APPENDIX C
Field Management Plan

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Appendix F

FIELD MANAGEMENT PLAN

Moorpark-Newbury 66 kV Subtransmission Line Project

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List of Terms

ACSR	Aluminum Conductor Steel Reinforced
CDHS	California Department of Health Services
COSCA	Conejo Open Space Conservancy Agency
CPCN	Certificate of Public Convenience and Necessity
CPUC	California Public Utilities Commission
ELF	Extremely Low Frequency
EMF	Electric and Magnetic Fields
FMP	Field Management Plan
FRC	Fault Return Conductor
GO	General Order
IARC	International Agency for Research on Cancer
kV	kilovolt
LWS	light weight steel
mG	milligauss
NIEHS	National Institute of Environmental Health Sciences
NRPB	National Radiation Protection Board
PEA	Proponents Environmental Assessment
RAPID	Research and Public Information Dissemination
ROW	Right-of-Way
SAC	Stranded Aluminum Conductor
SCE	Southern California Edison
T/L	transmission line
TSP	tubular steel pole
WHO	World Health Organization

I. EXECUTIVE SUMMARY

This document is Southern California Edison Company's (SCE) Field Management Plan (FMP) for the Moorpark-Newbury 66 kilovolt (kV) Subtransmission Line Project (Project). SCE proposes to construct and operate the Project to address a base case overload on the Moorpark-Newbury tap of the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line. The Project would occur in the City of Moorpark, the City of Thousand Oaks, and in unincorporated Ventura County between the two cities (Figure 1). The Project has been divided into discrete geographic Project Sections per the Proponent's Environmental Assessment (PEA) of the Project:

- Project Section 1 includes all work conducted within the fenceline at Moorpark Substation in the City of Moorpark.
- Project Section 2 spans from Moorpark Substation to near the border of the City of Thousand Oaks; most of Project Section 2 is located in unincorporated Ventura County (including the Santa Rosa Valley), with a portion of Project Section 2 located in the City of Moorpark. Project Section 2 is approximately 5 miles in length.
- Project Section 3 spans from just north of the City of Thousand Oaks border to a point within Conejo Open Space Conservancy Agency (COSCA) lands in the Conejo Canyons area; the end of Project Section 3 is the point at which the subtransmission route changes direction from east to south in the City of Thousand Oaks. Project Section 3 is approximately 3 miles in length.
- Project Section 4 spans from the end of Project Section 3 to the termination of the Project infrastructure within Newbury Substation in the City of Thousand Oaks. Project Section 4 is approximately 1 mile in length.

The Project includes the following major components:

- Construction of approximately 1,200 feet of new underground 66 kV subtransmission line entirely within Moorpark Substation.
- Construction of approximately 5 miles of the new Moorpark-Newbury 66 kV Subtransmission Line on new tubular steel poles (TSPs) on the south and east sides of SCE's existing Moorpark-Ormond Beach 220 kV Right-of-Way (ROW).
- Construction of approximately 3 miles of the new Moorpark-Newbury 66 kV Subtransmission Line within the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line ROW. Existing single-circuit lattice steel towers (LSTs) would be replaced with new TSPs; the TSPs would be double-circuited, carrying both the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line and the new Moorpark-Newbury 66 kV Subtransmission Line. The existing single-circuit Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line in this section would be reconstructed and reconductored to accommodate the installation of the new Moorpark-Newbury 66 kV Subtransmission Line.

- Construction of approximately 1 mile of the new Moorpark-Newbury 66 kV Subtransmission Line within the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line ROW into Newbury Substation. Existing single-circuit wood poles would be replaced with new lightweight steel (LWS) poles; within Newbury Substation, four wood poles would be replaced with four TSPs. The existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line would be reconstructed and transferred to the new LWS poles and TSPs in a double-circuit configuration to accommodate the new Moorpark-Newbury 66 kV Subtransmission Line.

- Construction of new 66 kV subtransmission line positions and associated infrastructure within Moorpark Substation and Newbury Substation to facilitate the termination of the new Moorpark-Newbury 66 kV Subtransmission Line.

- Transfer of existing distribution circuitry and telecommunication facilities to new subtransmission poles as necessary.

Some scope of work within Moorpark Substation and Newbury Substation, and portions of subtransmission work in Project Sections 1 through 4, have already been completed between October 2010 and November 2011. Details of the work completed so far, along with the remaining work, have been outlined in the Project PEA.

SCE provides this FMP in order to inform the public, the California Public Utilities Commission (CPUC), and other interested parties of its evaluation of "no-cost and low-cost" magnetic field reduction design options for this Project, and SCE's proposed plan to apply these design options to this Project. This FMP has been prepared in accordance with CPUC Decision No. 93-11-013 and Decision No. 06-01-042 relating to extremely low frequency (ELF)[1] electric and magnetic fields (EMF). This FMP also provides background on the current status of scientific research related to possible health effects of EMF, and a description of the CPUC's EMF policy.

The "no-cost and low-cost" magnetic field reduction design options that are incorporated into the design of the Project are as follows:

- Utilize structure heights that meet or exceed SCE's EMF preferred design criteria
- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
- Arrange conductors of proposed subtransmission line for magnetic field reduction
- Place new substation electrical equipment (such as underground duct banks) away from the substation property lines closest to populated areas.

The "no-cost and low-cost" magnetic field reduction design options that SCE considered for the Project are summarized in Table 1.

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[1] The extremely low frequency is defined as the frequency range from 3 Hz to 3,000 Hz.

SCE's plan for applying the above "no-cost and low-cost" magnetic field reduction design options for the Project is consistent with CPUC's EMF policy and with the direction of leading national and international health agencies. Furthermore, the plan complies with SCE's EMF Design Guidelines[2], and with applicable national and state safety standards for new electrical facilities.

[2] EMF Design Guidelines, July 2006.

Table 1. Summary of "No-cost and Low-cost" Magnetic Field Reduction Design Options						
Area No.	**Location**[3]	**Adjacent Land Use**[4]	**MF Reduction Design Options Considered**	**Estimated Cost to Adopt**	**Design Option(s) Adopted? (Yes/No)**	**Reason(s) if not adopted**
Moorpark Substation (Project Section 1)	Near the intersection of Gabbert Road and east Los Angeles Avenue in Moorpark, CA	2,3,5,6	• Place new substation electrical equipment (such as underground duct banks) away from the substation property lines closest to populated areas	• No-Cost[5]	• Yes	
Segment 2 (Project Section 2) Existing Moorpark - Ormond Beach No. 1, 2, 3, and 4 220 kV T/Ls and the proposed Moorpark-Newbury 66 kV Subtransmission Line	Moorpark Substation to approximately 0.75 miles south of Santa Rosa Road	2,3,5,6	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria • Arrange conductors of proposed subtransmission line for magnetic field reduction	• No-Cost[6] • No-Cost[7]	• Yes • Yes	
Segment 3a (Project Section 3) Existing Moorpark - Ormond Beach No. 1, 2, 3, and 4 220 kV T/Ls; existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line; and the proposed Moorpark-Newbury 66 kV Subtransmission Line	Just south of Santa Rosa Road to the breakoff point between the 220 kV and 66 kV lines	4,5,6	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria • Arrange conductors of subtransmission lines for magnetic field reduction • Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction	• No-Cost[8] • Low-Cost[9] • No-Cost[10]	• Yes • Yes • Yes	

[3] This column shows the major cross streets, existing subtransmission lines, or substation name as reference points.

[4] Land usage codes are as follows: 1) schools, licensed day-cares, and hospitals, 2) residential, 3) commercial/industrial, 4) recreational, 5) agricultural, and 6) undeveloped land.

[5] This option was included in the preliminary design and continues to be included in the design of the Project.

[6] *Ibid.*

[7] *Ibid.*

[8] *Ibid.*

[9] This option is considered a low-cost measure in this segment because of the costs associated with transposing the conductors to the recommended phasing arrangement for magnetic field reduction.

[10] This option was included in the preliminary design and continues to be included in the design of the Project.

Table 1. Summary of "No-cost and Low-cost" Magnetic Field Reduction Design Options (Cont.)						
Area No.	**Location**	**Adjacent Land Use**	**MF Reduction Design Options Considered**	**Estimated Cost to Adopt**	**Design Option(s) Adopted? (Yes/No)**	**Reason(s) if not adopted**
Segment 3b (Project Section 3) Existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line and the proposed Moorpark-Newbury 66 kV Subtransmission Line	From the breakoff point between the 220 kV and 66 kV lines east for approximately 0.85 miles	4,6	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria • Arrange conductors of subtransmission line for magnetic field reduction • Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction	• No-Cost[11] • No-Cost[12] • No-Cost[13]	• Yes • Yes • Yes	
Segment 4a (Project Section 4) Existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line and the proposed Moorpark-Newbury 66 kV Subtransmission Line	From the end of Project Section 3 south to the junction point with Newbury-Thousand Oaks 66 kV Subtransmission Line	4,6	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria • Arrange conductors of subtransmission line for magnetic field reduction • Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction	• No-Cost[14] • No-Cost[15] • No-Cost[16]	• Yes • Yes • Yes	

11 This option was included in the preliminary design and continues to be included in the design of the Project.
12 This is considered a no-cost measure as the recommended phase arrangement is maintained from Segment 3a.
13 This option was included in the preliminary design and continues to be included in the design of the Project.
14 *Ibid.*
15 This is considered a no-cost measure as the recommended phase arrangement is maintained from Segment 3a.
16 This option was included in the preliminary design and continues to be included in the design of the Project.

Table 1. Summary of "No-cost and Low-cost" Magnetic Field Reduction Design Options (Cont.)						
Area No.	**Location**	**Adjacent Land Use**	**MF Reduction Design Options Considered**	**Estimated Cost to Adopt**	**Design Option(s) Adopted? (Yes/No)**	**Reason(s) if not adopted**
Segment 4b (Project Section 4) Existing Newbury-Thousand Oaks 66 kV Subtransmission Line; existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line; and the proposed Moorpark-Newbury 66 kV Subtransmission Line	From the junction point with Newbury-Thousand Oaks 66 kV Subtransmission Line east and south to Newbury Substation	1, 2, 3,4, 6	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria • Arrange conductors of subtransmission line for magnetic field reduction • Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction	• No-Cost[17] • No-Cost[18] • No-Cost[19]	• Yes • Yes • Yes	
Newbury Substation (Project Section 4)	Near the intersection of Marion Street and Roth Court in Newbury Park, CA	1, 2, 3,4, 6	N/A	N/A	N/A	No significant opportunities to reduce magnetic fields based on the Project scope.

