
IV. ENVIRONMENTAL IMPACT ANALYSIS
M. HAZARDS AND HAZARDOUS MATERIALS
2. ELECTROMAGNETIC FIELD EMISSIONS

INTRODUCTION

This Section analyzes the potential impact of the proposed project on people and the environment with regard to electric and magnetic fields (commonly called “electromagnetic fields” or “EMFs”), primarily the EMFs generated by the high-voltage power lines owned by Southern California Edison (SCE) that transect the northern portion of the project site. The information and analysis set forth below is based on information presented in literature prepared in connection with the California EMF Program, a project of the California Department of Health Services and the Public Health Institute. California Public Utilities Commission (CPUC) Decision 93-11-013 created the California EMF Program to research and provide education and technical assistance on the possible health effects of exposure to electromagnetic fields from power lines and other uses of electricity. In addition to funding research and policy analysis on this issue, the EMF Program provides education and technical assistance to government agencies, professional organizations, businesses, and members of the general public.

Many of the statements and much of the data and analysis relied on in this Section are based on the most recent and comprehensive review of the scientific literature concerning the health affects of EMF exposure, as presented in “An Evaluation of the Possible Risks From Electric and Magnetic Fields (EMFs) From Power Lines, Internal Wiring, Electrical Occupations, and Appliances, Final Report dated June 2002 (the “EMF Report”). The EMF Report is one of the most in-depth governmental studies prepared on this subject to date. A summary of the findings and conclusions of the EMF Report is presented below in the Environmental Setting subsection.

ENVIRONMENTAL SETTING

Overview of Electric and Magnetic Fields

Wherever there is electricity, there are electric and magnetic fields (EMFs), which are fields of force (or energy) created by electric charges. Electric fields are produced by the voltage (i.e., electrical “pressure”) in a wire, such as when an appliance is plugged in (but not turned on). Electric fields can be blocked or partially shielded by other objects. The intensity or strength of an electric field is measured in volts per meter (V/m). Magnetic fields are created by the current or flow of electricity through a wire, such as when an appliance is turned on. Magnetic fields can pass through most objects. The intensity of a magnetic field is measured in gauss (G) or tesla (T). Most of the EMF fields humans

Table IV.M-2
Electromagnetic Field Measurements

Electromagnetic Fields at Home (Measurements are in milliGauss.)			
	1.2" away	12" away	39" away
Microwave Oven	750 to 2,000	40 to 80	3 to 8
Clothes Washer	8 to 400	2 to 30	0.1 to 2
Electric Range	60 to 2,000	4 to 40	0.1 to 1
Fluorescent Lamp	400 to 4,000	5 to 20	0.1 to 3
Hair Dryer	60 to 20,000	1 to 70	0.1 to 3
Television	25 to 500	0.4 to 20	0.1 to 2

Source: Adapted from Gauger 1985

experience on a daily basis comes from sources other than power lines, such as home wiring and plumbing and other common appliances in homes or workplaces, including televisions, computer monitors, microwave ovens, hairdryers, and electric blankets. Sources with high *voltage* produce strong electric fields, while sources with strong electric *currents* produce strong magnetic fields.

The strength of both electric and magnetic fields decreases as one moves away from the source. For both electric and magnetic fields, strength decreases more quickly with distance from “point” sources like appliances than from “line” sources such as power lines. For example, as shown in Table IV.M-2, above, the magnetic field is reduced to “background levels” (the naturally occurring amounts) at 3 or 4 feet away from typical household appliances. As depicted in Table IV.M-2, EMF exposure from common household appliances such as televisions, range from 25 to 500 mG, at a distance of 1.2 inches, and is greatly reduced to 0.1 to 2 mG at a distance of 39-inches or more. For a 230 kV transmission line, a typical EMF strength of 57.5 mG measured directly under the line is reduced to 19.5 mG at a distance of 50 feet from the edge of the right-of-way (ROW), and to roughly 7.1 mG at a distance of 100 feet from the edge of the ROW. A graphic illustrating typical EMF strengths at various distances from transmission lines is depicted in Figure IV.M-1 on page IV.M-16.

The EMF Mixture

A careful assessment of electromagnetic exposure from power lines, appliances, and occupations reveals what amounts to a complex mixture, which takes into consideration many complex aspects of EMF exposure such as frequency, polarization, distance attenuation, and the human interaction with EMF sources which includes, among other sources, common household appliances. The variety of EMF sources that a person is exposed to throughout any given day is referred to as the “EMF

Figure IV.M-1 Typical EMF levels for Transmission Lines

mixture.” Each aspect of the EMF mixture varies from instant to instant to form a time series of intensities that can be summarized as a single number by various summary “exposure metrics,” which may be more or less biologically active. For example, the exposure metric of ionizing radiation that best predicts biological effects is the simple integral of the exposure time series. The exposure metric that best predicts the effect of an antibiotic might be the integral of blood levels above some threshold. Other electricity-related correlates, including proximity to power lines, internal wiring in homes, and household appliances, are not part of the fields at all, but might be correlated with them. These include contact currents from stray currents from plumbing and in the earth, and intermittent shocks. These are called the “ingredients” of the mixture.

