC54





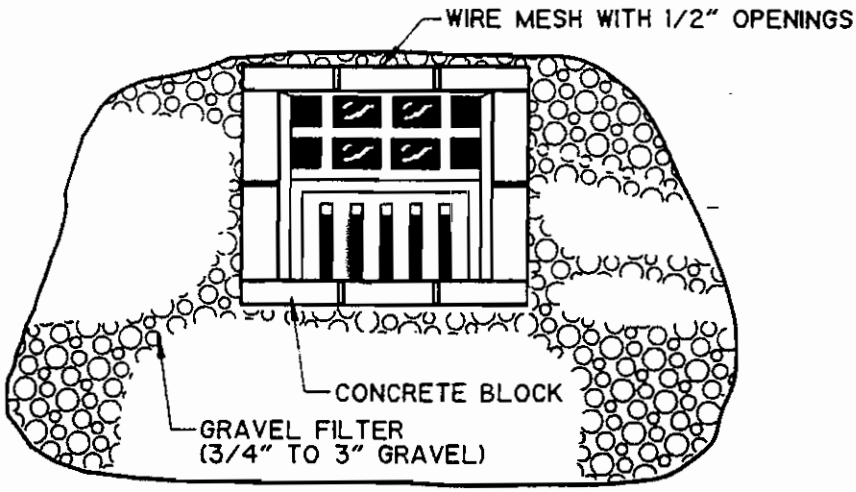
SPECIFIC APPLICATION

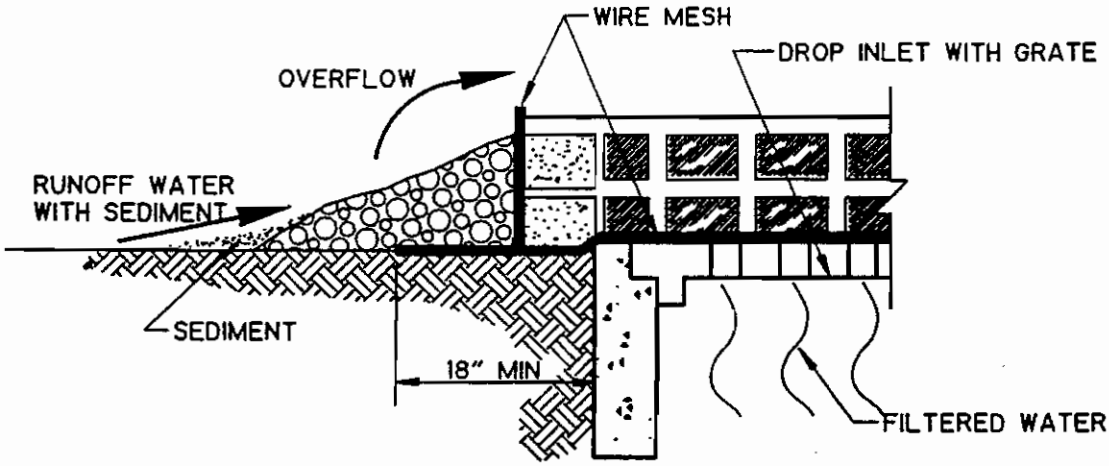
THIS METHOD OF INLET PROTECTION IS APPLICABLE WHERE HEAVY FLOWS ARE EXPECTED AND WHERE AN OVERFLOW CAPABILITY AND EASE OF MAINTENANCE ARE DESIRABLE.

ESC54

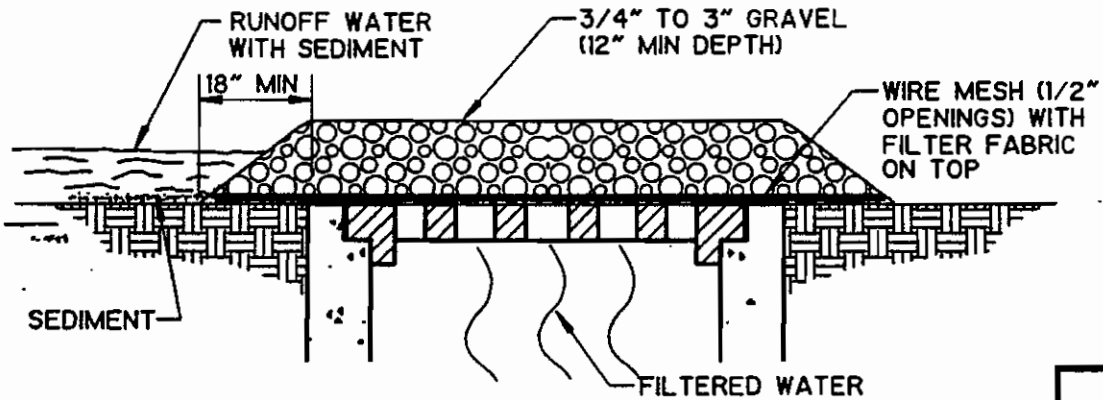
EXCAVATED DROP INLET SEDIMENT TRAP

Additional Information — Storm Drain Inlet Protection





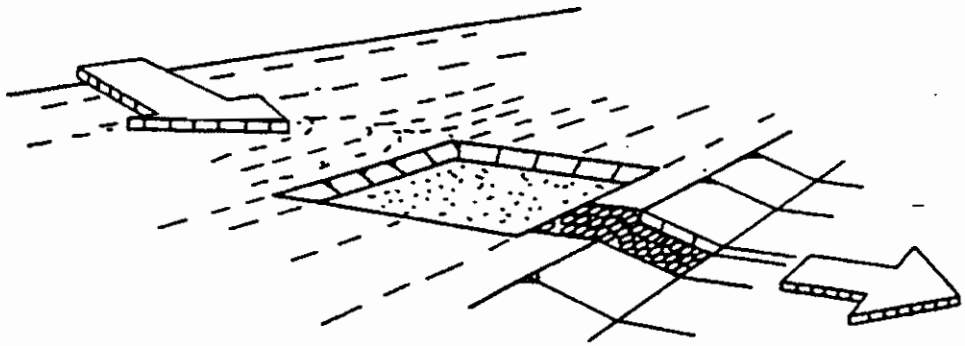
BLOCK AND GRAVEL FILTER AT DROP INLET



GRAVEL AND WIRE MESH FILTER FOR DROP INLET

ESC54

BMP: SEDIMENT TRAP



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabalize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ◒ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ◒ *O&M Costs*
- ○ *Maintenance*
- ○ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC 55

Best Management Practices

GENERAL DEFINITION

A sediment trap is a small, excavated or bermed area where runoff from small drainage areas is detained and sediment can settle.

SUITABLE APPLICATIONS

- Any disturbed area less than 5 acres. (Sediment Basins, ESC56, must be used for drainage areas greater than 5 acres).
- Along the perimeter of the site at locations where sediment-laden runoff is discharged off-site.
- Around and/or upslope from storm drain inlet protection measures.
- At any point within the site where sediment-laden runoff can enter stabilized or natural areas or waterways.

INSTALLATION/APPLICATION CRITERIA

- Build outside the area to be graded <u>before</u> clearing, grubbing, and grading begin.
- Locate where the trap can be easily cleared of sediment.
- Trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency.
- The larger the trap, the less frequently sediment must be removed.
- The outlet of the trap must be stabilized with rock, vegetation, or another suitable material.
- A stable emergency spillway must be installed to safely convey major floods (see your local flood control agency).

REQUIREMENTS

- Maintenance
  - Remove sediment when the sediment storage zone is no more than 1 ft. from being full.
  - Inspect weekly and after each rain.
- Cost (source: EPA, 1992)
  - Average annual cost per installation and maintenance (18 month useful life) is \$0.70 per $ft.^3$ (\$1,300 per drainage acre).

LIMITATIONS

- Only use for drainage areas up to 5 acres (see Sedimentation Basin BMP ST8 for larger areas).
- Only removes coarse sediment (medium silt size and larger) unless sized like a sedimentation basin.

Additional Information — Sediment Trap

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation and/or by constructing an earthen embankment. Its purpose is to collect and store sediment from sites cleared and/or graded during construction. It is intended for use on small drainage areas, with no unusual drainage features, and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately 6 months, and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Application Criteria

Planning:

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to Sediment Basins (ST8), or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed of, such as for in fill areas on-site, or removal to an approved off-site dump. Sediment traps used as a perimeter control should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. Also, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks.

1. Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
2. Restrict basin side slopes to 3:1 or flatter.