[17] This option was included in the preliminary design and continues to be included in the design of the Project.
[18] This is considered a no-cost measure as the recommended phase arrangement is maintained from Segment 3a.
[19] This option was included in the preliminary design and continues to be included in the design of the Project.

II. BACKGROUND REGARDING EMF AND PUBLIC HEALTH RESEARCH ON EMF

There are many sources of power frequency[20] electric and magnetic fields, including internal household and building wiring, electrical appliances, and electric power transmission and distribution lines. There have been numerous scientific studies about the potential health effects of EMF. After many years of research, the scientific community has been unable to determine if exposures to EMF cause health hazards. State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate.[21]

Many of the questions about possible connections between EMF exposures and specific diseases have been successfully resolved due to an aggressive international research program. However, potentially important public health questions remain about whether there is a link between EMF exposures and certain diseases, including childhood leukemia and a variety of adult diseases (e.g., adult cancers and miscarriages). As a result, some health authorities have identified magnetic field exposures as a possible human carcinogen. As summarized in greater detail below, these conclusions are consistent with the following published reports: the National Institute of Environmental Health Sciences (NIEHS) 1999[22], the National Radiation Protection Board (NRPB) 2001[23], the International Commission on non-Ionizing Radiation Protection (ICNIRP) 2001, the California Department of Health Services (CDHS) 2002[24], the International Agency for Research on Cancer (IARC) 2002[25] and the World Health Organization (WHO) 2007[26] .

The federal government conducted EMF research as a part of a $45-million research program managed by the NIEHS. This program, known as the EMF RAPID (Research and Public Information Dissemination), submitted its final report to the U.S. Congress on June 15, 1999. The report concluded that:

- "The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak."[27]
- "The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard."[28]

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20 In U.S., it is 60 Hertz (Hz).

21 CPUC Decision 06-01-042, p. 6, footnote 10.

22 National Institute of Environmental Health Sciences' Report on Health Effects from Exposures to Power-Line frequency Electric and Magnetic Fields, NIH Publication No. 99-4493, June 1999.

23 National Radiological Protection Board, Electromagnetic Fields and the Risk of Cancer, Report of an Advisory Group on Non-ionizing Radiation, Chilton, U.K. 2001.

24 California Department of Health Services, An Evaluation of the Possible Risks from Electric and Magnetic Fields from Power Lines, Internal Wiring, Electrical Occupations, and Appliances, June 2002.

25 World Health Organization / International Agency for Research on Cancer, IARC Monographs on the evaluation of carcinogenic risks to humans (2002), Non-ionizing radiation, Part 1: Static and extremely low-frequency (ELF) electric and magnetic fields, IARCPress, Lyon, France: International Agency for Research on Cancer, Monograph, vol. 80, p. 338, 2002.

26 WHO, Environmental Health Criteria 238, EXTREMELY LOW FREQUENCY FIELDS, 2007.

27 National Institute of Environmental Health Sciences, NIEHS Report on Health Effects from Exposures to Power-Frequency Electric and Magnetic Fields, p. ii, NIH Publication No. 99-4493, 1999.

- "The NIEHS suggests that the level and strength of evidence supporting ELF-EMF exposure as a human health hazard are insufficient to warrant aggressive regulatory actions; thus, we do not recommend actions such as stringent standards on electric appliances and a national program to bury all transmission and distribution lines. Instead, the evidence suggests passive measures such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. NIEHS suggests that the power industry continue its current practice of siting power lines to reduce exposures and continue to explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards."[29]

In 2001, Britain's NRPB arrived at a similar conclusion:

> "After a wide-ranging and thorough review of scientific research, an independent Advisory Group to the Board of NRPB has concluded that the power frequency electromagnetic fields that exist in the vast majority of homes are not a cause of cancer in general. However, some epidemiological studies do indicate a possible small risk of childhood leukemia associated with exposures to unusually high levels of power frequency magnetic fields."[30]

In 2002, three scientists for CDHS concluded:

> "To one degree or another, all three of the [CDHS] scientists are inclined to believe that EMFs can cause some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig's disease, and miscarriage.
>
> They [CDHS] strongly believe that EMFs do not increase the risk of birth defects, or low birth weight.
>
> They [CDHS] strongly believe 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 [CDHS] are 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. For adult leukemia, two of the scientists are 'close to the dividing line

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28 *Ibid.*, p. iii.

29 *Ibid.*, p. 37 – 38.

30 NRPB, NRPB Advisory Group on Non-ionizing Radiation Power Frequency Electromagnetic Fields and the Risk of Cancer, NRPB Press Release May 2001.

between believing or not believing' and one was 'prone to believe' that EMFs cause some degree of increased risk."[31]

Also in 2002, the World Health Organization's (WHO) IARC concluded:

> "ELF magnetic fields are possibly carcinogenic to humans"[32], based on consistent statistical associations of high-level residential magnetic fields with a doubling of risk of childhood leukemia...Children who are exposed to residential ELF magnetic fields less than 0.4 microTesla (4.0 milliGauss) have no increased risk for leukemia…. In contrast, "no consistent relationship has been seen in studies of childhood brain tumors or cancers at other sites and residential ELF electric and magnetic fields."[33]

In June of 2007, the WHO issued a report on their multi-year investigation of EMF and the possible health effects. After reviewing scientific data from numerous EMF and human health studies, they concluded:

> "Scientific evidence suggesting that everyday, chronic low-intensity (above 0.3-0.4 μT [3-4 mG]) power-frequency magnetic field exposure poses a health risk is based on epidemiological studies demonstrating a consistent pattern of increased risk for childhood leukaemia."[34]
>
> "In addition, virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern."[35]
>
> "A number of other diseases have been investigated for possible association with ELF magnetic field exposure. These include cancers in both children and adults, depression, suicide, reproductive dysfunction, developmental disorders, immunological modifications and neurological disease. The scientific evidence supporting a linkage between ELF magnetic fields and any of these diseases is much weaker than for childhood leukemia and in some cases (for example, for cardiovascular disease or breast cancer) the evidence is sufficient to give confidence that magnetic fields do not cause the disease"[36]
>
> "Furthermore, given both the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukemia, and the limited impact

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31 CDHS, An Evaluation of the Possible Risks From Electric and Magnetic Fields (EMFs) From Power Lines, Internal Wiring, Electrical Occupations and Appliances, p. 3, 2002.

32 IARC, Monographs, Part I, Vol. 80, p. 338.

33 *Ibid*., p. 332 – 334.

34 WHO, Environmental Health Criteria 238, EXTREMELY LOW FREQUENCY FIELDS, p. 11 - 13, 2007.

35 *Ibid*., p. 12.

36 *Ibid*., p. 12.

on public health if there is a link, the benefits of exposure reduction on health are unclear. Thus the costs of precautionary measures should be very low."[37]

III. APPLICATION OF THE CPUC'S "NO-COST AND LOW-COST" EMF POLICY TO THIS PROJECT

Recognizing the scientific uncertainty over the connection between EMF exposures and health effects, the CPUC adopted a policy that addresses public concern over EMF with a combination of education, information, and precaution-based approaches. Specifically, Decision 93-11-013 established a precautionary based "no-cost and low-cost" EMF policy for California's regulated electric utilities based on recognition that scientific research had not demonstrated that exposures to EMF cause health hazards and that it was inappropriate to set numeric standards that would limit exposure.

In 2006, the CPUC completed its review and update of its EMF Policy in Decision 06-01-042. This decision reaffirmed the finding that state and federal public health regulatory agencies have not established a direct link between exposure to EMF and human health effects,[38] and the policy direction that (1) use of numeric exposure limits was not appropriate in setting utility design guidelines to address EMF,[39] and (2) existing "no-cost and low-cost" precautionary-based EMF policy should be continued for proposed electrical facilities. The decision also reaffirmed that EMF concerns brought up during Certificate of Public Convenience and Necessity (CPCN) and Permit to Construct (PTC) proceedings for electric and transmission and substation facilities should be limited to the utility's compliance with the CPUC's "no-cost and low-cost" policies.[40]

The decision directed regulated utilities to hold a workshop to develop standard approaches for EMF Design Guidelines and such a workshop was held on February 21, 2006. Consistent design guidelines have been developed that describe the routine magnetic field reduction measures that regulated California electric utilities consider for new and upgraded transmission line and transmission substation projects. SCE filed its revised EMF Design Guidelines with the CPUC on July 26, 2006.

"No-cost and low-cost" measures to reduce magnetic fields would be implemented for this Project in accordance with SCE's EMF Design Guidelines. In summary, the process of

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37 *Ibid*., p. 13.

38 CPUC Decision 06-01-042, Conclusion of Law No. 5, mimeo. p. 19 ("As discussed in the rulemaking, a direct link between exposure to EMF and human health effects has yet to be proven despite numerous studies including a study ordered by this Commission and conducted by DHS.").

39 CPUC Decision 06-01-042, mimeo. p. 17 - 18 ("Furthermore, we do not request that utilities include non-routine mitigation measures, or other mitigation measures that are based on numeric values of EMF exposure, in revised design guidelines or apply mitigation measures to reconfigurations or relocations of less than 2,000 feet, the distance under which exemptions apply under GO 131-D. Non-routine mitigation measures should only be considered under unique circumstances.").

40 CPUC Decision 06-01-042, Conclusion of Law No. 2, ("EMF concerns in future CPCN and PTC proceedings for electric and transmission and substation facilities should be limited to the utility's compliance with the Commission's low-cost/no-cost policies.").

evaluating "no-cost and low-cost" magnetic field reduction measures and prioritizing within and between land usage classes considers the following:

1. SCE's priority in the design of any electrical facility is public and employee safety. Without exception, design and construction of an electric power system must comply with all applicable federal, state, and local regulations, applicable safety codes, and each electric utility's construction standards. Furthermore, transmission and subtransmission lines and substations must be constructed so that they can operate reliably at their design capacity. Their design must be compatible with other facilities in the area and the cost to operate and maintain the facilities must be reasonable.