Measuring EMF Exposure in Homes

There are several different ways of estimating a person’s electromagnetic field exposure at home, including: (1) indirectly by assessing the types and proximity of power lines to homes (wire codes); (2) indirectly by taking area (spot) measurements; and (3) directly by taking repeated measurements with a meter worn by a person while at home (personal measurements). Wire coding is a method to classify homes according to the type of, and distance from, nearby power lines. Spot measurements are magnetic field measurements taken at various individual locations throughout a room or area. Each of these ways of measuring a person’s home electromagnetic field exposure has advantages and limitations. Wire code classifications estimate exposure on the basis of something relatively constant over time, including proximity to different types of power lines. As a result, wire code classifications may provide good estimates of exposure from power lines. The different wire code categories overlap, however, and only consider power lines, not other sources, so wire code classifications may not capture differences in exposure between homes as well as some of the other measurement strategies. Also, wire code classifications may only capture certain types of exposures such as the average level, rather than the level’s rate of change. Spot measurements capture more of these differences because they measure actual fields at different locations in the home; however, they are generally only taken at specific locations around the home and at one point in time, and so may not capture people’s actual exposure in the areas where they spend time or over the course of a year. Personal measurements capture a person’s actual exposure, but generally only measure a short period of time that may not be representative of a person’s exposure on a typical day or a person’s average annual or lifetime exposure. For purposes of this analysis, the wire code classification method is the most appropriate method to discuss in detail, because the focus of this Section is to address the potential impacts of EMF exposure relative to the proximity of proposed homes to existing transmission lines. Additional information on spot measurements and personal measurements can be found on the official EMF Program website at <http://www.dhs.cahwnet.gov/ps/deodc/ehib/emf/pdf/resifactsheet.pdf>.

Wire codes categorize homes based on the types of power lines near those homes and their distances from it. The wire code classification system is based on the fact that electromagnetic field strength

decreases with distance from the field source and the assumption that homes near power lines that have the potential to carry more current would have stronger electromagnetic fields than homes next to lines that carry smaller amounts of current. Table IV.M-3 shows one type of wire code classification system and also shows the ranges of “spot measurements” (brief electromagnetic field measurements taken at different locations) found in different wire code category homes in one study.¹ Using this system, all homes fit into one of four possible categories based on the type and distance of nearby power lines. These four categories are intended to reflect different levels of electromagnetic field exposure from power lines. Though the highest fields are found in homes in the highest categories, spot measurements in the homes show that there is a great deal of overlap between the electromagnetic fields found in the different categories. It should be noted that, while the average electromagnetic field in homes served by underground lines is lower than those served by above ground lines, these homes still have electromagnetic fields from other sources such as wiring and appliances.²

Electric Transmission Lines

Development Area A is transected by a 150-foot-wide, high-voltage transmission power line right-of-way (the “Transmission Line ROW”) owned by SCE. The Transmission Line ROW transects the project site diagonally from the northeast to southwest, crossing the Interstate 210 east of the project site. Across the entire length of Development Area A, the Transmission Line ROW covers approximately 10,200 linear feet (not adjusted for terrain), of which approximately 3,200 feet is adjacent to areas proposed for residential development. The transmission lines are identified by SCE as the Sylmar-Eagle Rock and Sylmar-Gould lines. The Sylmar-Eagle Rock lines are on the northern side of the towers, and the Sylmar-Gould lines are located on the southern side of the towers. Both systems carry power produced in Sylmar and are rated as 220-kilovolt (kV) lines operating at a 60-Hertz frequency. The two transmission systems are supported by 200-foot-tall steel electrical support towers. The two systems are carried on three line sets on the towers, one on each side of the towers. Regionally, the direction of the transmission lines run from the east (Sylmar) and continue through northern sections of Glendale and onto into Eagle Rock and beyond.

¹ Lee, G., *California Exposure Assessment Study (preliminary findings)*, California EMF Program, 1996.

² *The reason that underground lines usually produce lower fields in nearby homes than overhead lines is not because the dirt blocks the magnetic field, but rather because several heavily insulated cables can be placed closer to each other than relatively uninsulated overhead cables, allowing the magnetic fields from the different cables to cancel each other out. Nonetheless, magnetic fields directly above an underground line can be quite high because they are only a few feet below the surface.*

Table IV.M-3
Electromagnetic Field Spot Measurements in Residential Areas By Wire Code
(Strengths in milliGauss)

	Under Line				Outdoor + Front Door				Indoor			
	UG	OL	OH	VH	UG	OL	OH	VH	UG	OL	OH	VH
Mean	X	1.2	2.2	3.3	0.8	0.7	1.1	1.5	0.8	0.9	1.1	1.5
10%	X	0.5	0.5	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5
50%	X	0.9	1.1	1.5	0.7	0.6	0.8	0.9	0.7	0.7	0.9	0.9
90%	X	2.0	5.0	6.1	1.3	1.2	1.9	3.2	1.2	1.5	1.7	2.8

Wire Codes:
UG (Underground): All power lines within 150 feet of the house are below ground.
OL (Ordinary Low): The house is 130-150 feet from a transmission line or major primary distribution line, 65-150 feet from a minor primary distribution line, or 51-150 feet from most secondary distribution lines.
OH (Ordinary High): The house is 50-129 feet from a minor primary, 25-64 feet from a minor primary, or within 50 feet of certain types of secondary lines.
VH (Very High): The house is within 50 feet of a transmission line or major primary or within 25 feet of a minor primary.
Spot Measurement Categories:
Under Line: Measured directly underneath the power lines nearest the home being surveyed.
Outdoor: Measured in the outdoor areas on the property of the home being surveyed.
Indoor: Measures inside the home being surveyed.