Design:

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see Sedimentation Basin ESC56). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a two-year, 24-hour storm is a common design criteria for sedimentation trap. The sizing criteria below assume that this runoff volume is 0.042 ac-ft/ac (0.5 inches of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California.

- Trap settling volume at least 67 cu. yd. per acre.
- Trap sediment storage volume at least 33 cu. yd. per acre (note: the larger this volume, the less frequently the trap must be cleaned out).
- Trap length greater than twice the basin width.
- Flood volume large enough to contain a major flood without upstream damage and overtopping the embankment.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a barrier or low-head dam. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainageways. The following steps must be followed during installation.

1. The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
2. The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.

ESC55

Best Management Practices

Additional Information — Sediment Trap

3. The trap is removed and the area stabilized when the upslope drainage area has been properly stabilized.
4. All cut-and-fill slopes should be 3:1 or flatter.
5. When a riser is used, all pipe joints must be watertight.
6. When a riser is used, at least the top two-thirds of the riser shall be perforated with 1/2-inch diameter holes spaced 8 inches vertically and 10 to 12 inches horizontally. (See Sediment Basin, ESC56)
7. When an earth or stone outlet is used, the outlet crest elevation should be at least 1 foot below the top of the embankment.
8. When a crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

REFERENCES

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Rough Draft - July 1992.

"Draft - Sedimentation and Erosion Control, An Inventory of Current Practices", U.S.E.P.A., April, 1990.

"Environmental Criteria Manual", City of Austin, Texas.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, June 1981.

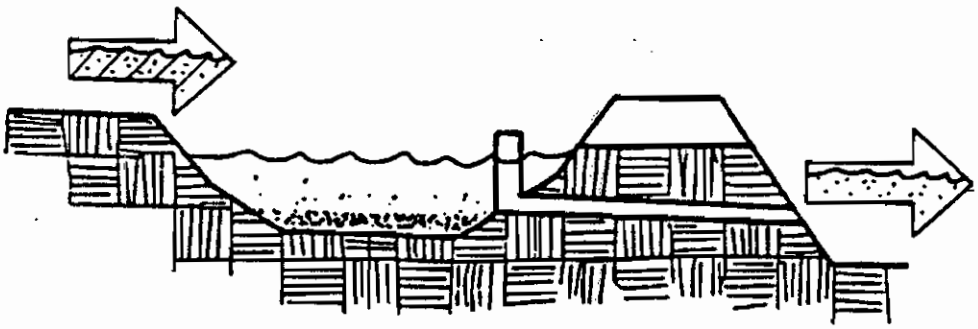
Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April, 1992.

Stormwater Management Water for the Puget Sound Basin, Washington State Department of Ecology, The Technical Manual - February 1992, Publication # 91-75.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency - November 1988.

ESC55

BMP: SEDIMENT BASIN



Objectives

- *Housekeeping Practices*
- *Contain Waste*
- *Minimize Disturbed Areas*
- *Stabalize Disturbed Areas*
- *Protect Slopes/Channels*
- *Control Site Perimeter*
- *Control Internal Erosion*

GENERAL DEFINITION

A pond created by excavation or constructing an embankment, and designed to retain or detain runoff sufficiently to allow excessive sediment to settle.

SUITABLE APPLICATIONS

- At the outlet of all disturbed watershed 10 acres or larger.
- At the outlet of smaller disturbed watersheds, as necessary.
- Where post construction detention basins will be located.
- Should be used in association with dikes, temporary channels, and pipes used to divert disturbed areas into the basin and undisturbed areas around the basin.

INSTALLATION/APPLICATION

- Construct before clearing and grading work begins.
- Do <u>not</u> locate in a stream.
- All basin sites should be located where failure of the embankment would not cause loss of life/property damage.
- Large basins are subject to state/local dam safety requirements.
- Securely anchor and install an anti-seep collar on the outlet pipe/riser, and provide an emergency spillway for passing major floods (see local flood control agency).
- The basin volume should be sized to capture runoff from a 2-year, 24-hour storm, or other appropriate design storms specified by the local agency. A detention time of 24 to 40 hours should allow 70 to 80 percent of sediment to settle.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 foot deep.
  - A settling zone at least 2 feet deep.
- The length to settling depth ratio (L/SD) should be less than 200.
- The length to width ratio should be greater than 6:1, or baffles are required to prevent short circuiting.

REQUIREMENTS

- Maintenance
  - Inspect weekly and after each rain.
  - Remove sediment where the sediment storage zone is half full.
- Cost: Average annual cost for installation and maintenance (2 year useful life, source: EPA, 1992)
  - Basin less than 50,000 $ft.^3$: \$0.40 per $ft.^3$ (\$700 per drainage acre)
  - Basin size greater than 50,000 $ft.^3$: \$0.20 per $ft.^3$ (\$350 per drainage acre)

Targeted Pollutants

- ● *Sediment*
- ○ *Nutrients*
- ◒ *Toxic Materials*
- ○ *Oil & Grease*
- ○ *Floatable Materials*
- ○ *Other Construction Waste*

- ● *Likely to Have Significant Impact*
- ○ *Probable Low or Unknown Impact*

Implementation Requirements

- ○ *Capital Costs*
- ◒ *O&M Costs*
- ○ *Maintenance*
- ○ *Training*
- ○ *Suitability for Slopes >5%*

● *High* ○ *Low*

ESC56

Best Management Practices

LIMITATIONS

- The basin should have shallow side slopes (minimum 4:1) or be fenced to prevent drowning.
- Sites with very fine sediments (fine silt and clay) may require longer detention times for effective sediment removal.
- Basins in excess of 25 feet height and/or an impounding capacity of 50 ac. ft. must obtain approval from Division of Safety of Dams.
- Standing water may cause mosquitos or other pests to breed.
- Basins in excess of certain depth and storage volume criteria must meet State Division of Safety of Dams (DSOD) and local safety requirements.

ESC56

Additional Information — Sediment Basin

A sediment basin is a controlled storm water release structure formed by excavation or by constructing an embankment of compacted soil across a drainageway, or other suitable location. Its purpose is to collect and store sediment from sites cleared and/or graded during construction or for extended periods of time before reestablishment of permanent vegetation and/or construction of permanent drainage structures. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure (with a design life of 12 to 18 months) and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sedimentation basins are suitable for nearly all types of construction projects. Whenever possible, construct the sedimentation basins before clearing and grading work begins.
Basins should be located at the stormwater outlet from the site, but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to divert runoff to the basin inlet.

Many development projects in California will be required by local ordinances to provide a storm water detention basin for post-construction flood control, desiltation, or storm water pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins trap 70-80 percent of the sediment which flows into them if designed according to this handbook. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Installation/Application Criteria
Planning:
To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. The best locations are generally low areas below disturbed areas. Drainage into the basin can be improved by the use of diversion dikes and ditches. The basin must not be located in a stream but should be located to trap sediment-laden runoff before it enters the stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Design:
- The sedimentation basin volume consists of two zones:
  - The sediment storage zone (at least 1 foot in depth).
  - A settling zone at least 2 feet in depth.
- The sedimentation basin may be formed by partial excavation and/or by construction of a compacted embankment. It may have one or more inflow points.
- A securely anchored riser pipe with an anti-seep collar is the principal outlet, along with an emergency overflow spillway. A solid riser pipe with two 1-inch diameter dewatering holes located at the top of the sediment storage volume on opposite sides of the riser pipe usually provides sufficient detention time for basins draining about 10 acres. Rock, rip-rap, or other suitable outlet protection is provided to reduce erosion at the riser pipe outlet.
- Settling Zone Volume

ESC56

Best Management Practices

Additional Information — Sediment Basin

The settling zone volume is determined by the following equation:

$$(V) = 1.2(SD)Q / V_{SED}$$

Q = design inflow based on the peak discharge from a specified design storm (e.g., a 2-year, 24-hour duration design storm event) from the tributary drainage area as computed using the methods required by the local flood control agency. Provide a minimum of 67 cubic yards of settling volume per acre of drainage if a design storm is not specified.

V_{SED} = the settling velocity of the design soil particle. The design particle chosen is medium silt (0.02 mm). This has a settling velocity (V_{SED}) of 0.00096 ft/sec. As a general rule it will not be necessary to design for a particle of size less than 0.02 mm, especially since the surface area requirement increases dramatically for smaller particle sizes. For example, a design particle of 0.01 mm requires about three times the surface area of 0.02 mm. Note also that choosing V_{SED} of 0.00096 ft/sec equates to a surface area (SA) of 1250 sq. ft. per cfs of inflow.