2. As a supplement to Step 1, SCE follows the CPUC's direction to undertake "no-cost and low-cost" magnetic field reduction measures for new and upgraded electrical facilities. Any proposed "no-cost and low-cost" magnetic field measures, must, however, meet the requirements described in Step 1 above. The CPUC defines "no-cost and low-cost" measures as follows:

   - Low-cost measures, in aggregate, should:
     - Cost in the range of 4 percent of the total project cost.
     - Result in magnetic field reductions of "15% or greater at the utility R-O-W [right-of-way]…"[41]

   The CPUC Decision stated,

   > "We direct the utilities to use 4 percent as a benchmark in developing their EMF mitigation guidelines. We will not establish 4 percent as an absolute cap at this time because we do not want to arbitrarily eliminate a potential measure that might be available but costs more than the 4 percent figure. Conversely, the utilities are encouraged to use effective measures that cost less than 4 percent."[42]

3. The CPUC provided further policy direction in Decision 06-01-042, stating that, "[a]lthough equal mitigation for an entire class is a desirable goal, we will not limit the spending of EMF mitigation to zero on the basis that not all class members can benefit."[43] While Decision 06-01-042 directs the utilities to favor schools, day-care facilities and hospitals over residential areas when applying low-cost magnetic field reduction measures, prioritization within a class can be difficult on a project case-by-case basis because schools, day-care facilities, and hospitals are often integrated into residential areas, and many licensed day-care facilities are housed in private homes, and can be easily moved from one location to another. Therefore, it may be practical for public schools, licensed day-care centers, hospitals, and residential land uses to be grouped together to receive

[41] CPUC Decision 06-01-042, p. 10.
[42] CPUC Decision 93-11-013, § 3.3.2, p.10.
[43] CPUC Decision 06-01-042, p. 10.

> highest prioritization for low-cost magnetic field reduction measures. Commercial and industrial areas may be grouped as a second priority group, followed by recreational and agricultural areas as the third group. Low-cost magnetic field reduction measures will not be considered for undeveloped land, such as open space, state and national parks, and Bureau of Land Management and U.S. Forest Service lands. When spending for low-cost measures would otherwise disallow equitable magnetic field reduction for all areas within a single land-use class, prioritization can be achieved by considering location and/or density of permanently occupied structures on lands adjacent to the projects, as appropriate.

This FMP contains descriptions of various magnetic field models and the calculated results of magnetic field levels based on those models. These calculated results are provided only for purposes of identifying the relative differences in magnetic field levels among various transmission or subtransmission line design alternatives under a specific set of modeling assumptions and determining whether particular design alternatives can achieve magnetic field level reductions of 15 percent or more. The calculated results are not intended to be predictors of the actual magnetic field levels at any given time or at any specific location if and when the Project is constructed. This is because magnetic field levels depend upon a variety of variables, including load growth, customer electricity usage, and other factors beyond SCE's control. The CPUC affirmed this in D. 06-01-042 stating:

> "Our [CPUC] review of the modeling methodology provided in the utility [EMF] design guidelines indicates that it accomplishes its purpose, which is to measure the relative differences between alternative mitigation measures. Thus, the modeling indicates relative differences in magnetic field reductions between different transmission line construction methods, but does not measure actual environmental magnetic fields."[44]

[44] CPUC Decision 06-01-042, p. 11.

IV. PROJECT DESCRIPTION

Southern California Edison Company (SCE) proposes to construct and operate the Project to address a base case overload on the Moorpark-Newbury tap of the existing Moorpark–Newbury-Pharmacy 66 kV Subtransmission Line. The Project would occur in the City of Moorpark and the City of Thousand Oaks, and in unincorporated Ventura County between the two cities (Figure 1). The Project has been divided into discrete geographic Project Sections per the Proponent's Environmental Assessment (PEA) of the Project:

- Project Section 1 includes all work conducted within the fenceline at Moorpark Substation in the City of Moorpark.
- Project Section 2 spans from Moorpark Substation to near the border of the City of Thousand Oaks; most of Project Section 2 is located in unincorporated Ventura County (including the Santa Rosa Valley), with a portion of Project Section 2 located in the City of Moorpark. Project Section 2 is approximately 5 miles in length.
- Project Section 3 spans from just north of the City of Thousand Oaks border to a point within Conejo Open Space Conservancy Agency (COSCA) lands in the Conejo Canyons area; the end of Project Section 3 is the point at which the subtransmission route changes direction from east to south in the City of Thousand Oaks. Project Section 3 is approximately 3 miles in length.
- Project Section 4 spans from the end of Project Section 3 to the termination of the Project infrastructure within Newbury Substation in the City of Thousand Oaks. Project Section 4 is approximately 1 mile in length.

The Project includes the following major components:

- Construction of approximately 1,200 feet of new underground 66 kV subtransmission line entirely within Moorpark Substation.
- Construction of approximately 5 miles of the new Moorpark-Newbury 66 kV Subtransmission Line on new tubular steel poles (TSPs) on the south and east sides of SCE's existing Moorpark-Ormond Beach 220 kV Right-of-Way (ROW).
- Construction of approximately 3 miles of the new Moorpark-Newbury 66 kV Subtransmission Line within the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line ROW. Existing single-circuit lattice steel towers (LSTs) would be replaced with new TSPs; the TSPs would be double-circuited, carrying both the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line and the new Moorpark-Newbury 66 kV Subtransmission Line. The existing single-circuit Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line in this section would be reconstructed and reconductored to accommodate the installation of the new Moorpark-Newbury 66 kV Subtransmission Line.

- Construction of approximately 1 mile of the new Moorpark-Newbury 66 kV Subtransmission Line within the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line ROW into Newbury Substation. Existing single-circuit wood poles would be replaced with new lightweight steel (LWS) poles; within Newbury Substation, four wood poles would be replaced with four TSPs. The existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line would be reconstructed and transferred to the new LWS poles and TSPs in a double-circuit configuration to accommodate the new Moorpark-Newbury 66 kV Subtransmission Line.
- Construction of new 66 kV subtransmission line positions and associated infrastructure within Moorpark Substation and Newbury Substation to facilitate the termination of the new Moorpark-Newbury 66 kV Subtransmission Line.
- Transfer of existing distribution circuitry and telecommunication facilities to new subtransmission poles as necessary.

SCE's requirements for this Project are broken into the following components: Substations and 66 kV Subtransmission Line. Each of these components is described below.

Substations

There are no new substations proposed as part of this Project. The Project includes work to be conducted at two existing substations: the 220/66/16 kV Moorpark Substation and the 66/16 kV Newbury Substation. Modifications to existing substations are being performed to accommodate the construction of the new subtransmission line work between Moorpark Substation and Newbury Substation.

All substation-related work (installation of new circuit breakers, disconnect switches, switchrack positions, and protection equipment) at the substations would be conducted within the existing substation fence lines; the substation footprints or exterior dimensions of the substations would not be expanded as part of the Project. Further details of the substation work are described in the PEA.

66 kV Subtransmission Line

The Project would include the construction of new, and reconstruction of existing, 66 kV subtransmission line elements within existing SCE ROWs. The proposed subtransmission line elements have been subdivided into four geographically-defined Project Sections (Sections) per the PEA of the Project. The Project route is identified on Figure 1.

Project Section 1:

Project Section 1 is located entirely within the fenceline at Moorpark Substation. Project Section 1 begins at the 66 kV switchrack, runs underground through conduit installed in a duct bank to a riser TSP, and then exits the substation overhead.

Between October 2010 and November 2011, the following past activities were performed in Project Section 1:

- Installed a single TSP riser pole on the substation property (pole location 1)
- Constructed 700 feet of duct bank consisting of six 5-inch conduits and two underground vaults. Approximately 20 feet of the duct bank was installed in 28-inch steel casing under the SCE railroad spur located within Moorpark Substation

Subtransmission-related construction work in Project Section 1 is largely complete; however, the following future activities remain to be performed as part of the Project:

- Construct approximately 500 feet of duct bank consisting of six 5-inch conduits
- Install and splice subtransmission cable
- Terminate new cable at a line position in the 66 kV switchrack

Project Section 2:

Project Section 2 originates at the fenceline of Moorpark Substation and terminates near the City of Thousand Oaks boundary. Project Section 2 is located entirely within SCE's existing Moorpark-Ormond Beach 220 kV ROW. The ROW exits Moorpark Substation at the northwest corner of the substation, proceeds west from Moorpark Substation for approximately 4,800 feet, assumes a southerly routing near Montair Drive, crosses State Route 118 (SR-118, Los Angeles Avenue) and continues south across open space and lands used for agricultural purposes.

When fully constructed, Project Section 2 would consist of approximately 5 linear miles of a new overhead 66 kV subtransmission line installed on TSPs that would be located within SCE's existing Moorpark-Ormond Beach 220 kV ROW. The TSPs would be located within the south and east sides of the ROW, adjacent to the existing 220 kV structures. The TSPs would be single-circuited, carrying the Moorpark-Newbury 66 kV Subtransmission Line.

Between October 2010 and November 2011, the following past activities were performed in Project Section 2:

- Installed 24 TSP foundations (pole locations 2-25)
- Installed 21 complete TSPs (pole locations 2-22)
- Installed partially 1 TSP (only base of pole installed) (pole location 23)

Future activities in Project Section 2 include:

- Install two TSP foundations (pole locations 26-27)
- Install upper sections of one partially-installed TSP to complete construction (pole location 23)
- Install four TSPs (pole locations 24-27)
- Install approximately five circuit miles of 954 aluminum conductor steel-reinforced (ACSR)(from poles 1 to 28)
- Install marker balls on conductor where determined to be appropriate

Project Section 3:

Project Section 3 extends from the termination of Project Section 2 (north of the boundary of the City of Thousand Oaks) and is routed south and east to its termination at the northern terminus of Project Section 4. With the exception of approximately 400 feet at its northern end, all of Project Section 3 is located in open space lands managed by COSCA.