Source: Lee, G., California Exposure Assessment Study (preliminary findings). California EMF Program. 1996.

Existing Field Strength Conditions

A recent EIR for a proposed residential project in Glendale adjacent to another segment of the Transmission Line ROW cited electromagnetic field strength measurements of 94 to 96 mG at the edge of the Transmission Line ROW, decreasing to 3.5 mG at 150 feet from the south edge of the Transmission Line ROW.³ Recent (2002) field measurements by a SCE EMF specialist recorded EMF levels of approximately 24.2 mG directly under the transmission lines, at a location a short distance east of the project site along La Tuna Canyon Road.⁴ However, since measurements of electromagnetic fields vary over the time of day and are dependent on the flow of energy (i.e., energy use), this data could be reflective of a low electrical demand period. Residential measurements of EMF levels typically show appreciable morning and evening peaks (Dovan et al., 1993) and a seasonal component which varies by geographic region and closely follows the electrical use patterns of urban residents.

³ City of Glendale, February 2002, Final EIR for Oakmont Phase V, Volume 1, Section 3N, Electromagnetic Fields, Page 3N-2 (measurements were recorded in 1997).

⁴ Glenn G. Sias, Southern California Edition, Engineer, T&D Engineering, Field Notes, February 20, 2003.

Therefore, both the project-specific reading and the prior readings along the other segment of the Transmission Line ROW in Glendale should only be considered representative.

Existing homes and businesses in the immediate surrounding project vicinity are located adjacent to and in close proximity to the Transmission Line ROW both east and west of the project site. Some of these homes are within 50 to 100 feet of the Transmission Line ROW and in some instances may be closer than 50 feet (see View 6 in Section, IV.N, Aesthetics). In particular, existing homes east of the project site are located closer than 50 feet from the transmission lines because of higher ground levels.

EMF Research on Potential Adverse Health Effects

Power lines and wiring in buildings and appliances generate 50 and 60 Hertz fields (also known as extremely low frequency fields or “ELF”). It has not been determined whether exposure to 50 and 60 Hertz fields represents a potential health risk. Three kinds of studies have been done to explore this: (1) laboratory studies that expose human or animal cells or organs to EMF, looking for biological changes; (2) laboratory studies that expose animals to EMF, looking for changes in body function, chemistry, behavior or general health; and (3) “epidemiological” studies that observe people’s health and evaluate whether groups that have high or unusual EMF exposure have a greater chance for developing a disease like cancer than groups with “normal” or usual exposures.

These studies are inconclusive for several reasons. First, these studies do not show a clear pattern of health hazards. Some, but not all, animal and cell studies have shown biological changes linked with electromagnetic field exposure. However, it is not clear whether these biological changes would be the same in humans. Second, it is not clear which component (frequency, strength, harmonics, etc.) of electromagnetic field exposure might be hazardous. Concern about possible health hazards from electric power use is supported by results of some scientific studies, but the evidence they provide is still incomplete and inconclusive and even, in some cases, contradictory. Most, but not all, epidemiological studies show an association between leukemia (a type of cancer) and an “indirect” estimate of high electromagnetic field exposure, such as living very near a power line with high electromagnetic fields or working where there is high electrical exposure. These estimates may not really represent a person’s true exposure at the critical time period when they may have started developing an illness. Also, these studies show that some estimates of electromagnetic field exposure might be related to cancer, but this does not necessarily mean that magnetic fields cause cancer. Indirect ways of estimating exposure may unintentionally include other risk factors like chemicals used at work or living in a particular neighborhood.

Special Committee of the National Research Council

In 1996, a special committee of the National Research Council (NRC) made a careful review of 11 epidemiological studies examining the relationship between childhood leukemia and residential proximity to powerlines.⁵ The NRC made a statistical summary and comparison of these 11 studies. They concluded that children living in high current configuration houses are 1.5 times more likely to develop childhood leukemia than children in other homes. Despite this conclusion, the NRC was unable to explain this elevated risk and recommended that more research be done to help clarify the issue. One reason for this uncertainty is that wire-code classification assumes that houses with high wire-codes have higher electromagnetic field levels than low wire-code houses, but high wire-codes may also be a proxy for some type of exposure besides magnetic fields that is not yet understood. For example, high wire-code houses tend to have higher traffic density nearby, resulting in higher air pollution levels. However, traffic density seems to be an unlikely explanation for the wire-code association found in these studies. In 1997, the NRC statement seemed to be contradicted by the findings of Dr. M. S. Linet of the National Cancer Institute in a large epidemiological study.⁶ Her researchers estimated exposure to electromagnetic fields in two ways, wire-codes as defined above (based on distance of different types of power lines near the home) and home area measurements. The study found no association between living in high wire-code houses and childhood leukemia. On the other hand, the study found that children living in houses with high average electromagnetic field levels did have higher rates of cancer in general.