SD = settling depth, which should be at least 2 ft., and no shallower than the average distance from the inlet to the outlet of the pond (L) divided by 200 (i.e., SD > L/200).

Total sediment basin volume and dimension are determined as outlined below:

a. The details shown in the attached figure may be useful in designing the sediment basin.
b. Determine basin geometry for the sediment storage volume calculated above using a minimum of 1 ft depth and 3:1 side slopes from the bottom of the basin. Note, the basin bottom is level.
c. Extend the basin side slopes (at 3:1 max.) as necessary to obtain the settling zone volume as determined above.
d. Adjust the geometry of the basin to effectively combine the settling zone volume and sediment storage volumes while preserving the depth and side slope criteria.
e. Provide an emergency spillway with a crest elevation one foot above the top of the riser pipe.
f. The ratio between the basin length and width of the pond should either be greater than 6:1, or baffles should be installed to prevent short-circuiting.

Limitations

Sediment traps and ponds must be installed only within the property limits. Failure of the structure must not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. Also, sediment traps and ponds are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the pond is required, the type of fence and its location shall be shown in the SWPPP and in the construction specifications.

- Generally, temporary sedimentation ponds are limited to drainage of 5 acres or more.
- Sediment ponds may be capable of trapping smaller sediment particles if additional detention time is provided. However, they are most effective when used in conjunction with other BMPs such as seeding or mulching.
- Ponds may become an "attractive nuisance" and care must be taken to adhere to all safety practices.
- Sediment ponds designed according to this handbook are only practically effective in removing sediment down to about the medium silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) will pass through untreated emphasizing the need to stabilize the soil quickly.

ESC56

Additional Information — Sediment Basin

REFERENCES

A Current Assessment of Urban Best Management Practices: Techniques for Reducing Nonpoint Source Pollution in the Coastal Zones, Metropolitan Washington Council of Governments, March, 1992.

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Rough Draft - July 1992.

Draft - Sedimentation and Erosion Control, An Inventory of Current Practices, U.S.E.P.A., April, 1990.

Environmental Criteria Manual, City of Austin, Texas.

Guidlines for the Design and Construction of Small Embankment Dams, Division of Safety of Dams, California Department of Water Resources, March 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, Jun 1981.

Proposed Guidance Specifying Mnangement Measures for Sources of Nonpoint Pollution in Coastal Water, Work Group Working Paper, USEPA, April, 1992.

Stormwater Management Water for the Puget Sound Basin, Washington State Department of Ecology, The Technical Manual - February 1992, Publication # 91-75.

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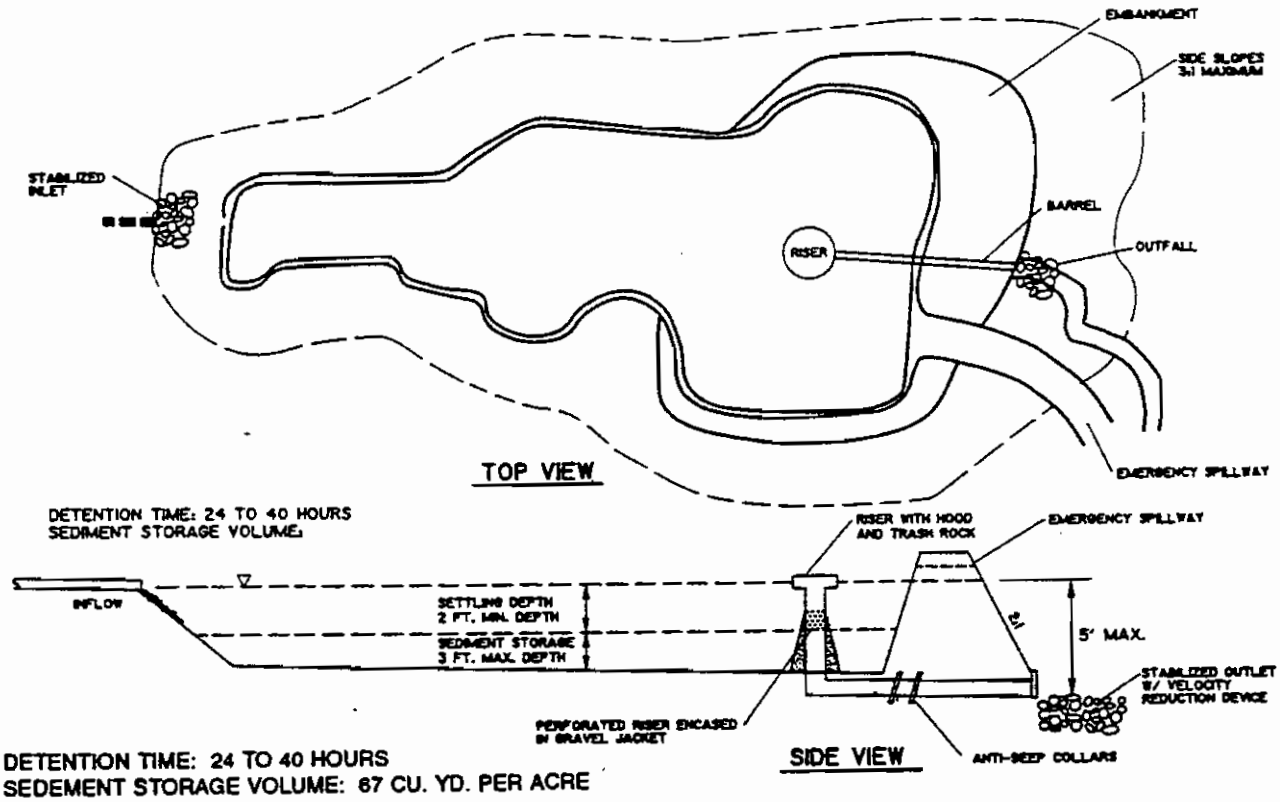
Additional Information — Sediment Basin



DETENTION TIME: 24 TO 40 HOURS
SEDEMENT STORAGE VOLUME: 67 CU. YD. PER ACRE

TEMPORARY SEDIMENT BASIN

ESC56

Best Management Practices

EXHIBIT "E"

PERMANENT WATER QUALITY MANAGEMENT PLAN FEATURES

Grassed Swales

General

A Grass swale is a wide, shallow densely vegetated channel that treats stormwater runoff as it is slowly conveyed into a downstream system. These swales have very shallow slopes in order to allow maximum contact time with the vegetation. The depth of water of the design flow should be less than the height of the vegetation. Contact with vegetation improves water quality by plant uptake of pollutants, removal of sediment, and an increase in infiltration. Overall the effectiveness of a grass swale is limited and it is recommended that they are used in combination with other BMPs.

This BMP is not appropriate for industrial sites or locations where spills occur. Important factors to consider when using this BMP include: natural channelization should be avoided to maintain this BMP's effectiveness, large areas must be divided and treated with multiple swales, thick cover is required to function properly, impractical for steep topography, and not effective with high flow velocities.

Grass Swale Design Criteria:

Design Parameter	Unit	Design Criteria
Design Flow	cfs	Q_{BMP}
Minimum bottom width	ft	2 ft [2]
Maximum channel side slope	H:V	3:1 [2]
Minimum slope in flow direction	%	0.2 (provide underdrains for slopes < 0.5) [1]
Maximum slope in flow direction	%	2.0 (provide grade-control checks for slopes >2.0) [1]
Maximum flow velocity	ft/sec	1.0 (based on Manning n = 0.20) [1]
Maximum depth of flow	inches	3 to 5 (1 inch below top of grass) [1]
Minimum contact time	minutes	7 [1]
Minimum length	ft	Sufficient length to provide minimum contact time [1]
Vegetation	-	Turf grass or approved equal [1]
Grass height	inches	4 to 6 (mow to maintain height) [1]

1 Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures
2 City of Modesto's Guidance Manual for New Development Stormwater Quality Control Measures
3 CA Stormwater BMP Handbook for New Development and Significant Redevelopment
4 Riverside County DAMP Supplement A Attachment

Grass Swale Design Procedure

1. Design Flow
   Use Worksheet 2 - Design Procedure Form for Design Flow Rate, Q_{BMP}.

2. Swale Geometry
   a. Determine bottom width of swale (must be at least 2 feet).
   b. Determine side slopes (must not be steeper than 3:1; flatter is preferred).
   c. Determine flow direction slope (must be between 0.2% and 2%; provide underdrains for slopes less than 0.5% and provide grade control checks for slopes greater than 2.0%