When fully constructed, Project Section 3 would consist of approximately 3 linear miles of overhead 66 kV subtransmission lines installed on TSPs. The TSPs would be double-circuited, carrying both the Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line and the Moorpark-Newbury 66 kV Subtransmission Line.

Between October 2010 and November 2011, the following past activities were performed in Project Section 3:

- Excavated holes for three TSP foundations and then subsequently filled them with slurry (pole locations 29-31)
- Constructed five TSP foundations (pole locations 33-37)

Future activities to be completed in Project Section 3 include:

- Install eight TSP foundations (five new foundations at pole locations 28, 32, and 38-40; and complete the three that were slurried at pole locations 29-31)
- Install 13 TSPs (pole locations 28-40)
- Remove 14 existing lattice steel towers (LSTs)
- Install approximately 3 miles of double circuit 954 ACSR on new TSPs as follows:
    - Install approximately 3 circuit miles of new 954 ACSR on new TSPs for the new Moorpark-Newbury 66 kV Subtransmission Line
    - Reconductor approximately 3 circuit miles of the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line by removing 653 ACSR and installing 954 ACSR on new TSPs
    - Install marker balls on conductor where determined to be appropriate

Project Section 4:

Project Section 4 extends from the southern terminus of Project Section 3 to Newbury Substation. When fully constructed, Project Section 4 would consist of approximately 1 linear mile of overhead 66 kV subtransmission lines installed on TSPs and LWS poles. The TSPs and LWS poles would primarily be double-circuited.

Between October 2010 and November 2011, the following past activities were performed in Project Section 4:

- Installed 27 LWS subtransmission poles (pole locations 41 through 67)
- Removed 27 wood subtransmission poles (pole locations 41 through 67)
- Transferred the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line from wood subtransmission poles to newly-installed LWS poles

- Installed a portion of the total length of 954 stranded aluminum conductor (SAC) for the new Moorpark-Newbury 66 kV Subtransmission Line
- Installed a portion of the total length of FRC (Fault Return Conductor)
- Transferred existing distribution lines and third-party facilities to new subtransmission structures

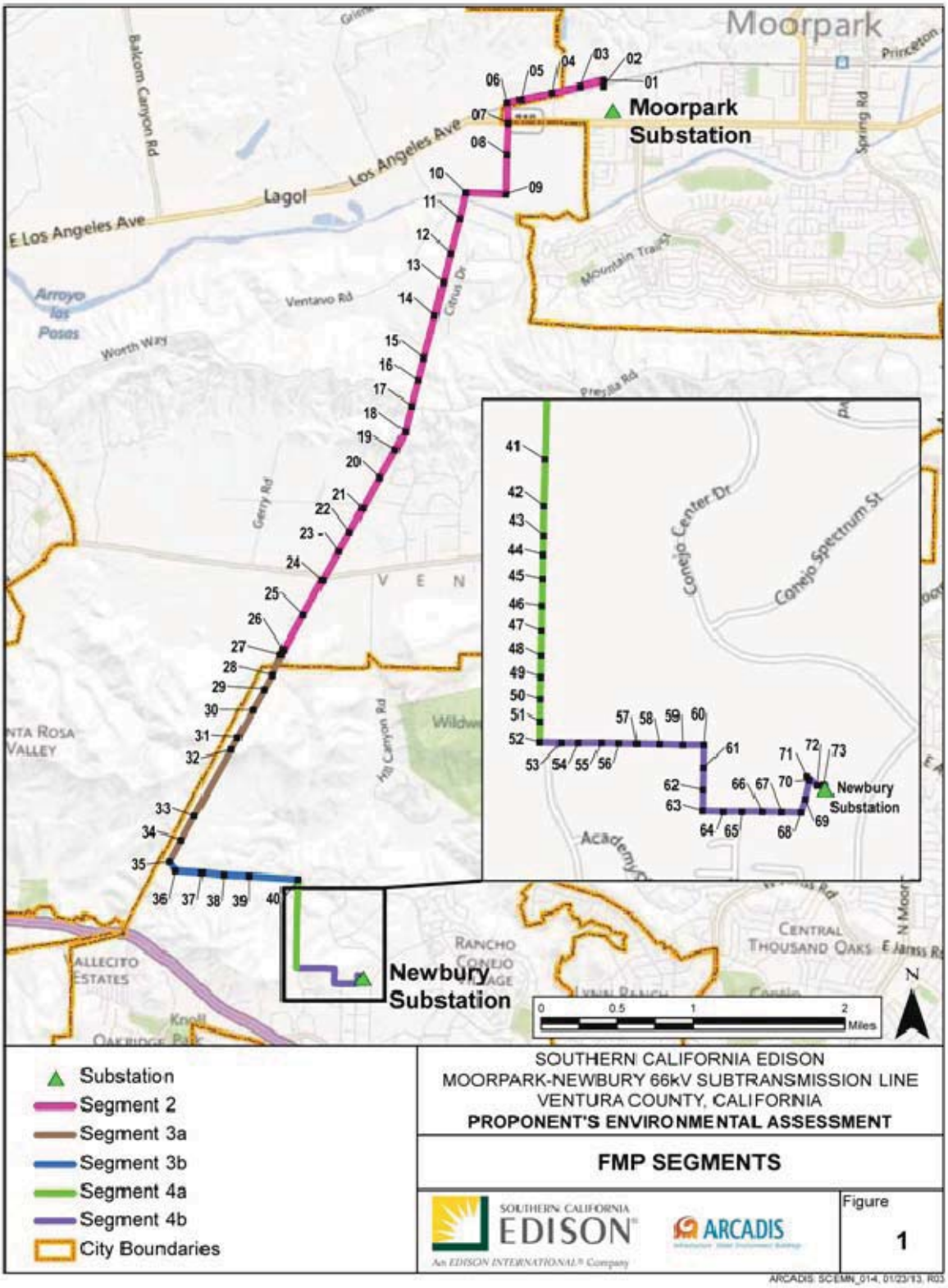
Future activities remaining in Project Section 4 include:

- Install approximately 0.5 mile of 954 SAC for the new Moorpark-Newbury 66 kV Subtransmission Line
- Install an additional length of FRC
- Install four TSP foundations at Newbury Substation
- Install four TSPs at Newbury Substation (pole locations 68, 70, 71, and 73)
- Install two LWS poles at Newbury Substation (pole locations 69 and 72)
- Remove six wood subtransmission poles at Newbury Substation
- Transfer existing subtransmission, distribution and telecommunications facilities to new structures
- Install marker balls on conductor where determined to be appropriate

66 kV Subtransmission Line Infrastructure:

TSPs to be installed as part of this Project would extend approximately 70 feet to 135 feet above ground. LWS poles installed as part of this Project would extend approximately 60 to 80 feet above ground. Additional details on the subtransmission line infrastructure are stated in the PEA.

Figure 1. Moorpark-Newbury Proposed 66 kV Subtransmission Line Route – FMP Segments



V. EVALUATION OF "NO-COST AND LOW-COST" MAGNETIC FIELD REDUCTION DESIGN OPTIONS

Please note that the following magnetic field models and the calculated results of magnetic field levels are intended only for purposes of identifying the relative differences in magnetic field levels among various subtransmission line and subtransmission line design alternatives under a specific set of modeling assumptions (see §VII-Appendix A for more detailed information about the calculation assumptions and loading conditions) and determining whether particular design alternatives can achieve magnetic field level reductions of 15 percent or more. The calculated results are not intended to be predictors of the actual magnetic field levels at any given time or at any specific location when the Project is constructed.

For the purpose of evaluating "no-cost and low-cost" magnetic field reduction design options, the evaluation of magnetic fields associated with the Project is divided into two parts:

- Part 1 - Proposed Substation Work
- Part 2 - Proposed 66 kV Subtransmission Lines

Part 1 - Proposed Substation Work

Project Section 1:

Most of the Project Section 1 construction has been completed as described in the PEA. This Project Section is located entirely within the property lines at Moorpark Substation and runs underground through conduit installed in a duct bank.

Generally, magnetic field values along the substation perimeter are low compared to the substation interior because of the distance from the perimeter to the energized equipment. Normally, the highest magnetic field values around the perimeter of a substation result from overhead power lines and underground duct banks entering and leaving the substation, and are not caused by substation equipment. Therefore, the magnetic field reduction design options generally applicable to a substation project are as follows:

- Site selection for a new substation[45];
- Setback of substation structures and major substation equipment (such as bus, transformers, and underground cable duct banks, etc.) from perimeter;
- Field reduction for transmission lines and subtransmission lines entering and exiting the substation.

The Substation Checklist, as shown in Table 2, is used for evaluating the no-cost and low-cost design options considered for Moorpark Substation, the design options adopted, and

[45] There are no new substations being constructed as part of this Project. All substation related work would occur within the existing Moorpark Substation and Newbury Substation.

reasons that certain design options were not adopted if applicable. There are no significant opportunities for magnetic field reductions within Newbury Substation as part of this Project. Therefore, only the Moorpark Substation Checklist is shown in Table 2.

Table 2. Substation Checklist for Examining No-cost and Low-cost Magnetic Field Reduction Design Options for Moorpark Substation

No.	No-Cost and Low-Cost Magnetic Field Reduction Design Options Evaluated for a Substation Project	Design Options Adopted? (Yes/No)	Reason(s) if not Adopted
1	Keep high-current devices such as transformers, capacitors, and reactors away from substation property lines.	N/A	Not in Project Scope
2	For underground duct banks, the minimum distance should be 12 feet from the adjacent property lines or as close to 12 feet as practical.	Yes	
3	Locate new substations close to existing power lines to the extent practical.	N/A	Not in Project Scope
4	Increase the substation property boundary to the extent practical.	N/A	Not in Project Scope

Part 2 - Proposed 66 kV Subtransmission Lines

For the purpose of evaluating "no-cost and low-cost" magnetic field reduction design options, the proposed Project is divided into five segments. The segments are shown below their associated Project Section, described previously in this document.