In 1998, a working group of experts gathered by the federal EMF RAPID program (see “Governmental Regulation” below) reviewed the research on the possible health risks associated with EMF. A majority felt that the epidemiology studies of childhood leukemia provided enough evidence to classify EMF as a “possible human carcinogen,” meaning they felt it might cause cancer. However, this does not mean that it does cause cancer. The working group’s findings are published in a report posted on the EMF Program’s website.⁷

The Final EMF Report (June 2002)

As stated previously, the most recent and comprehensive review of the scientific literature concerning the health effects of EMF exposure is contained in the EMF Report (Final Study, June 2002). The

⁵ *Electric and Magnetic Fields Measurements and Possible Effect on Human Health – What We Know and What We Don’t Know in 2000, Long Fact Sheet (page 5), The California EMF Program, Department of Health Services, December 2000, downloaded from <http://www.dhs.ca.gov/ps/deodc/ehib/>. May 27, 2003.*

⁶ *Linet MS et al. Residential exposure to magnetic fields and acute lymphoblastic leukemia in children. New England Journal of Medicine. 1997; 337:1-7.*

⁷ <http://www.dhs.ca.gov/ps/deodc/ehib/>

EMF Report was conducted by three experts in the field who conducted a review of the most relevant existing scientific literature (including the literature referenced above) and evaluated it in consultation with peer reviewers. To integrate and extend their body of knowledge, the EMF Program contracted with specialists in biophysics, statistics, and animal experimentation to prepare a background in critical literature review in their respective fields and to make sure that the literature review was up to date through June 2000 (P. Gailey, Ph.D., G. Sherman, Ph.D., W. Rogers, Ph.D., and A. Martin, Ph.D.). While there are important differences between the three DHS reviewers' conclusions, the DHS scientists were more inclined, and in some cases significantly more inclined, to believe that EMF exposure increased the risk of certain health problems than the majority of the members of scientific committees convened to evaluate the scientific literature by the National Institutes of Environmental Health Sciences Working Group (NIEHS) in 1998, the International Agency for Research on Cancer (IARC) in 2001, and the British National Radiological Protection Board (NRPB) in 2001. As such, the opinions cited in the EMF Report apparently reflect a conservative review of the scientific literature on EMF and, therefore, form the basis for a conservative EIR analysis.

The EMF Program's policy analysis required each of the three DHS scientists to express in numbers their individual professional judgments that the range of added personal risks suggested by the epidemiological studies were "real." They did this as a numerical "degree of certainty" on a scale of 0 to 100. For the conditions with the most suggestive evidence of EMF risk, a graph was prepared that depicts their best judgments with a little "x" and the margin of uncertainty with a shaded bar. The differences in certainty among the three reviewers arose primarily from their divergent views on the extent to which study flaws or other explanatory agents compromised their data and analysis and how much the evidence on one disease influenced certainty in the findings for other diseases. The study used everyday English phrases to describe degrees of certainty of causality. A tabular illustration defining these terms in regards to degree of probability is presented in Table IV.M-4 on page IV.M-23.

Having examined and discussed each of the health endpoints evaluated in the EMF Study, the three DHS reviewers each assigned their best-judgment IARC classification and degree of certainty (as a number between 0 and 100). These determinations are summarized in Table IV.M-5 below. Column 1 displays the condition considered. Column 2 identifies the reviewer. Column 3 shows the IARC classification in which the number "1" denotes a definite hazard, "2A" a probable hazard, "2B" a possible hazard, and "3" evidence "inadequate" to make a classification. Column 4 displays the pre-agreed-upon phrases for describing zones of certainty. Column 5 shows the ratio of the reviewers' imputed posterior odds to the reviewers' imputed prior odds (this is discussed in further detail below). In Column 6, the reviewers graphed their best-judgment degree of certainty as an "x" and indicated their uncertainty with a shaded bar on either side of that best judgment (as explained previously and illustrated in Table IV.M-3).

Table IV.M-4
Everyday English Phrases to describe Degrees of Certainty of Causality

Q. Are the Highest EMFs at Home or at Work Safe, or Do High EMFs Increase the Risk of to a Degree Detectable by Epidemiology?	Degree of Certainty on a Scale of 1 to 100
Virtually certain that they increase the risk to some degree	> 99.5
Strongly believe that they increase the risk to some degree	90 to 99.5
Prone to believe that they increase the risk to some degree	60 to 90
Close to the Dividing line between believing or not believing that EMFs increase the risk to some degree	40 to 60
Prone to believe that they do not increase the risk to any degree	10 to 40
Strongly believe that they do not increase the risk to any degree	0.5 to 10
Virtually certain that they do not increase the risk to any degree	< 0.5

<p>A. Virtually Certain Risk B. Strongly Believe C. Prone to Believe D. Close to the Dividing Line E. Prone not to Believe F. Strongly Believe Safe G. Virtually Certain Safe</p>	
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Source: California EMF Risk Evaluation, June 2002, Rational and Overview. Table 1.