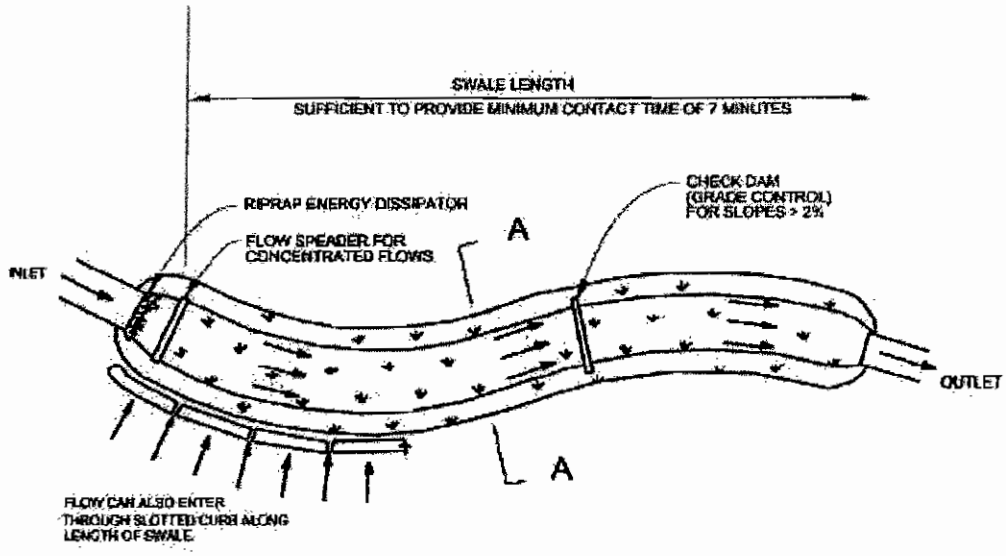
3. Flow Velocity
   Maximum flow velocity should not exceed 1.0 ft/sec based on a Mannings n = 0.20

4. Flow Depth
   Maximum depth of flow should not exceed 3 to 5 inches based on a Manning n = 0.20

5. Swale Length
   Provide length in the flow direction sufficient to yield a minimum contact time of 7 minutes.
   L = (7 min) x (flow velocity ft/s) x (60 sec/min)

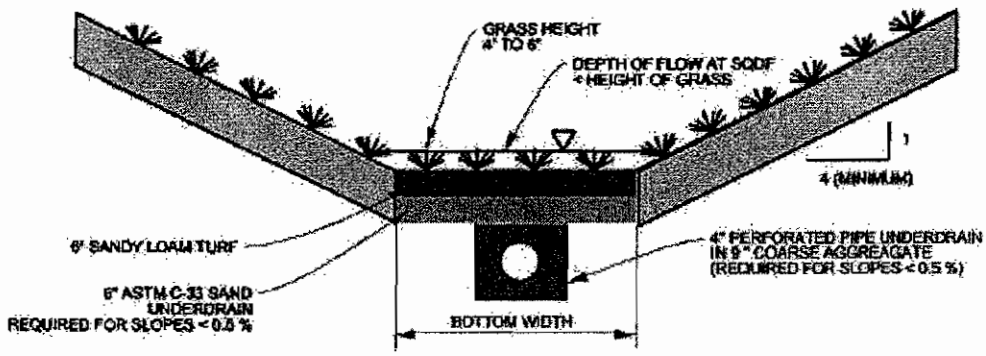
6. Vegetation
   Provide irrigated perennial turf grass to yield full, dense cover. Mow to maintain height of 4 to 6 inches.

7. Provide sufficient flow depth for flood event flows to avoid flooding of critical areas or structures.



TRAPEZOIDAL GRASS SWALE PLAN

NOT TO SCALE

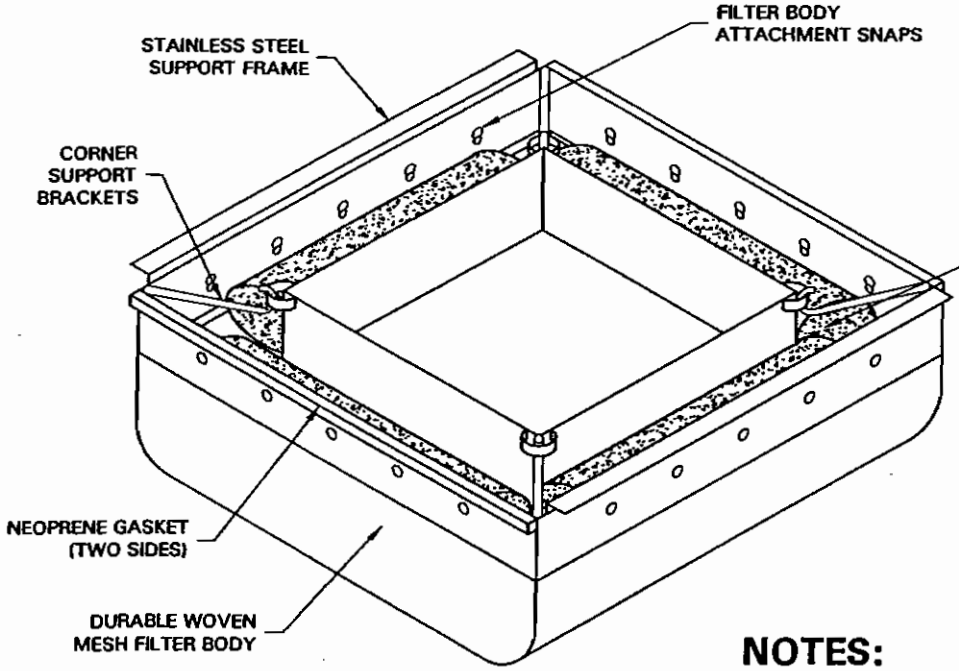


TRAPEZOIDAL GRASS SWALE SECTION

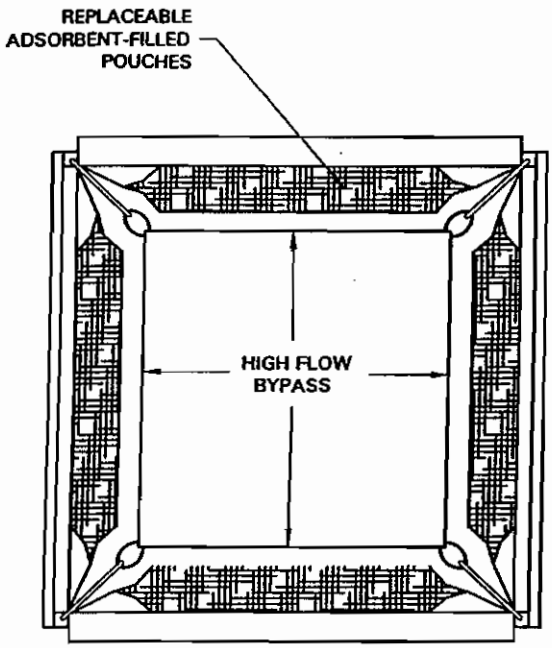
NOT TO SCALE

Figure 11: Grassed Swale

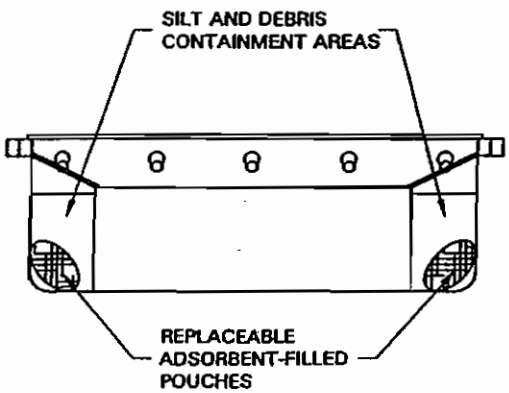
Source: Ventura County Guidance Manual



MODULAR DESIGN FOR EASY REPLACEMENT OF FILTER COMPONENTS



TOP VIEW



SECTION VIEW

NOTES:

1. *Flo-Gard*™ Filter body is prefabricated from polypropylene woven monofilament geotextile.
2. All metal components shall be stainless steel (Type 304).
3. Refer to application chart for catch basin and filter sizing.
4. Filter medium shall be *Fossil Rock*,™ installed and maintained in accordance with manufacturer recommendations.
5. Refer to Manufacturer's recommendations for maintenance program.
6. *Flo-Gard*™ inserts may be installed (without adsorbent pouches) during course of construction as a sedimentation control device. After construction, remove sediment and install adsorbent pouches.