Project Section 2:

Some of the Project Section 2 construction work was completed as described in the PEA. When fully constructed, Project Section 2 would consist of approximately 5 linear miles of a new overhead 66 kV subtransmission line installed on TSPs that would be located within SCE's existing Moorpark-Ormond Beach 220 kV ROW. The TSPs would be located within the south and east side of the ROW, adjacent to the existing 220 kV structures. The TSPs would be single-circuited, carrying the proposed (new) Moorpark-Newbury 66 kV Subtransmission Line.

- **Segment 2**

  Segment 2 consists of the entire route within Project Section 2. This segment would consist of five SCE circuits (four 220 kV existing Moorpark-Ormond Beach No. 1, 2, 3, and 4 Transmission Lines (T/Ls) and the one proposed single-circuit Moorpark-Newbury 66 kV Subtransmission Line) within the SCE ROW. The proposed design is shown in Figure 2.

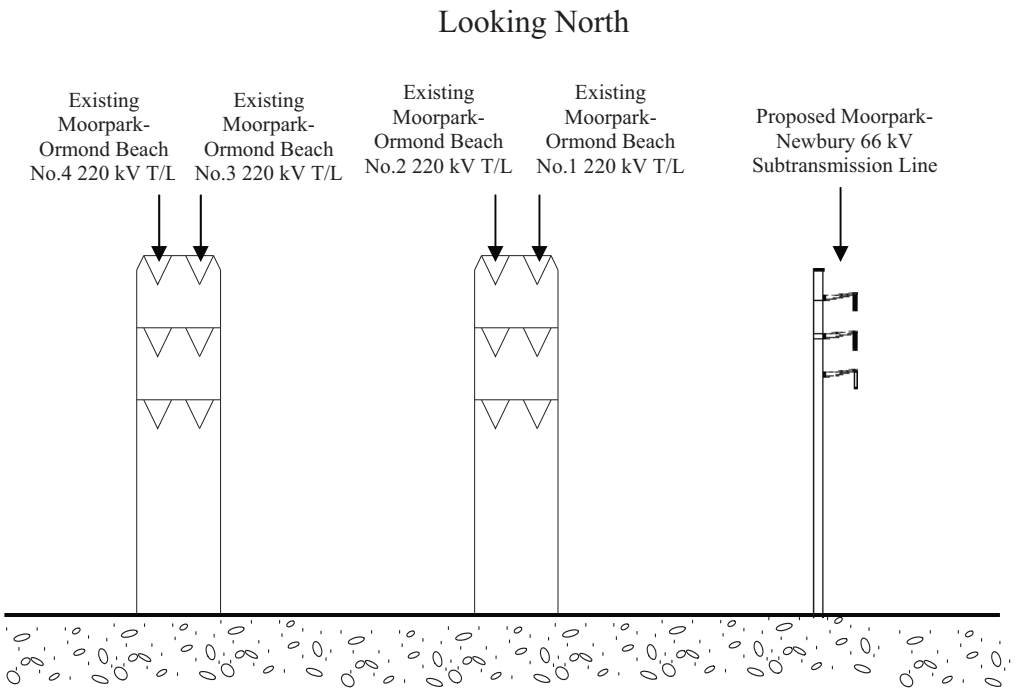
For EMF analysis, calculated field levels were evaluated at the edges of the approximately 270 feet wide ROW. Presently, there are no schools adjacent to Segment 2 of the proposed 66 kV subtransmission line route. The proposed route for Segment 2 is adjacent to residential, commercial / industrial, agricultural, and undeveloped land.

No-Cost Field Reduction Measures: The proposed design for Segment 2 includes the following no-cost field reduction measures:

1. Utilize structure heights that meet or exceed SCE's EMF preferred design criteria.
2. Arrange conductors of proposed subtransmission line for magnetic field reduction. This is considered a no-cost measure as the recommended phase arrangement can be obtained at subtransmission line terminations at Moorpark Substation and Newbury Substation (this recommended phase arrangement remains unchanged throughout the Project route).

Low-Cost Field Reduction Options: The proposed design incorporates the above listed no-cost field reduction measures that meet SCE's preferred design criteria; no low-cost reduction measures such as utilizing taller structures were considered for this segment of the Project.

Figure 2. Proposed 66 kV Single-Circuit Structure Design - Segment 2[46]



Magnetic Field Calculations: Figure 3 and Table 3 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed TSP with a minimum height of 85 feet (above ground).

[46] Figure is not to scale.

Figure 3. Calculated Magnetic Field Levels[47] for Segment 2
Proposed 66 kV Subtransmission Line (Looking North)

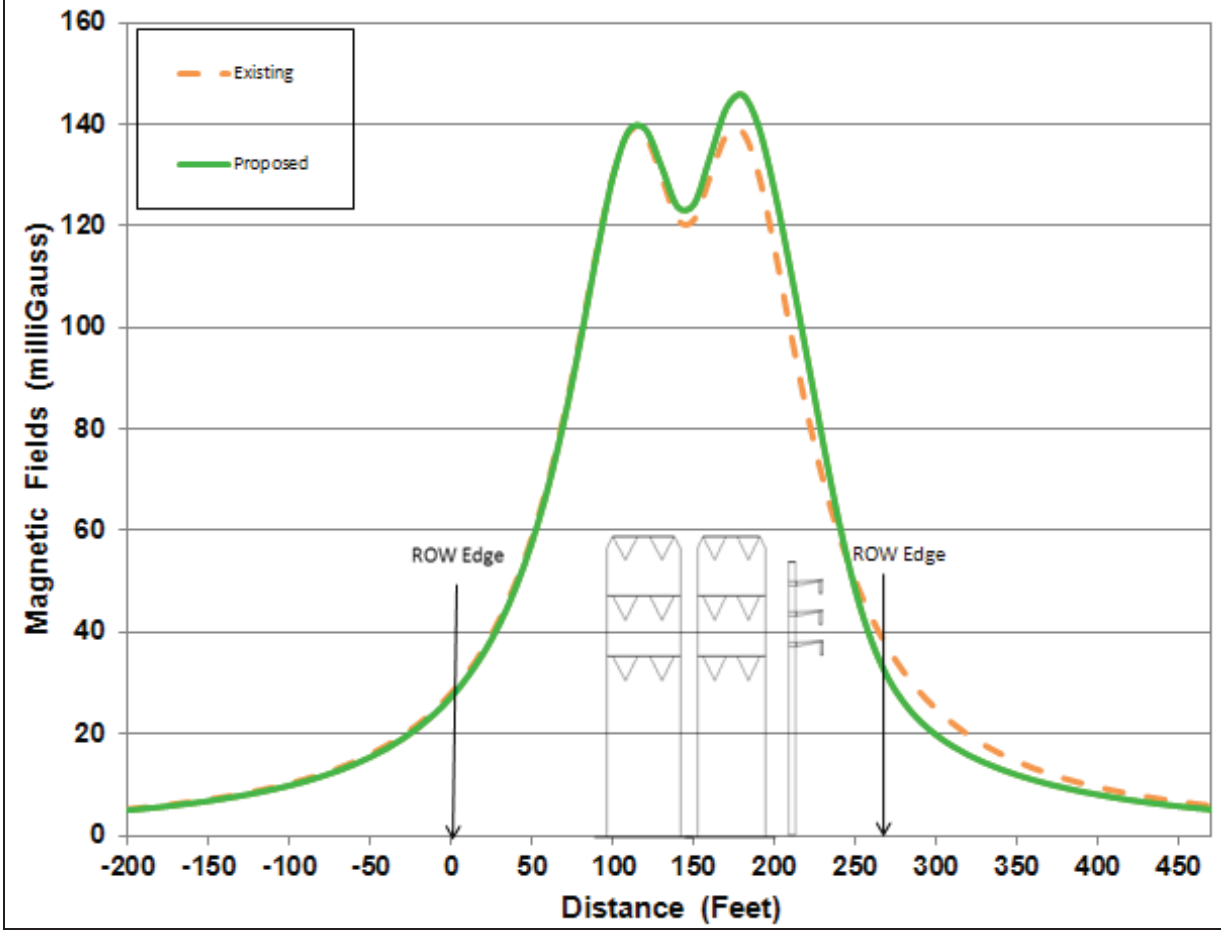


Table 3. Calculated Magnetic Field Levels[48] for Segment 2

Design Options	Left edge of ROW (mG)	% Reduction	Right edge of ROW (mG)	% Reduction
Existing	28.1	-	36.9	-
Proposed	27.3	2.8	31.1	15.7

[47] This figure shows calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

[48] This table lists calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

Recommendations for Segment 2: *The proposed design includes no-cost field reduction measures. Because the proposed design already incorporates structures with heights meeting or exceeding SCE's preferred design criteria and arranges phase conductors for magnetic field reduction, no low-cost field reduction measures are recommended.*

Project Section 3:

Some of the Project Section 3 construction work was completed as described in the PEA. When fully constructed, Project Section 3 would consist of approximately 3 miles of overhead 66 kV subtransmission lines installed on TSPs. The TSPs would be double-circuited, carrying both the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line and the proposed Moorpark-Newbury 66 kV Subtransmission Line.

- **Segment 3a**

  Segment 3a within Project Section 3 consists of the span from Poles 28-35. This segment would consist of six SCE circuits (existing Moorpark-Ormond Beach No. 1, 2, 3, and 4 220 kV T/Ls; existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line; and the proposed Moorpark-Newbury 66 kV Subtransmission Line) within the SCE ROW (comprised of two separate easements). The proposed design is shown in Figure 4.

  For EMF analysis, calculated field levels were evaluated at the edges of the approximately 440 feet wide ROW. Presently, there are no schools adjacent to Segment 3a of the proposed 66 kV subtransmission line route. The proposed route for Segment 3a is adjacent to recreational, agricultural and undeveloped land.