To provide an illustration, this method has been applied to two non-EMF examples in the first two rows. In Row 1, Reviewer 2 has indicated that air pollution is a definite causal trigger of asthma attacks and that he is virtually certain of this. In Row 2, he shows that he strongly believes that particulate air pollution causes excess deaths. There is relatively little uncertainty around either of these determinations. Row 3 displays the prior degree of certainty that there would be epidemiologically detectable effects when comparing disease rates among persons exposed to EMFs at or above the 95th percentile of U.S. residential levels to rates at or below the 1st percentile residential exposure. These prior degrees of certainty range from 5 to 12 on a scale from 0 to 100. Column 5 is labeled “IRL” for “imputed relative likelihood.” If the degree of certainty is converted to a probability scale (0–1.0) and, in turn, if one converted the probability to odds (probability/1–probability), the

imputed prior odds can be compared to analogously calculated imputed posterior odds. One would base these on the “best judgment” posterior degrees of certainty graphed in Table IV.M-5. The resulting “imputed relative likelihoods” provide some indication of how much the overall pattern of evidence in biophysics, mechanistic, animal pathology, and epidemiological streams of evidence have combined to move the reviewers’ from their respective starting degrees of certainty. For example, with regard to air pollution triggering asthma attacks, the existing evidence has caused Reviewer 2 to move 900-fold from his prior judgment, while the childhood leukemia evidence has moved him 22-fold.⁸

In summary, the results of Table IV.M-5 reflect that, to one degree or another, all three of the DHS scientists were inclined to believe that EMFs can cause some degree of increased risk of childhood leukemia, adult brain cancer, ALS (Lou Gehrig’s Disease) and miscarriage. With respect to miscarriage and ALS, all three reviewers were close to the dividing line (i.e., just over 50% degree of certainty). With respect to adult brain cancer, two of the three scientists were “close to the dividing line”, and only Reviewer 1 was “prone to believe”. With respect to childhood leukemia, Reviewer 1 “strongly believed”, while the other two reviewers had far weaker opinions.

The DHS scientists also strongly believed that EMFs do not increase the risk of birth defects, or low birth weight. They strongly believed that EMFs are not universal carcinogens, since there are a number of cancer types that are not associated with EMF exposure. To one degree or another, they were inclined to believe that EMFs do not cause an increased risk of breast cancer, heart disease, Alzheimer’s Disease, depression, or symptoms attributed by some to a sensitivity to EMFs. However, all three scientists had judgments that were “close to the dividing line between believing and not believing” that EMFs cause some degree of increased risk of suicide. With respect to adult leukemia, two of the scientists were “close to the dividing line between believing or not believing” and one was “prone to believe” that EMFs cause some degree of increased risk.

With the exception of miscarriage, which is common, the other diseases for which EMFs may be a contributing cause (childhood leukemia, adult brain cancer, Lou Gehrig’s Disease) have low incidence, with rates between 1/100,000 and 1/10,000 a year. Even doubling such rates and accumulating them over a childhood or a lifetime leaves accumulated lifetime risks between 1/1,000 and 1%. Thus, the vast majority (99%–99.9%) of highly exposed people would still not contract these diseases. Furthermore, calculations suggest that the fraction of all cases of the above-mentioned conditions that one could attribute to EMFs would be no more than a few percent of the total cases (if any). The uncommon, accumulated high EMF exposures implicated by the evidence about these conditions come

⁸ Reviewer 2 had a prior of 5 and a posterior for childhood leukemia of 54. The prior odds are $5/95 = 0.0526$. The posterior odds are $54/46 = 1.174$. The imputed relative likelihood is $1.174/0.0526 = 22.3$.

Table IV.M-5

California EMF Risk Evaluation (June 2002):

Table V. Prior and Posterior Degrees of Certainty and DHS Reviewer's Application of IARC Classification

CONDITION	REVIE- WER	IARC CLASS	CERTAINTY PHRASE	IRL	DEGREE OF CERTAINTY FOR POLICY ANALYSIS THAT AN AGENT (EMFs) INCREASES DISEASE RISK TO SOME DEGREE																				
					0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Air Pollution Triggered Asthma Attacks (Example: Not EMF-Related)	2	Human Risk	Virtually Certain	931																		XX			
Particulate Air Pollution Triggered Deaths (Example: Not EMF-Related)	2	Prob. Risk	Strongly believe	171																		XX			
Prior Confidence that EMFs Could Cause Epidemiologically Detectable Disease	1	N.A.	Prone not to believe	1																		XX			
	2		Strongly believe not	1																		XX			
	3		Strongly believe not	1																			XX		
Childhood Leukemia	1	1	Strongly believe	140																		XX			
	2	2B	Close to dividing line	22																		XX			
	3	2A	Prone to believe	17																		XX			
Adult Leukemia	1	1	Prone to believe	29																		XX			
	2	2B	Close to dividing line	21																		XX			
	3	2B	Close to dividing line	6																		XX			
Adult Brain Cancer	1	2B	Prone to believe	29																		XX			
	2	2B	Close to dividing line	20																		XX			
	3	2B	Close to dividing line	13																		XX			