APPLICATION CHART*

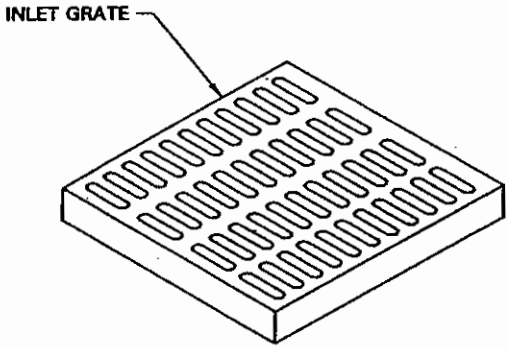
MODEL NO.	Inlet I.D.	Grate O.D.	COMMENTS
FF-16D	16" x 16"	18" x 18"	GRATED INLET
FF-18D	18" x 18"	20" x 20"	GRATED INLET
FF-1836SD	18" x 36"	18" x 40"	GRATED INLET
FF-1836DGO	18" x 36"	18" x 40"	COMBINATION INLET
FF-24D	24" x 24"	26" x 26"	GRATED INLET
FF-2436D	24" x 36"	24" x 40"	GRATED INLET
FF-RF24D	24" Dia.	25" Dia.	CIRCULAR INLET
FF-24DGO	24" x 24"	18" x 26"	COMBINATION INLET
FF-2436DGO	24" x 36"	24" x 40"	COMBINATION INLET

*Flo-Gard™ Filter inserts are designed to fit catch basins with approximate dimensions shown.

FOSSIL FILTER™
FLO-GARD™
CATCH BASIN INSERT
(SHEET 1 OF 2)

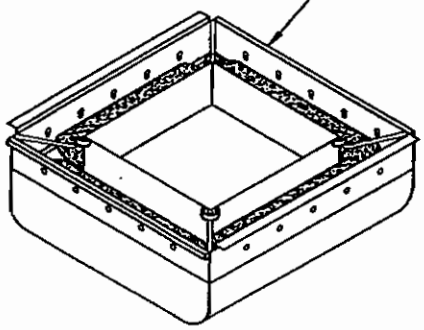
KriStar Enterprises, Inc., Santa Rosa, CA (800) 579-8819

PATENT PENDING



NOTES:

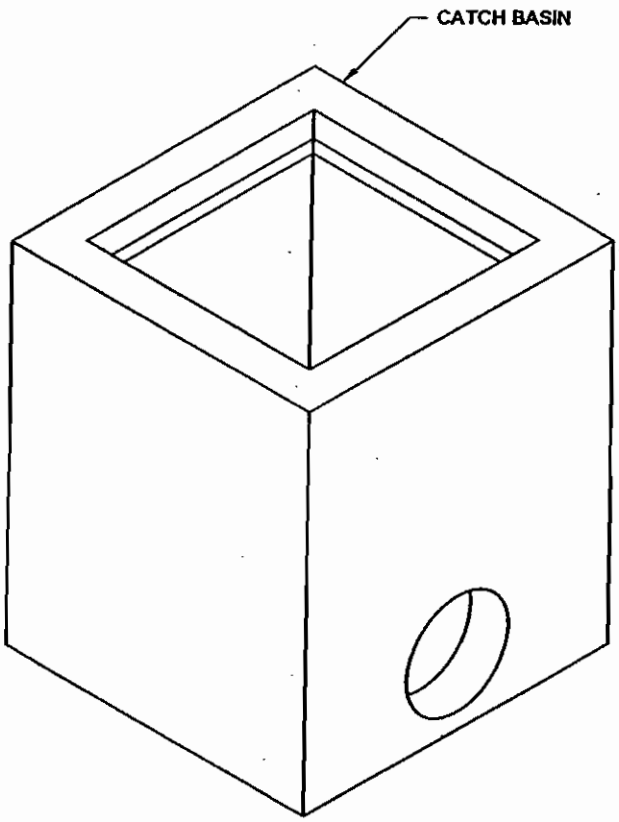
1. *Flo-Gard*™ Filter body is prefabricated from polypropylene woven monofilament geotextile.
2. All metal components shall be stainless steel (Type 304).
3. Refer to application chart for catch basin and filter sizing.
4. Filter medium shall be *Fossil Rock*™ installed and maintained in accordance with manufacturer recommendations.
5. Refer to Manufacturer's recommendations for maintenance program.
6. *Flo-Gard*™ inserts may be installed without adsorbent pouches during course of construction as a sedimentation control device. After construction, remove the sediment and install the adsorbent pouches.



APPLICATION CHART*

MODEL NO.	Inlet I.D.	Grate O.D.	COMMENTS
FF-16D	16" x 16"	18" x 18"	GRATED INLET
FF-18D	18" x 18"	20" x 20"	GRATED INLET
FF-1836SD	18" x 36"	18" x 40"	GRATED INLET
FF-1836DGO	18" x 36"	18" x 40"	COMBINATION INLET
FF-24D	24" x 24"	26" x 26"	GRATED INLET
FF-2436D	24" x 36"	24" x 40"	GRATED INLET
FF-RF24D	24" Dia.	25" Dia.	CIRCULAR INLET
FF-24DGO	24" x 24"	18" x 26"	COMBINATION INLET
FF-2436DGO	24" x 36"	24" x 40"	COMBINATION INLET

*Flo-Gard Filter™ inserts are designed to fit catch basins with approximate dimensions shown.



FOSSIL FILTER™
FLO-GARD™
CATCH BASIN INSERT INSTALLATION DETAIL

(SHEET 2 OF 2)

KriStar Enterprises, Inc., Santa Rosa, CA (800) 579-8819

PATENT PENDING

CONDITIONAL USE PERMIT SITE PLAN

SHOWING PERMANENT WATER QUALITY MANAGEMENT PLAN FEATURES

Original map on file with the County of San Bernardino, Land Use Services Department

CHURCH OF THE WOODS
CONDITIONAL USE PERMIT SITE PLAN
SHOWING PERMANENT WATER QUALITY MANAGEMENT PLAN FEATURES

Scale: 1" = 50'

NOTES:

1. RECORD OWNER: CHURCH OF THE WOODS, A CALIFORNIA CORPORATION; P. O. BOX 2000; LAKE ARROWHEAD, CA; 92352; 909-337-5483.
2. PUBLIC UTILITIES ARE AS FOLLOWS:
   A) WATER: CRESTLINE LAKE ARROWHEAD WATER AGENCY; P.O. BOX 3880; CRESTLINE, CA; 92325; 909-338-1779
   B) SEWER: LAKE ARROWHEAD COMMUNITY SERVICES DIST; P. O. BOX 759; LAKE ARROWHEAD, CA 92352; 909-337-8555
   C) NATURAL GAS: SO. CAL. GAS CO.; P. O. BOX 6228; SAN BERNARDINO, CA; 909-889-9711
   D) ELECTRIC: SO. CAL. EDISON CO.; P. O. BOX 98; RIM FOREST, CA; 92378; 909-337-2564
   E) TELEPHONE: VERIZON; 1500 CRAFTON AVE.; MONTONE, CA; 92356; 909-783-7441
   F) CABLE TV: FALCON CABLE; P. O. BOX 9; RIM FOREST, CA; 92378; 909-336-2457
3. LEGAL DESCRIPTION: THE SE 1/4; NW 1/4; SECTION 28, T2N; R.3W; SBM. COUNTY OF SAN BERNARDINO, CALIFORNIA, APN NO. 335-101-06
4. THE CURRENT AND PROPOSED GENERAL PLAN USE DISTRICT IS LA/RC.
5. ENTRY SIGNS WILL BE SUBMITTED FOR REVIEW AT A LATER DATE.
6. ALL PARKING AREAS WILL BE SURFACED WITH ASPHALT. THE MINIMUM PARKING SPACE WILL BE 9'x18' TYPICAL.
7. TREES TO BE REMOVED ARE DISCUSSED IN THE FORESTER'S REPORT PREPARED BY JOHN HATCHER DATED 3-25-03.