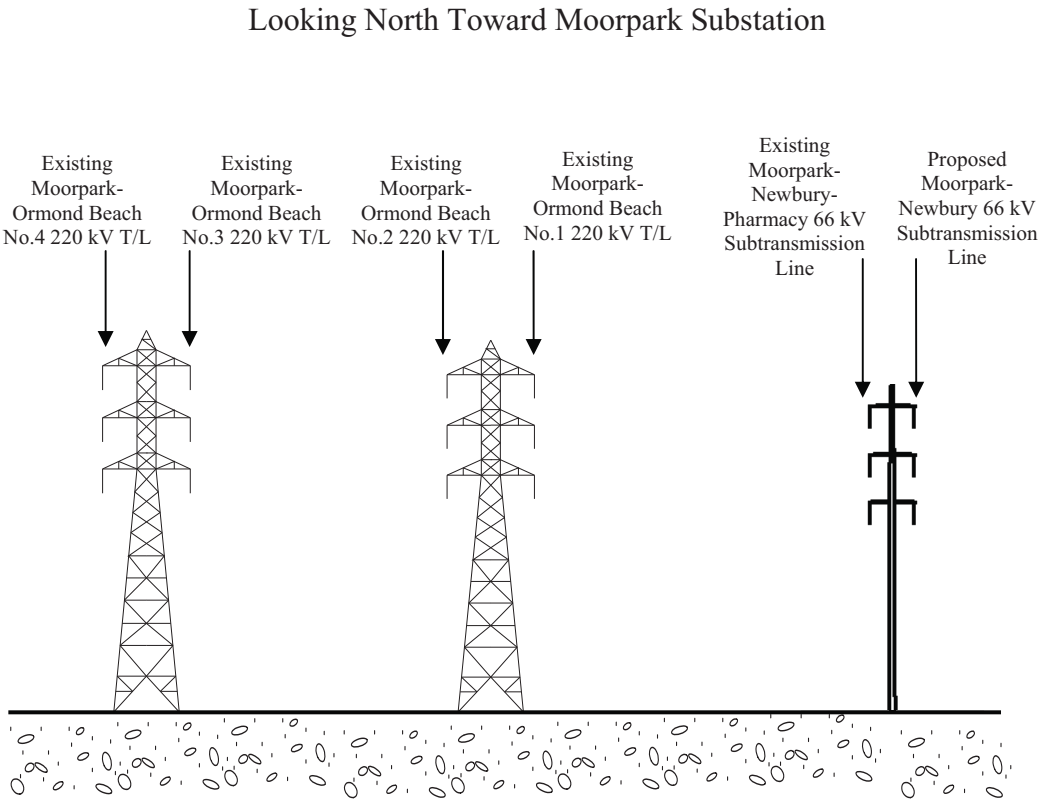
  No-Cost Field Reduction Measures: The proposed design for Segment 3a includes the following no-cost field reduction measures:

  1. Utilize structure heights that meet or exceed SCE's EMF preferred design criteria.
  2. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction.

  Low-Cost Field Reduction Options: The proposed design for Segment 3a includes the following low-cost field reduction measure:

  1. Arrange conductors of subtransmission lines for magnetic field reduction. This is considered a low-cost measure in this segment because of the costs associated with transposing the conductors to the recommended phasing arrangement for magnetic field reduction.

Figure 4. Proposed 66 kV Double-Circuit Structure Design - Segment 3a[49]



Magnetic Field Calculations: Figure 5 and Table 4 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed TSP with a minimum height of 70 feet (above ground).

[49] Figure is not to scale.

Figure 5. Calculated Magnetic Field Levels[50] for Segment 3a
Proposed 66 kV Subtransmission Line (Looking North)

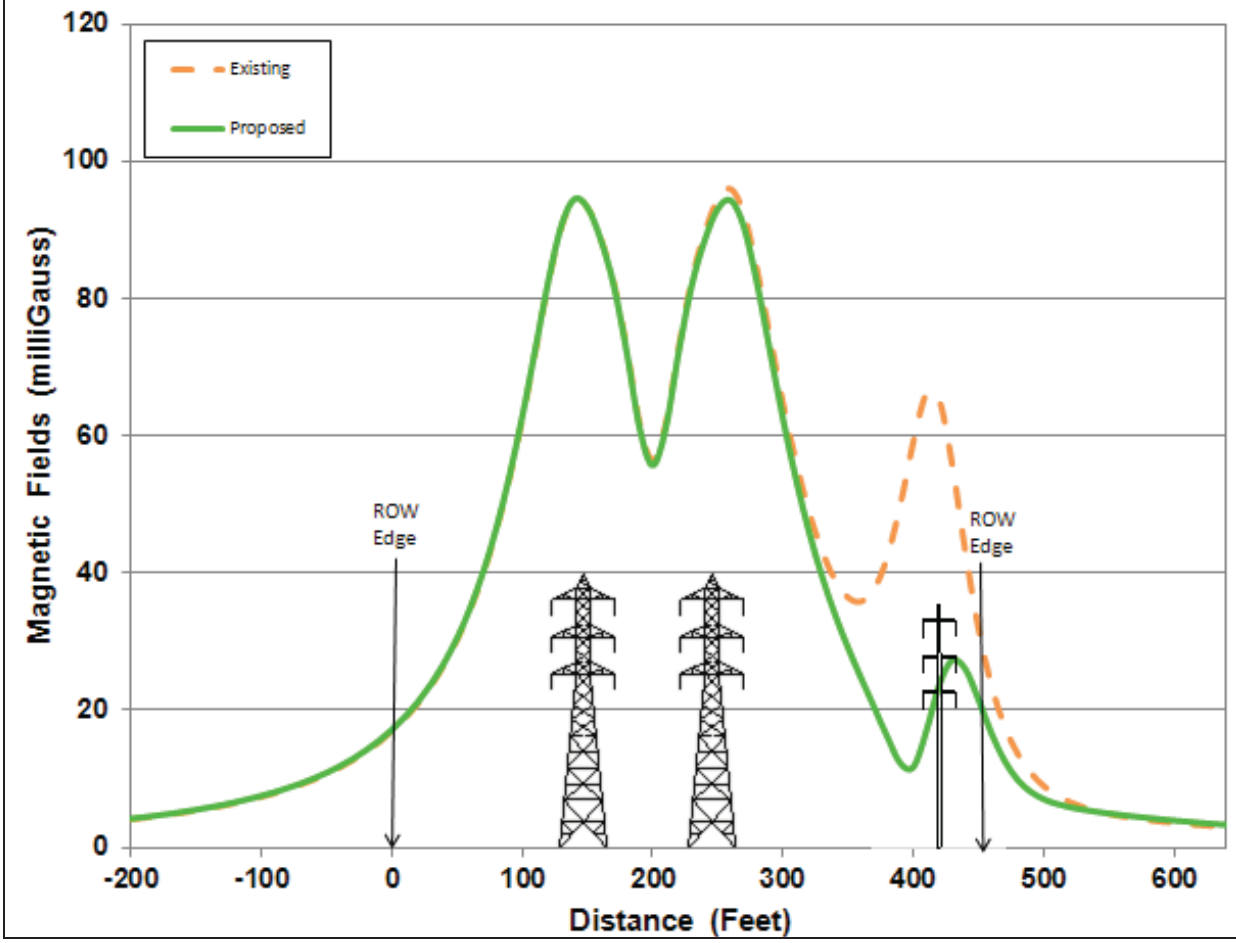


Table 4. Calculated Magnetic Field Levels[51] for Segment 3a

Design Options	Left edge of ROW (mG)	% Reduction	Right edge of ROW (mG)	% Reduction
Existing	16.9	-	43.0	-
Proposed	17.2	Less than 15% Increase	26.0	39.5

[50] This figure shows calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

[51] This table lists calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

Recommendations for Segment 3a: *The proposed design includes no-cost and low-cost field reduction measures. Because the proposed design already incorporates structures with heights meeting or exceeding SCE's preferred design criteria, utilizes double-circuit construction that reduces spacing between circuits as compared with single-circuit construction, and arranges phase conductors for magnetic field reduction, no further low-cost field reduction measures are recommended.*

- **Segment 3b**

Segment 3b within Project Section 3 consists of the span from Poles 35-40. This segment would consist of two circuits (the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line and the proposed Moorpark-Newbury 66 kV Subtransmission Line) within the SCE ROW. The proposed design is shown in Figure 6.

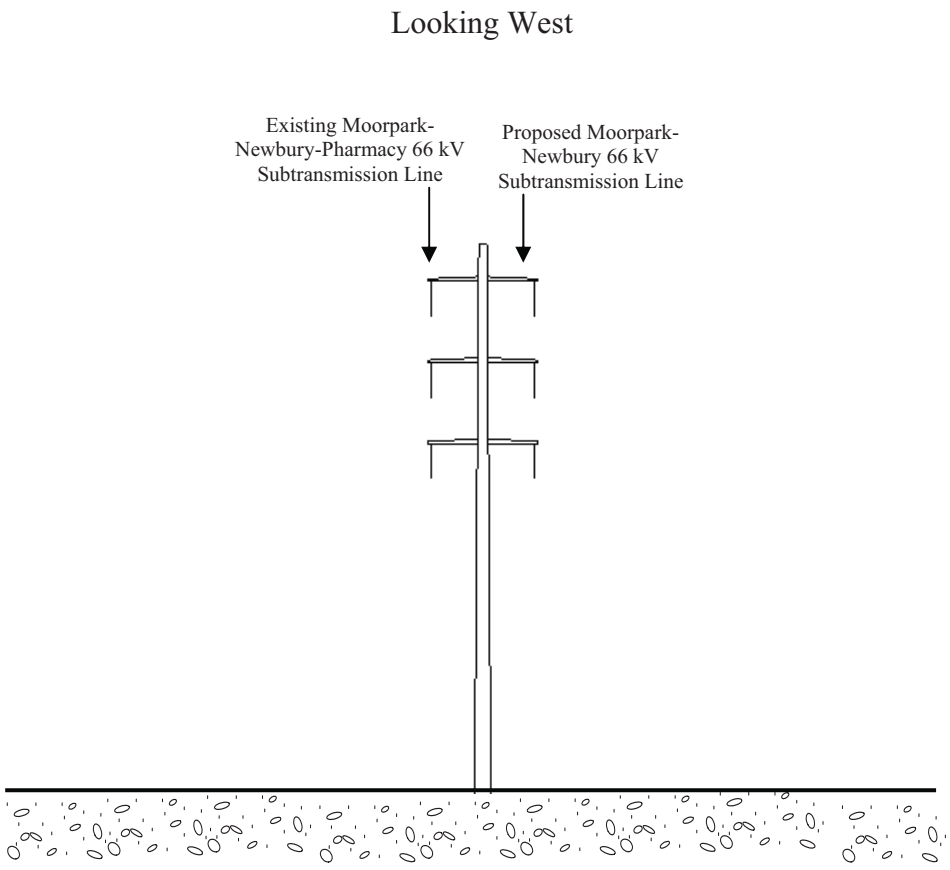
For EMF analysis, calculated field levels were evaluated at the edges of the approximately 50 feet wide ROW. Presently, there are no schools adjacent to Segment 3b of the proposed 66 kV subtransmission line route. The proposed route for Segment 3b is adjacent to recreational and undeveloped land.