Table IV.M-5 (continued)
California EMF Risk Evaluation (June 2002):
Table V. Prior and Posterior Degrees of Certainty and DHS Reviewer's Application of IARC Classification

CONDITION	REVIE- WER	IARC CLASS	CERTAINTY PHRASE	IRL	DEGREE OF CERTAINTY FOR POLICY ANALYSIS THAT AN AGENT (EMFs) INCREASES DISEASE RISK TO SOME DEGREE																				
					0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Childhood Brain Cancer	1	3	Close to dividing line	7	[Progressive shading from 0 to 100 with 'X' at 45]																				
	2	3	Prone not to believe	2	[Progressive shading from 0 to 100 with 'X' at 15]																				
	3	3	Prone not to believe	3	[Progressive shading from 0 to 100 with 'X' at 20]																				
Breast Cancer, Female	1	3	Close to dividing line	7	[Progressive shading from 0 to 100 with 'X' at 50]																				
	2	3	Prone not to believe	3	[Progressive shading from 0 to 100 with 'X' at 15]																				
	3	3	Prone not to believe	2	[Progressive shading from 0 to 100 with 'X' at 20]																				
Breast Cancer, Male	1	3	Close to dividing line	6	[Progressive shading from 0 to 100 with 'X' at 45]																				
	2	3	Prone not to believe	12	[Progressive shading from 0 to 100 with 'X' at 40]																				
	3	3	Prone not to believe	2	[Progressive shading from 0 to 100 with 'X' at 20]																				
EMF Universal Carcinogen?	1	3	Strongly believe not	0.4	[Progressive shading from 0 to 100 with 'X' at 5]																				
	2	3	Strongly believe not	0.5	[Progressive shading from 0 to 100 with 'X' at 10]																				
	3	3	Strongly believe not	0.2	[Progressive shading from 0 to 100 with 'X' at 5]																				
Miscarriage	1	2B	Close to dividing line	9	[Progressive shading from 0 to 100 with 'X' at 55]																				
	2	2B	Close to dividing line	20	[Progressive shading from 0 to 100 with 'X' at 50]																				
	3	2B	Close to dividing line	11	[Progressive shading from 0 to 100 with 'X' at 65]																				
Other Reproductive	1	3	Strongly believe not	0.4	[Progressive shading from 0 to 100 with 'X' at 5]																				
	2	3	Strongly believe not	0.8	[Progressive shading from 0 to 100 with 'X' at 10]																				
	3	3	Strongly believe not	0.2	[Progressive shading from 0 to 100 with 'X' at 5]																				

Table IV.M-5 (continued)
California EMF Risk Evaluation (June 2002):
Table V. Prior and Posterior Degrees of Certainty and DHS Reviewer's Application of IARC Classification

CONDITION	REVIEWER	IARC CLASS	CERTAINTY PHRASE	IRL	DEGREE OF CERTAINTY FOR POLICY ANALYSIS THAT AN AGENT (EMFs) INCREASES DISEASE RISK TO SOME DEGREE																				
					0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
ALS (Lou Gehrig's Disease)	1	2B	Close to dividing line	9																					
	2	2B	Close to dividing line	21																					
	3	2B	Close to dividing line	11																					
Alzheimer's	1	3	Close to dividing line	5																					
	2	3	Prone not to believe	4																					
	3	3	Prone not to believe	2																					
Suicide	1	3	Close to dividing line	6																					
	2	3	Close to dividing line	15																					
	3	3	Close to dividing line	7																					
Heart	1	3	Close to dividing line	6																					
	2	3	Prone not to believe	8																					
	3	3	Prone not to believe	3																					

from unusual configurations of wiring in walls, grounded plumbing, nearby power lines, and exposure from some jobs in electrical occupations. There are ways to avoid these uncommon accumulated exposures by maintaining a distance from some appliances, changes in home wiring and plumbing, and power lines.

The reviewers also stressed the notion of “mixture” because different aspects of EMF exposure would require different actions for abatement. A variety of electrical phenomena are present in the vicinity of power lines, in-home wiring, plumbing, and appliances. These include electric and magnetic fields with a variety of frequencies and orientations, stray currents from contact with grounded plumbing, and air pollution particles charged by electric fields. The epidemiological studies primarily implicate the magnetic fields or something closely correlated with them. Some researchers think that associated high or low frequency stray contact currents or charged air pollution particles are the true explanation, rather than magnetic fields. The actions one would take to eliminate the fields are not always the same as one would take to eliminate the currents or the charged particles. There are some situations where different and costly measures would be required to address each possible explanation. There are other situations where one or more inexpensive avoidance actions could address all of them. This additional uncertainty about what aspect of the mixture might need to be mitigated will thus provide a challenge for policymakers.