PROJECT SUMMARY:

TOTAL PROJECT

a)	Building Coverage (First Floor)	66,310 SF	4.2%
b)	Drives / Walks / Drainage	340,512 SF	21.2%
c)	Ball Field and Play Fields	232,080 SF	14.4%
d)	Landscape and Recreation	128,800 SF	8.0%
e)	Landscape Slopes	233,635 SF	14.6%
f)	Natural Area	595,414 SF	37.1%
	TOTAL AREA	1,606,160 SF	100%

PROJECT SUMMARY

PARCEL 1: PLAYFIELDS:

a)	Building Coverage	480 SF	0.2%
b)	Drives and Walks	38,382 SF	16.8%
c)	Slope Area	43,445 SF	19.0%
d)	Ornamental Landscape	16,861 SF	7.4%
e)	Play Field	120,327 SF	52.5%
f)	Natural Area	10,023 SF	4.4%
	TOTAL AREA :	229,533 SF	100%

PARCEL 2: CHURCH OF THE WOODS:

a)	Building Coverage	66,740 SF	12.0%
b)	Drives and Walks	276,914 SF	49.1%
c)	Slope Area	71,791 SF	12.8%
d)	Ornamental Landscape/Recreation	109,020 SF	19.3%
e)	Natural Area	49,928 SF	8.5%
	TOTAL AREA :	575,710 SF	100%

PARCEL 3: BASEBALL FIELD:

a)	Drives, Walks and Drainage	28,318 SF	9.6%
b)	Slopes	116,596 SF	39.5%
c)	Ball Field and Adjacent Areas	119,558 SF	40.5%
d)	Landscape	2,381 SF	0.8%
e)	Natural Area	28,122 SF	9.6%
	TOTAL AREA :	294,876 SF	100%

PARCEL 4: NATURAL OPEN SPACE 147,461 SF

PARCEL 5: NATURAL OPEN SPACE 356,560 SF

BUILDING SUMMARY

CHURCH OF THE WOODS

PHASE I
ASSEMBLY BUILDING-(YOUTH CENTER)

First Floor	18,305 SF
Second Floor	8,579 SF
Snack Bar	580 SF
SUBTOTAL	27,464 SF

PHASE II
ASSEMBLY BUILDING ADDITION-(AUDITORIUM/CHILDREN'S MINISTRY)

First Floor	27,254 SF
Second Floor	13,783 SF
SUBTOTAL	41,037 SF

MAINTENANCE BUILDING

First Floor	1,800 SF
Second Floor	700 SF
SUBTOTAL	2,500 SF

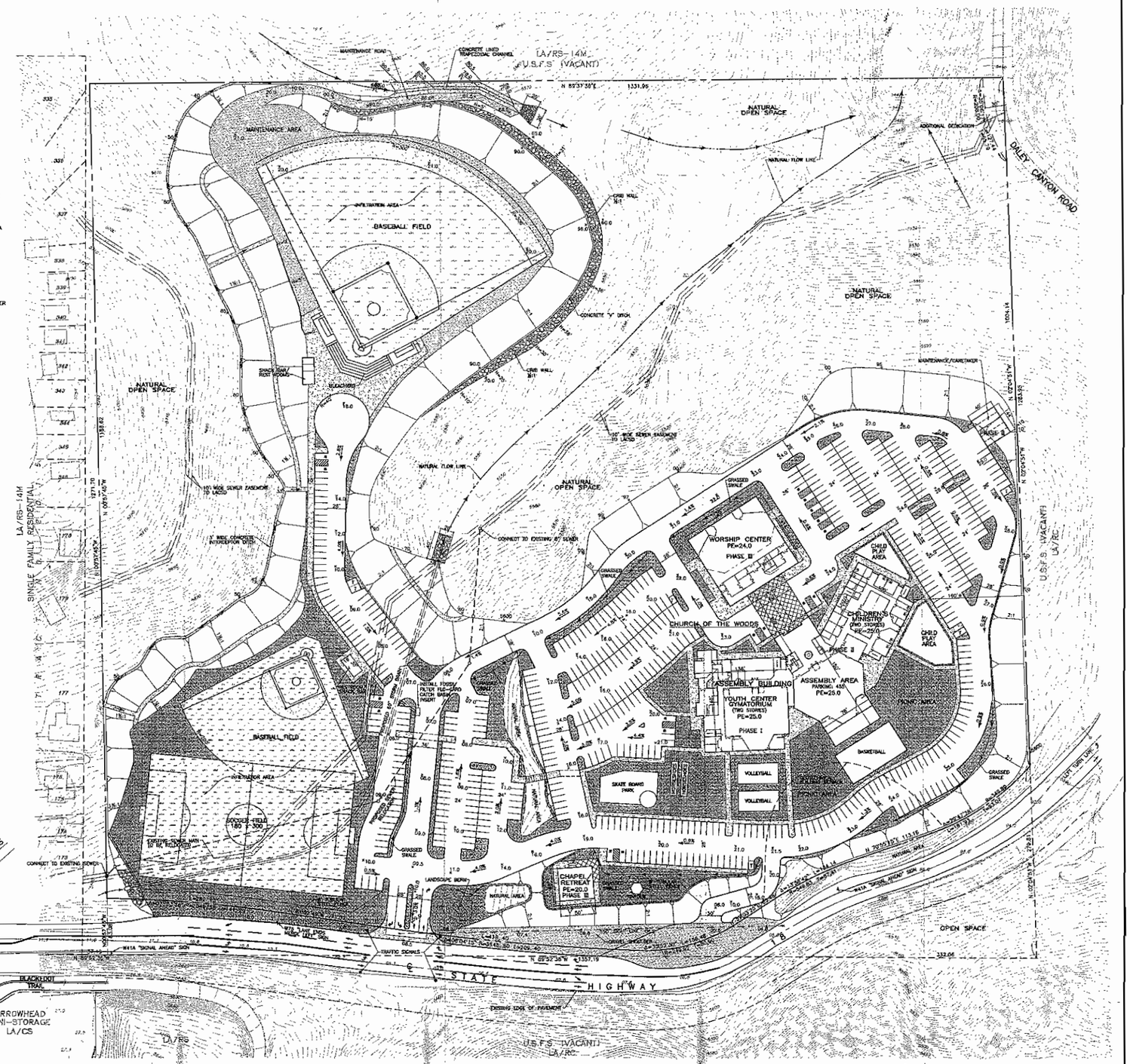
PHASE III

		SEATING
WORSHIP CENTER		
First Floor	18,880 SF	500 PEOPLE
Second Floor	4,636 SF	400 PEOPLE
SUBTOTAL	23,516 SF	1,200 PEOPLE
CHAPEL/RETREAT		
First Floor	2,500 SF	
Second Floor	573 SF	
SUBTOTAL	3,073 SF	

TOTAL SQUARE FOOTAGE (CHURCH OF THE WOODS) 97,484 SF

PARKING SUMMARY (9x18 TYPICAL)

	REQUIRED	PROVIDED
CHURCH OF THE WOODS (BUILD OUT) 1200 SEATS (1 space for 4 seats)	300	PHASE II - 540



LEGEND:

- INDICATES PLAY FIELD
- INDICATES ORNAMENTAL LANDSCAPE
- INDICATES LANDSCAPED MANUFACTURED SLOPE
- INDICATES GRAVEL SHOULDER (HIGHWAY 18)
- INDICATES NATURAL AREA
- INDICATES CONCRETE WALKWAY
- INDICATES 6' TUBULAR STEEL FENCE

W.J. McKEEVER, R.C.E. 25592 — DATE

9-09-04

W.J. McKEEVER, INC.
CIVIL ENGINEERING
547 NORTH MAIN STREET, SUITE 2A
RIVERSIDE, CALIFORNIA 92501
PH: (951) 341-3700
FAX: (951) 341-3740

W.J. McKeever, Inc.

Water Demand Calculations

July 18, 2006

ALBERT A.
WEBB
ASSOCIATES

Albert A. Webb Associates
Consulting Engineers
3788 McCray Street
Riverside, CA 92506-2973
Telephone (951) 686-1070
FAX (951) 788-1256

W.O. 04-175

FAX MEMO

TO: CLAWA
ATTENTION: Roxanne Holmes, General Manager
FAX NUMBER: 909-338-3686
FROM: Fred Hans Hanson, Vice-President
DATE: July 19, 2006

RE: Proposed Church of the Woods, Estimate of CLAWA's Water Service Requirements

Attached is a copy for your files of McKeever's fax to Webb dated July 18, 2006, sending (per our request) information about subject project to assist in our calculations to estimate CLAWA's water service requirements for this project. The attached copy of McKeever's fax is marked to show our estimated water demand calculations, which are summarized as follows:

Based upon the plumbing fixtures count shown in the attached fax, Phase I through Phase III development is estimated to require a maximum "Domestic Water" flow of about 125 GPM totaling about 49 AF/year. Phase I is estimated to require about 18 AF/year, Phase II estimated at about 22 AF/year, and Phase III at about 9 AF/year (AF = Acre-Feet).

Based upon the required fire flow shown in the attached fax (3,750 GPM for 3 hours duration at 20 psi residual pressure), each 3 hour fire is estimated to require about 2 AF of fire protection water.