No-Cost Field Reduction Measures: The proposed design for Segment 3b includes the following no-cost field reduction measures:

1. Utilize structure heights that meet or exceed SCE's EMF preferred design criteria.
2. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction.
3. Arrange conductors of subtransmission lines for magnetic field reduction. This is considered a no-cost measure as the recommended phase arrangement is maintained from Segment 3a.

Low-Cost Field Reduction Options: The proposed design incorporates the above listed no-cost field reduction measures that meet SCE's preferred design criteria; no low-cost reduction measures such as utilizing taller structures were considered for this segment of the Project.

Figure 6. Proposed 66 kV Double-Circuit Structure Design – Segment 3b[52]



Magnetic Field Calculations: Figure 7 and Table 5 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed TSP with a minimum height of 70 feet (above ground).

[52] Figure is not to scale.

Figure 7. Calculated Magnetic Field Levels[53] for Segment 3b
Proposed 66 kV Subtransmission Line (Looking West)

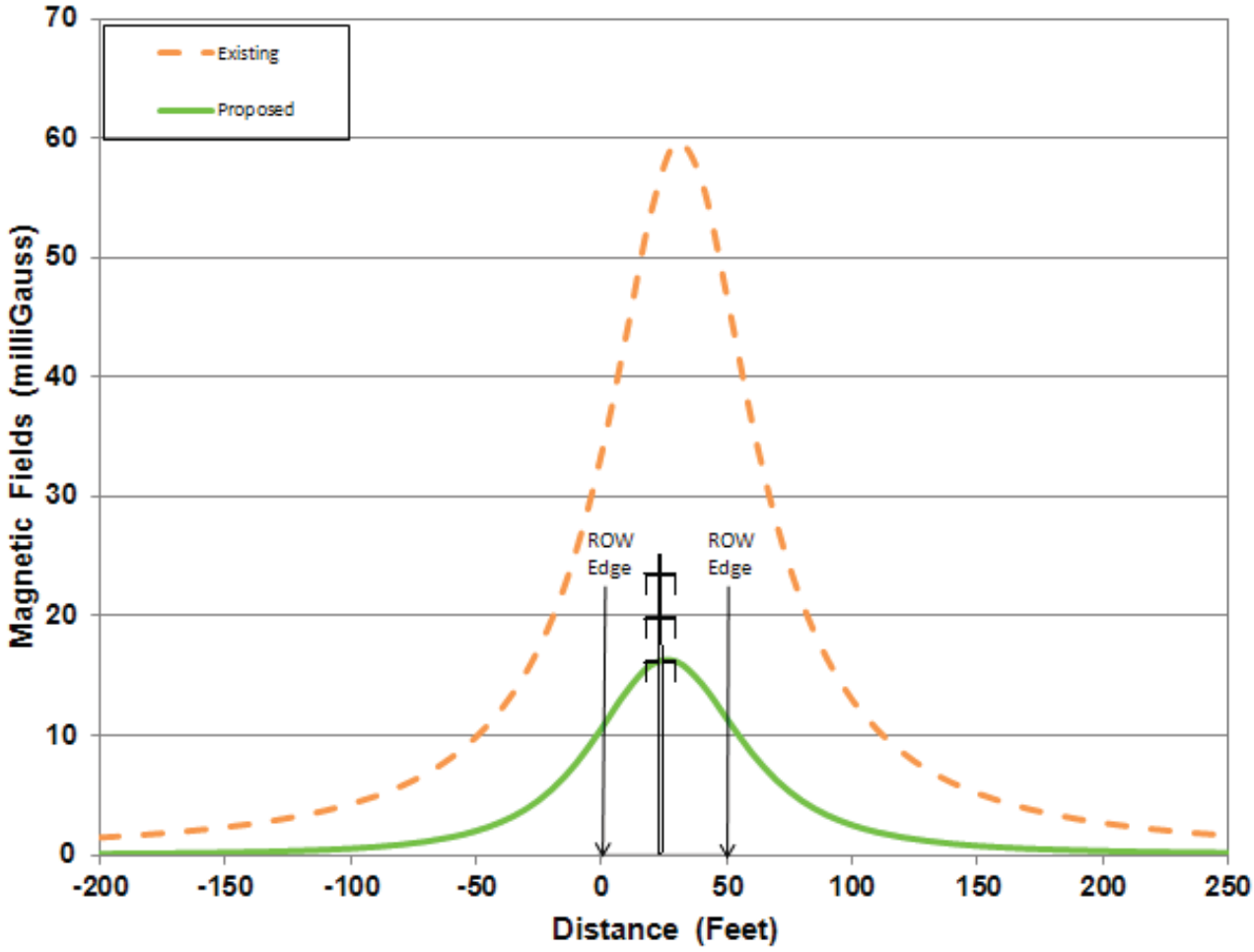


Table 5. Calculated Magnetic Field Levels[54] for Segment 3b

Design Options	Left edge of ROW (mG)	% Reduction	Right edge of ROW (mG)	% Reduction
Existing	33.5	-	46.9	-
Proposed	10.6	68.4	11.4	75.7

[53] This figure shows calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

[54] This table lists calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

Recommendations for Segment 3b: *The proposed design includes no-cost field reduction measures. Because the proposed design already incorporates structures with heights meeting or exceeding SCE's preferred design criteria, utilizes double-circuit construction that reduces spacing between circuits as compared with single-circuit construction, and arranges phase conductors for magnetic field reduction, no low-cost field reduction measures are recommended.*

Project Section 4:

Some of the Project Section 4 construction work was completed as described in the PEA. When fully constructed, Project Section 4 would consist of approximately 1 mile of overhead 66 kV subtransmission lines installed on TSPs and LWS poles. The TSPs and LWS poles would primarily be double-circuited.

- **Segment 4a**

Segment 4a in Project Section 4 consists of the span from Poles 40-52. This segment would consist of two circuits (the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line and the proposed Moorpark-Newbury 66 kV Subtransmission Line) within the SCE ROW. The proposed design is shown in Figure 8.

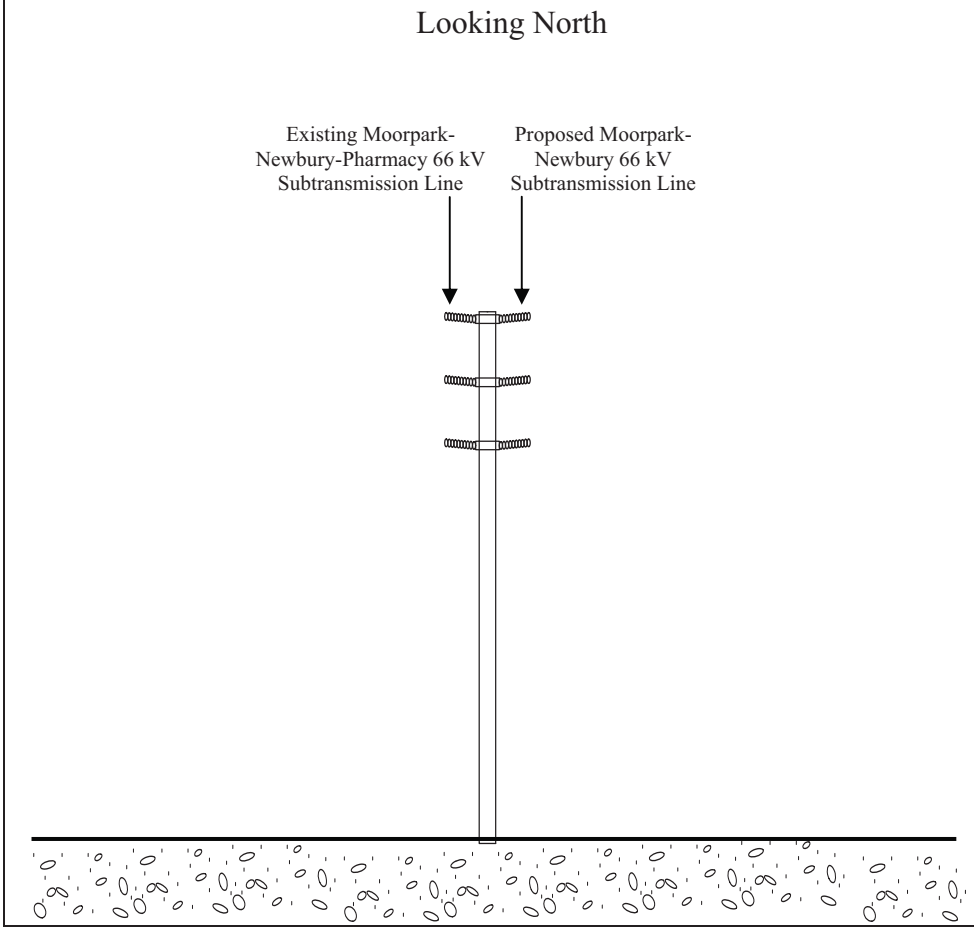
For EMF analysis, calculated field levels were evaluated at the edges of the approximately 25 feet wide ROW. Presently, there are no schools adjacent to Segment 4a of the proposed 66 kV subtransmission line route. The proposed route for Segment 4a is adjacent to recreational and undeveloped land.

No-Cost Field Reduction Measures: The proposed design for Segment 4a includes the following no-cost field reduction measures:

1. Utilize structure heights that meet or exceed SCE's EMF preferred design criteria.
2. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction.
3. Arrange conductors of subtransmission lines for magnetic field reduction. This is considered a no-cost measure as the recommended phase arrangement is maintained from Segment 3a.