According to the EMF Report, it would not be surprising if it took four more five-year research cycles (i.e., 20 years) to clarify the EMF issue. This would require a long-term commitment to steady research directions. Many prominent researchers who doubt that there are any biological effects, much less epidemiological effects, from the residential and occupational EMF mixture, feel there is nothing to find and have recommended that no more funding for this area be provided. The NIEHS suggests that the level and strength of evidence supporting EMF exposure as a human health hazard are insufficient to warrant aggressive regulatory actions, and therefore does not recommend actions such as stringent standards on electrical appliances or a national program to bury all transmission lines. Instead, the evidence suggests passive measures such as continued emphasis on educating both the public and regulatory community on means aimed at reducing exposures.

ENVIRONMENTAL IMPACTS

Thresholds of Significance

Neither the State of California nor the federal government has established specific exposure criteria for EMFs. The State of California has no adopted policies or regulations that establish a safe or unsafe distance for residential structures from power transmission lines. While the California Department of Education (CDE) has adopted a policy that establishes a setback requirement as part of siting schools in proximity to transmission lines, that standard is solely based on known facts about the reduction in electric fields with increased distance, as opposed to any known biological health risks associated with

exposure to EMFs. In any event, no new schools are proposed to be developed as part of the proposed project. Thus, the CDE setback policy for school facilities is not applicable to the proposed project.

Appendix G to the CEQA Guidelines does not include any specific threshold of significance with respect to EMF exposure. However, Appendix G includes the following general threshold addressing health effects under the subsection “Mandatory Findings of Significance” as follows: “Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly? For purposes of this EMF analysis, that general threshold is modified as follows:

- A significant impact would occur if the project would expose individuals to EMFs which would cause substantial adverse effects on human beings either directly or indirectly.

Project Impacts

EMF Report Analysis

As discussed above, the EMF Report discusses the multiple levels of uncertainty regarding the potential causal relationship between EMF exposure and adverse environmental impacts. As discussed above, there is substantial uncertainty in the scientific community about whether EMF exposure can cause or contribute to health effects in human populations. In its presentation to Congress regarding the NIEHS’ 1999 report on health effects from EMF exposure, the Department of Health and Human Services concluded that the scientific evidence suggesting a link between EMF exposure and health risk was weak and insufficient to warrant aggressive regulatory concern.⁹

The EMF Report reflects the most conservative review and analysis of the scientific literature on EMF exposure. Even so, the EMF Report did not conclude that EMFs cause any increased risk of adverse biological effects. Rather, as discussed above, the three DHS scientists were inclined to believe, to varying degrees, that EMFs can cause some unspecified degree of increased risk of childhood leukemia, adult brain cancer, ALS and miscarriage. Only one of the three scientists (Reviewer 1) “strongly believed” that EMF contributed to childhood leukemia and none of the scientists “strongly believed” that EMF caused an increase with respect to the other three health problems. In addition, only one of the three scientists (Reviewer 1) was “prone to believe” that EMFs may contribute to adult brain cancer. None of the scientists “strongly believed” or were “prone to believe” that EMFs contribute to the risk of ALS or miscarriage. The scientists were not inclined to believe that EMFs increased the risk of any other health problem.

⁹ *NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields, Prepared in Response to the 1992 Energy Policy Act (PL 102-486, Section 2118), Prepared by the NIEHS EMF-RAPID Program Staff, May 4, 1999.*

As noted in the EMF Report, the three diseases for which EMFs may be a contributing cause all have very low incidence rates, between 1/100,000 and 1/10,000 per year in California. Therefore, the vast majority (99-99.9 percent) of highly exposed people would still not contract these diseases. Furthermore, calculations suggest that the fraction of all cases of the above-mentioned diseases that one could attribute to EMFs would be no more than a few percent of the total cases, "if any". As one example, two recent review articles calculated that approximately 3 percent of all childhood leukemia cases might be attributed to the rare highest residential EMF exposures. Based on 99 deaths attributable to childhood leukemia in California in 1998, that would translate to approximately three deaths in California per year that are potentially attributable to EMFs. It should be noted that this analysis assumes that EMF exposure actually contributes to childhood leukemia, which has not been proven. The EMF Report only concluded that the three reviewers were inclined to believe that there might be a causal link.

It is also highly uncertain as to what aspects of the EMF mixture may contribute to a potential increased risk from EMF exposure. Prior studies and experiments have been flawed and inconclusive. In particular, it has not been determined which aspects of the EMF mixture might potentially contribute to childhood leukemia, adult brain cancer and ALS. Exposure to EMFs at home accounts for only a portion of an individual's daily or a lifetime exposure to EMFs. People exposed to EMFs throughout the day at work, at school and while using transportation. Furthermore, only a portion of EMF exposure in homes located near overhead power lines is attributable to the overhead power lines. Exposure to EMF within the home comes from a variety of sources, including appliances, wiring in the home and electronic equipment, the implications of which are beyond the scope of this Draft EIR.

Finally, as discussed above, the EMF Report conclude that it would not be surprising if it took four more five-year research cycles (i.e., 20 years) to determine whether any causal relationship exists between EMF exposure and adverse biological effects, which aspects of the EMF mixture are implicated in any observed health problems, and the extent to which EMFs contribution to various diseases and other health problems.

Based on the EMF Report and the other studies referenced therein, there is insufficient scientific data from which to conclude that the existence of power lines in proximity to the project site would cause substantial adverse effects on people living in the proposed homes in proximity to the Transmission Line ROW. Therefore, the potential EMF impacts associated with the proposed project would not be considered significant.