Based upon the square feet (SF) of "Areas Needing Landscape Irrigation Water" shown in the attached fax, Phase I through Phase III development is estimated to require a maximum of 125 GPM totaling about 35 AF/year. The project's playfields (Pcl. 1) is estimated to require about 11 AF/year, The Church of the Woods (Pcl. 2) is estimated at about 10 AF/year, and the baseball field (Pcl. 3) at about 14 AF/year.

Please contact us if you have any questions or comments regarding the above matter. We have today phoned Mike Harden (949-753-7001) to verbally advise him of the above estimate of CLAWA's water service requirements for this project, to assist in his preparation of an EIR.

cc: Robert Benavent, AAWA (Memo)
Bill McKeever (Memo)
Mike Riddell, BB&K (Memo)

Post-it® Fax Note 7671	Date 7-19-06	# of pages ▸ 8
To MIKE HARDEN	From FRED HANSON	
Co./Dept. PCR	Co. WEBB	
Phone #	Phone #	
Fax # 949-753-7002	Fax #	

04-175
COPY PER YOUR REQUEST VIA PHONE. FHH

Original will not follow	
Pages (Including this cover sheet):	8
Operator:	at/

G:\2004\04-0175\Fax Memo 7-19-06.doc

FILE
04-175
7-19-06

FAX

Date 7/18/06

Number of pages including cover sheet 2

TO: AA Webb Assoc.

Atten: Fred Hanson

Re: Church of The Woods

Phone
Fax Phone 788-1256

FROM: **W.J. McKeever Inc.**
647 N. Main St., Ste. 2A
Riverside, CA 92501
William J. McKeever

Phone (951) 341-3700
Fax Phone (951) 341-3740
E-Mail office@wjmckeeverinc.com

CC:

REMARKS: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please Comment

Fred:
I am sending you the following:

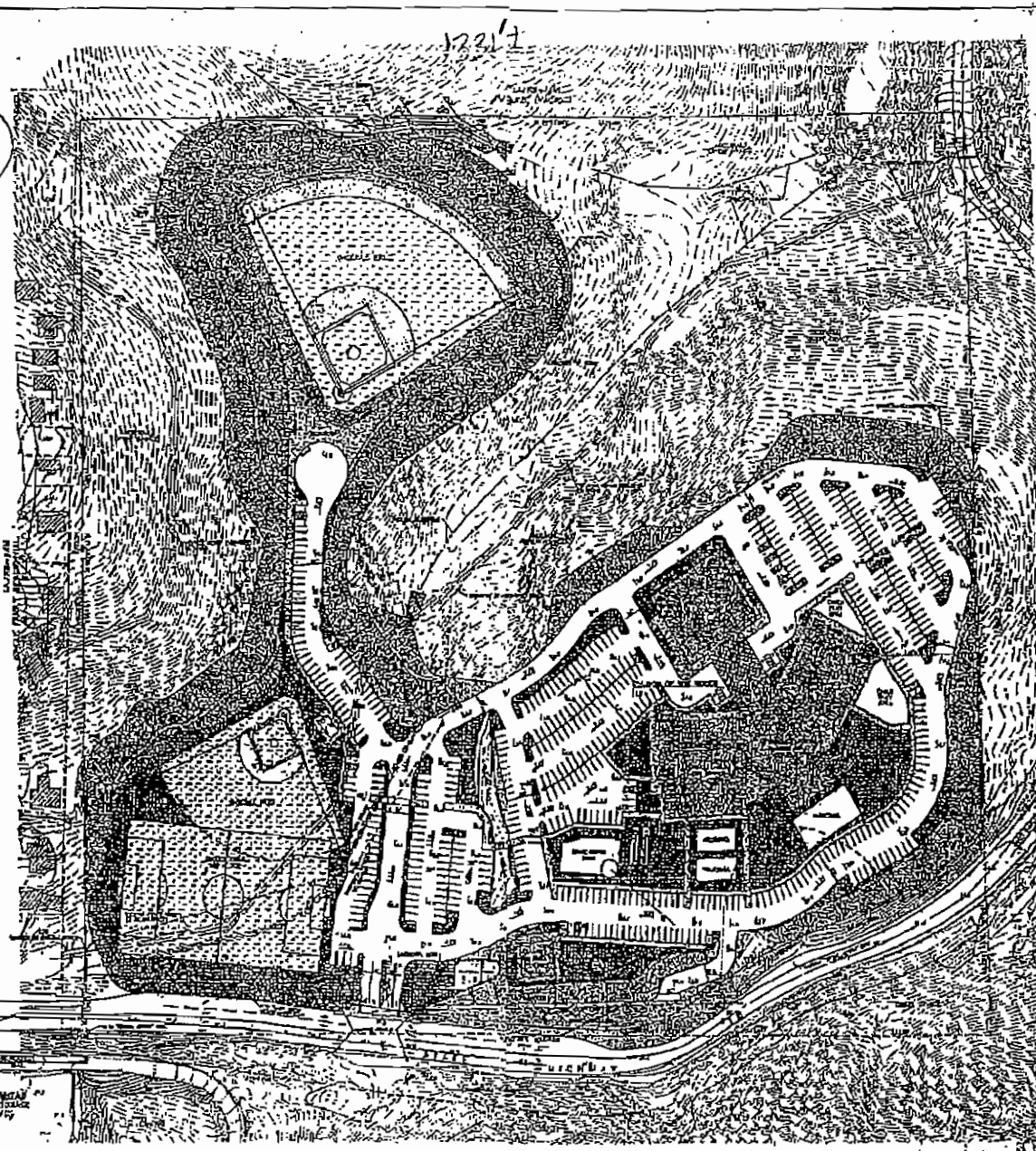
1. Site Plan
2. Project Summary
3. List of Plumbing Fixture Units per Phase
4. Fire Flow Requirements

If you need any further information to calculate water demand for this project, please call me.

Thank You
Bill

CHURCH OF THE WOODS
CONDITIONAL USE PERMIT
SITE PLAN

(THIS REDUCTION 1" = 167'±)



SEP 11 2006

BUILDING SUMMARY

CHURCH OF THE WOODS

PHASE I

ASSEMBLY BUILDING—(YOUTH CENTER)

First Floor	18,305 SF
Second Floor	8,579 SF
Snack Bar	480 SF
SUBTOTAL	27,364 SF

PHASE II

ASSEMBLY BUILDING ADDITION—(AUDITORIUM/CHILDREN'S MINISTRY)

First Floor	27,254 SF
Second Floor	13,783 SF
SUBTOTAL	41,037 SF

MAINTENANCE BUILDING

First Floor	1,800 SF
Second Floor	700 SF
SUBTOTAL	2,500 SF

PHASE III

WORSHIP CENTER

		SEATING
First Floor	18,880 SF	800 PEOPLE
Second Floor	4,630 SF	400 PEOPLE
SUBTOTAL	23,510 SF	1,200 PEOPLE

CHAPEL/RETREAT

First Floor	2,500 SF
Second Floor	573 SF
SUBTOTAL	3,073 SF

TOTAL SQUARE FOOTAGE: (CHURCH OF THE WOODS) 97,484 SF

PARKING SUMMARY (9x19 TYPICAL)

	REQUIRED	PROVIDED
CHURCH OF THE WOODS (BUILD OUT) 1200 SEATS (1 space for 4 seats)	300	PHASE III – 5

PROJECT SUMMARY:

TOTAL PROJECT

a)	Building Coverage (First Floor)	69,219	SF	4.2%
b)	Drives / Walks / Drainage	340,612	SF	21.2%
c)	Ball Field and Play Fields	238,880	SF	14.9%
d)	Landscape and Recreation	128,200	SF	8.0%
e)	Landscape Slopes	233,835	SF	14.6%
f)	Natural Area	595,414	SF	37.1%
	TOTAL AREA	1,606,160	SF	100%

35 AF/YR

600,915 SF

PROJECT SUMMARY

PARCEL 1: PLAYFIELDS:

a)	Building Coverage	480	SF	0.2%
b)	Drives and Walks	35,382	SF	15.5%
c)	Slope Area	45,445	SF	19.9%
d)	Ornamental Landscape	16,881	SF	7.4%
e)	Play Field	120,322	SF	52.6%
f)	Natural Area	10,023	SF	4.4%
	TOTAL AREA :	228,533	SF	100%