Exposure to EMFs from SCE Transmission Lines

Notwithstanding that there is insufficient scientific evidence to demonstrate any causal link between EMF exposure from transmission lines or any other source and adverse health effects, in the interest of

full disclosure, the potential EMF exposure of the proposed homes in closest proximity to the Transmission Line ROW is addressed below.

As stated previously, EMF levels decrease substantially with distance from the source (see Figure IV.M-1). EMFs from transmission lines are reduced to background levels (i.e., the typical amount a person might encounter even if that source were not present) about 150 feet from the transmission line. Development Area B is located approximately 2,400 feet away from the SCE Transmission Line ROW at its nearest point adjacent to Interstate 210. As such, none of the 69 residential lots located within Development Area B would be exposed to any EMF emissions from the transmission lines. Development Area A, however, is transected by the Transmission Line ROW, which could expose future residents to EMF. As discussed above, EMF levels for the SCE Sylmar-Eagle Rock and Sylmar-Gould Lines can range from 96 mG at the edge of the ROW to 3.5 mG at a distance of 150 feet from the edge of the ROW. Without a complete record of the daily and seasonal average EMF levels on SCE's Sylmar-Eagle Rock and Sylmar-Gould Lines, estimating the actual exposure levels for lots in Development Area A can only be approximated based on the literature cited above.

Residential lots in the proposed development can be categorized according to the wire code classification method. While not representative of actual exposure levels, the wire code classification is indicative of the relative level of magnetic field exposure for properties within specified distances from transmission lines. For informational purposes, the wire code classification areas are provided as an overlay on the project site plan to identify which residential lots fall within the "Very High", "Ordinary High" and "Ordinary Low" wire code classifications (see Figure IV.M-2). The "Very High" classification relates to homes located within 50 feet from the edge of the Transmission Line ROW, the "Ordinary High" classification relates to proposed homes located between 50 and 129 feet from the edge of the Transmission Line ROW and the "Ordinary Low" classification relates to proposed homes located between 130 and 150 feet from the edge of the Transmission Line ROW. As depicted in Figure IV.M-2, 31 proposed homes fall within the "Ordinary Low" wire code classification, 29 proposed homes fall within the "Ordinary High" wire code classification, and 10 proposed homes fall within the "Very High" wire code classification.

Once again, however, while the number of houses that will be affected by EMFs can be identified and classified based on approximate estimated exposure levels, there is no evidence to conclude that the proximity of a home has any direct correlation to adverse health effects. As such, there is no evidence to conclude that the proposed project would cause a substantial adverse effect on human beings either directly or indirectly by locating homes in proximity to the Transmission Line ROW. Therefore, as previously stated, the project's impacts with respect to EMF exposure would be considered less than significant.

Figure IV.M-2 EMF Wire Codes Overlay Map

MITIGATION MEASURES

No significant impacts associated with developing homes in proximity to the Transmission Line ROW have been identified. Therefore, no project-specific mitigation measures are required. However, in the interest of full disclosure with respect to the scientific community's uncertainty of potential health risks associated with EMF exposure, the following mitigation measure is recommended:

M.2-1 For all residential lots in Development Area A located within 150 feet of the edge of the SCE Transmission Line ROW, the project developer shall provide an EMF information and disclosure statement to each prospective buyer and included as part of the final sales literature, which statement shall include the following:

- The location of the SCE transmission lines in the vicinity of Development Area A.
- A statement that this subject has been addressed in the Final EIR for the project and that the Final EIR is on file with the City of Los Angeles, Department of City Planning.
- A statement that additional information regarding the potential health effects from EMF exposure may be obtained from the California State Department of Health or by contacting the California EMF Project located at 1515 Clay Street, Suite 1700, Oakland, California 94612, or by viewing available information posted on the California EMF Project's official internet site at <http://www.dhs.cahwnet.gov/ehib/emf/general.html>.

CUMULATIVE IMPACTS

Any potential impacts with respect to EMF exposure relate solely to the proximity of some of the proposed homes to the Transmission Line ROW. Only one of the 13 related projects – the Duke Project (Related Project 7) - is located within proximity to the SCE Transmission Line ROW. However, none of the 10 residential lots proposed for the Duke Project are located within 150 feet of the Transmission Line ROW. None of the other related projects are located in close proximity to any electrical transmission line and, in any event, and as discussed above, there is no evidence to conclude that the location of homes in proximity to transmission lines would cause any adverse effect on human beings, either directly or indirectly. In addition, the existing EMF exposure to existing homes along the Transmission Line ROW would not be increased or diminished by development of the proposed project. Therefore, no cumulatively significant EMF impacts are anticipated with respect to the proposed project.

LEVEL OF SIGNIFICANCE AFTER MITIGATION

The project's impact would be less than significant prior to implementation of the recommended mitigation measure listed above. With implementation of the precautionary measure described above, prospective homebuyers would be made aware of the current controversy regarding the possible health effects associated with EMF exposure and could make an informed personal decision. However, such measures are not necessary to mitigate any significant impacts, as none have been identified.