182,648 SF (30.4%) (11 AF/YR) Pel 1

PARCEL 2: CHURCH OF THE WOODS:

a)	Building Coverage	68,749	SF	12.0%
b)	Drives and Walks	276,914	SF	48.1%
c)	Slope Area	71,791	SF	12.5%
d)	Ornamental Landscape/Recreation	109,028	SF	18.9%
e)	Natural Area	49,228	SF	8.5%
	TOTAL AREA :	575,710	SF	100%

180,819 SF (30.1% 10 AF/YR) Pel 2

PARCEL 3: BASEBALL FIELD:

a)	Drives, Walks and Drainage	28,316	SF	9.6%
b)	Slopes	116,599	SF	39.5%
c)	Ball Field and Adjacent Areas	118,556	SF	40.2%
d)	Landscape	2,281	SF	0.8%
e)	Natural Area	29,122	SF	9.9%
	TOTAL AREA :	294,876	SF	100%

(39.5%) 237,438 SF

600,905 SF

PARCEL 4: NATURAL OPEN SPACE 147,481 SF

PARCEL 5: NATURAL OPEN SPACE 359,560 SF

(14 AF/YR Pel 3)

$\frac{600,915 \text{ SF}}{43,560} \cong 14$ Ac (SLOPES LANDSCAPING BALLFIELD PLAY AREAS ETC)

14 Ac @ 2.5 AF/Ac/YR = 35 AF/YR

35 X 0.25 = 9 AF/PK.MO.

= 0.30 AF/AVG. DAY PK.MO.

= 98,000 GAL AVG. DAY PK.MO.

= 68 GPM AVG. DAY PK.MO.

SAY = 125 GPM PK DAY PK.MO.

ATTN: DENNIS STAFFORD
FROM: BOB PORTER

Church of the Woods
Plumbing Fixtures ~~Units~~ COUNT
Per Phases

PHASE I

	Floors 1st	Floors 2nd	Total Units	CALC. FIXTURE UNITS
Toilets	5	3	8 x10	80
Urinals	1	1	2 x5	10
Sinks	7	2	9 x4	36
Showers	2		2 x8	16
Drinking Fountains	1	1	2 x2	4
			23	146
Maintenance Building				
Toilets	2		2 x10	20
Sinks	4		4 x4	16
Tub/Shower	1		1 x12	12
Dishwasher	1		1 x6	6
Washer	1		1 x3	3
			9	57
Total Phase I			32	203 (36.5% 46 GPM)

DOMESTIC FLOW:

PI–PIII 125 GPM PH PD PM

PH:PD → (÷1.5) 83 GPM PD PM

PD:AD → (÷1.5) 56 GPM AD PM

(x1440) 80,640 GAL AD PM

(x30) 2,419,200 GAL PM

15% PM → (÷0.15) 16,128,000 GAL YR

(÷7.48) 2,156,150 CF YR

(43,560) 49 AF/YR TOTAL

18 AF/YR

PHASE II

	Floors 1st	Floors 2nd	Total Units	CALC. FIXTURE UNITS
Toilets	8	4	12 X10	120
Urinals	2	1	3 X5	15
Sinks	9	4	13 X4	52
Drinking Fountains	2	2	4 X2	8
			32	195
Chapel				
Toilets				0 (ASSUME)
Sinks	3		3 X4	12
Drinking Fountains	5		5 X2	10
Urinals	1		1 X5	5
Washer	1		1 X3	3
Dishwasher	1		1 X6	6
Tub/Shower	1		1 X12	12
			13	48
	Total Phase II		45	243 (43.7% 55 GPM)
		22 AF/YR →		

PHASE III – Worship Ctr.

Toilets	5	3	8 X10	80
Urinals	1	1	2 X5	10
Sinks	2	2	4 X4	16
Drinking Fountains	1	1	2 X2	4
			16	110
	Total Phase III		16	110 (19.8% 24 GPM)
	9 AF/YR →			
	TOTAL PI–PIII		93 (X5.98 AVG.)	556

0–600 ≡ 100 GPM
VERY NEAR 600 FIXTURE UNITS → SAY 125 GPM
(SEE PREVIOUS PG) → 49 AF/YR

☒ **Water System.** Prior to any land disturbance, the water systems shall be designed to meet the required fire flow for this development and shall be approved by the Fire Department. The required fire flow shall be determined by using Appendix IIIA of the Uniform Fire Code.

The Fire Flow for this project shall be:

3750 GPM for a 3 Hour duration at 20 psi residual operating pressure.

Currently the project: ☐ Meets Fire Flow ☐ Does not meet Fire Flow

Fire Flow based on 66060 sq.ft. structure.

Except for individual single family residences, the applicant shall submit four (4) copies of the water system improvement plans to the Fire Department for review and approval. New water systems shall have minimum eight (8) inch mains, six (6) inch laterals, six (6) inch riser and an approved six (6) inch fire hydrant. Standard 903.1 [F-5]

☐ **Rural Water System.** In areas without water serving utilities, the fire protection water system shall be designed to NFPA 1142 and shall be operational prior to framing. All NFPA 1142 systems shall provide an approved permanent water supply of a minimum 5,000-gallon water tank or an approved rural water supply for fire fighting per NFPA 1142. Water supply systems can be mitigated with an approved NFPA 13, 13R or 13D-fire sprinkler system. If the project is in an FR1 or FR2, a temporary water tank shall be required and operable during construction. [F6]

☐ **Fire Equipment – Agreement/Surety.** The applicant shall execute an agreement with the County of San Bernardino, *(if applicable- San Bernardino County Redevelopment Agency)* and the Fire Department, to ensure that all fire equipment necessary to serve the project is available when necessary or the applicant may submit surety in a form and amount acceptable to County Counsel and the Fire Chief. [F-7]

☒ **Access Maintenance Agreement.** The applicant shall submit a written agreement signed by the applicant to either provide, or to contract to provide on-going road maintenance, vegetation maintenance, and snow removal (where applicable) for primary access routes, secondary access routes, and all internal drives, that are not otherwise maintained by a public agency. [F-8]

1-3 HR. FIRE: 3,750 GPM X 180 MIN. = 675,000 GAL
= 90,240 CF
= 2 AF/3 HR. FIRE

CLAWA

Water Availability Letter

March 3, 2010

CRESTLINE-LAKE ARROWHEAD WATER AGENCY

A Public Agency
P.O. BOX 3880 PHONE (909) 338-1779
24116 CREST FOREST DRIVE
CRESTLINE, CALIFORNIA 92325

Directors
STEPHEN L. PLEASANT, President
BRUCE D. RISHER
NORMAN C. MEEK
THOMAS L. SUTTON
KENNETH A. EATON
Secretary
JENNIFER A. SPINDLER
General Manager
ROXANNE M. HOLMES

March 3, 2010

Church of the Woods
P.O. Box 2000
Lake Arrowhead, CA 92352

RE: Water Service to Church of the Woods (APN 336-101-06)

Gentlemen:

This letter will serve as a one year extension of your original water availability letter through March 3, 2011. This letter will confirm that the Crestline-Lake Arrowhead Water Agency has water available to provide service to Assessor's Parcel Number 336-101-06, where you propose to construct a church and associated facilities, upon deposit of sums sufficient to cover Agency fees and charges, and upon compliance with the Agency's rules, regulations, ordinances, resolutions, policies and procedures.

Prior to preparation of plans for development or construction, it will be necessary for you to confer with the local fire protection agency to ascertain any conditions or requirements in the development of your property to protect against fire hazards. In addition, the Agency will need to see your development plans before determining the facilities that may need to be installed in order to provide service, including the size and location of the meter(s).

This parcel has been exempt from Agency standby charges since 1993 because it was not within the service area of another retail purveyor having a connection from the Agency. Therefore, all past due water standby charges must be paid prior to water connection. At this time, the outstanding standby charges are $3,870.00.

This water availability letter will expire automatically one year after the date of execution by the Agency unless metering facilities have been installed by the Agency to serve the property before that date. However, the Agency, in its discretion, may extend the period of time for installation of metering facilities, upon your written request.

Please let us know if you have any questions or concerns.

Yours very truly,

Roxanne M. Holmes, General Manager

RMH: js

PCR Santa Monica

233 Wilshire Boulevard
Suite 130
Santa Monica, CA 90401
TEL 310.451.4488
FAX 310.451.5279
PCRinfo@pcrnet.com

PCR Irvine

One Venture
Suite 150
Irvine, CA 92618
TEL 949.753.7001
FAX 949.753.7002
PCRinfo@pcrnet.com

PCR Pasadena

55 South Lake Avenue
Suite 215
Pasadena, CA 91101
TEL 626.204.6170
FAX 626.204.6171
PCRinfo@pcrnet.com