Low-Cost Field Reduction Options: The proposed design incorporates the above listed no-cost field reduction measures that meet SCE's preferred design criteria; no low-cost reduction measures such as utilizing taller structures were considered for this segment of the Project.

Figure 8. Proposed 66 kV Double-Circuit Structure Design – Segment 4a[55]



Magnetic Field Calculations: Figure 9 and Table 6 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed LWS pole with a minimum height of 75 feet.

[55] Figure is not to scale.

Figure 9. Calculated Magnetic Field Levels[56] for Segment 4a
Proposed 66 kV Subtransmission Line (Looking North)

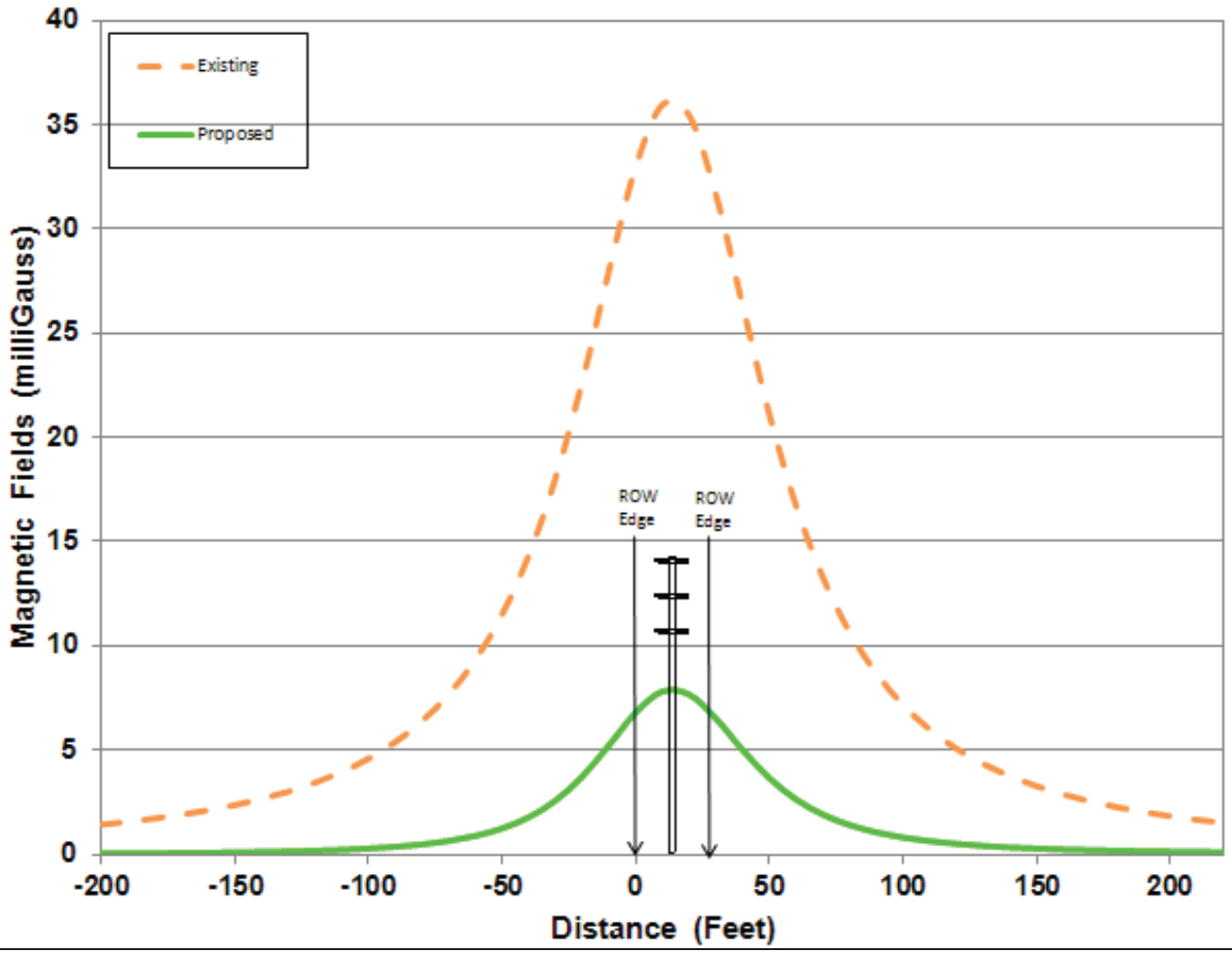


Table 6. Calculated Magnetic Field Levels[57] for Segment 4a

Design Options	Left edge of ROW (mG)	% Reduction	Right edge of ROW (mG)	% Reduction
Existing	33.0	-	33.9	-
Proposed	6.8	79.4	7.2	78.8

[56] This figure shows calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

[57] This table lists calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

Recommendations for Segment 4a: *The proposed design includes no-cost field reduction measures. Because the proposed design already incorporates structures with heights meeting or exceeding SCE's preferred design criteria, utilizes double-circuit construction that reduces spacing between circuits as compared with single-circuit construction, and arranges phase conductors for magnetic field reduction, no low-cost field reduction measures are recommended.*

- **Segment 4b**

Segment 4b within Project Section 4 consists of the span from Poles 52-Newbury Substation. This segment would consist of three circuits (the existing Newbury-Thousand Oaks 66 kV Subtransmission Line; the existing Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line; and the proposed Moorpark-Newbury 66 kV Subtransmission Line) within the SCE ROW. The proposed design is shown in Figure 10.

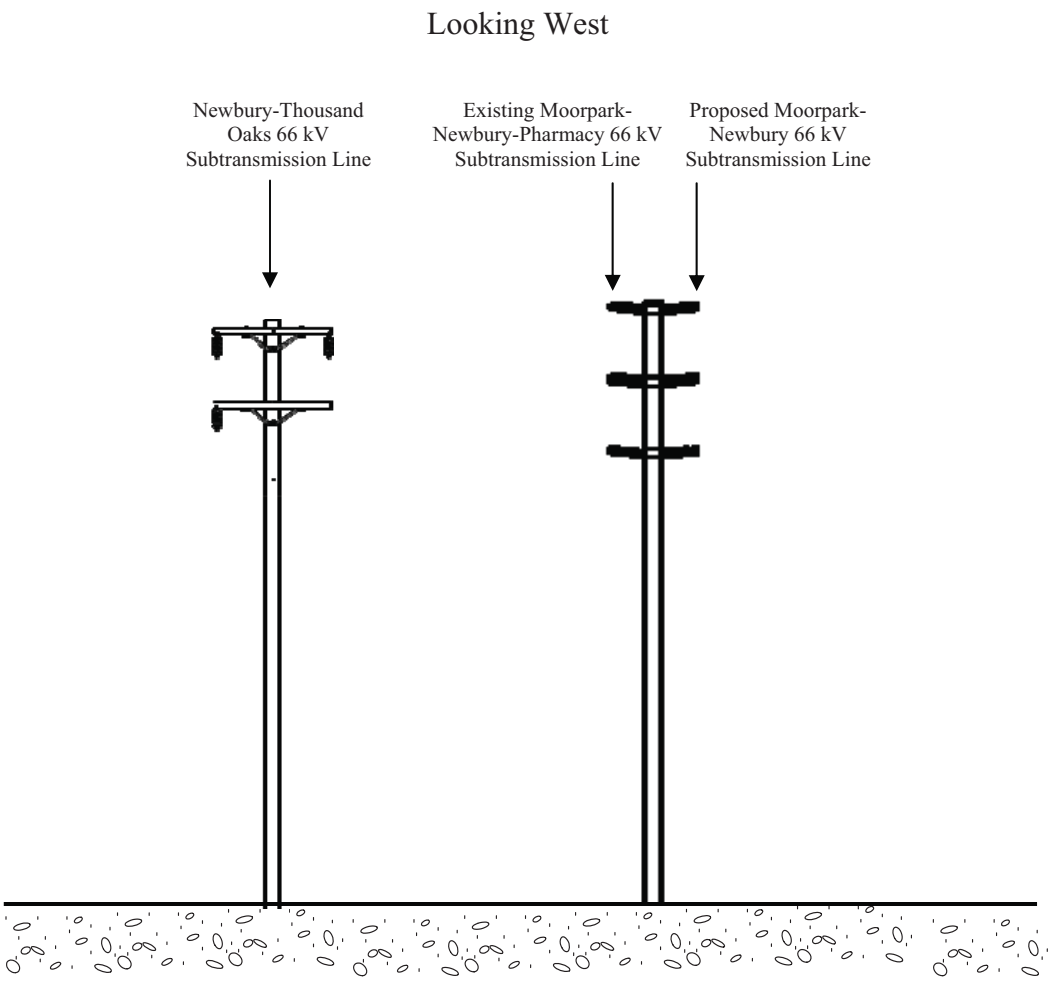
For EMF analysis, calculated field levels were evaluated at the edges of the approximately 75 feet wide ROW. Presently, there are schools (Newbury Park Adventist Academy, Passageway School, and Conejo Adventist Elementary) located more than 300 feet from the southern ROW edge of Segment 4b. The proposed route for Segment 4b is also adjacent to residential, commercial / industrial, recreational, and undeveloped land.

No-Cost Field Reduction Measures: The proposed design for Segment 4b includes the following no-cost field reduction measures:

1. Utilize structure heights that meet or exceed SCE's EMF preferred design criteria.
2. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction.
3. Arrange conductors of subtransmission lines for magnetic field reduction. This is considered a no-cost measure as the recommended phase arrangement is maintained from Segment 3a.

Low-Cost Field Reduction Options: The proposed design incorporates the above no-cost field reduction measures that meet SCE's preferred design criteria; no low-cost reduction measures such as utilizing taller structures were considered for this segment of the Project.

Figure 10. Proposed 66 kV Double-Circuit Structure Design - Segment 4b[58]



Magnetic Field Calculations: Figure 11 and Table 7 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed LWS pole with an overall minimum height of 75 feet.

[58] Figure is not to scale.

Figure 11. Calculated Magnetic Field Levels[59] for Segment 4b
Proposed 66 kV Subtransmission Line (Looking West)

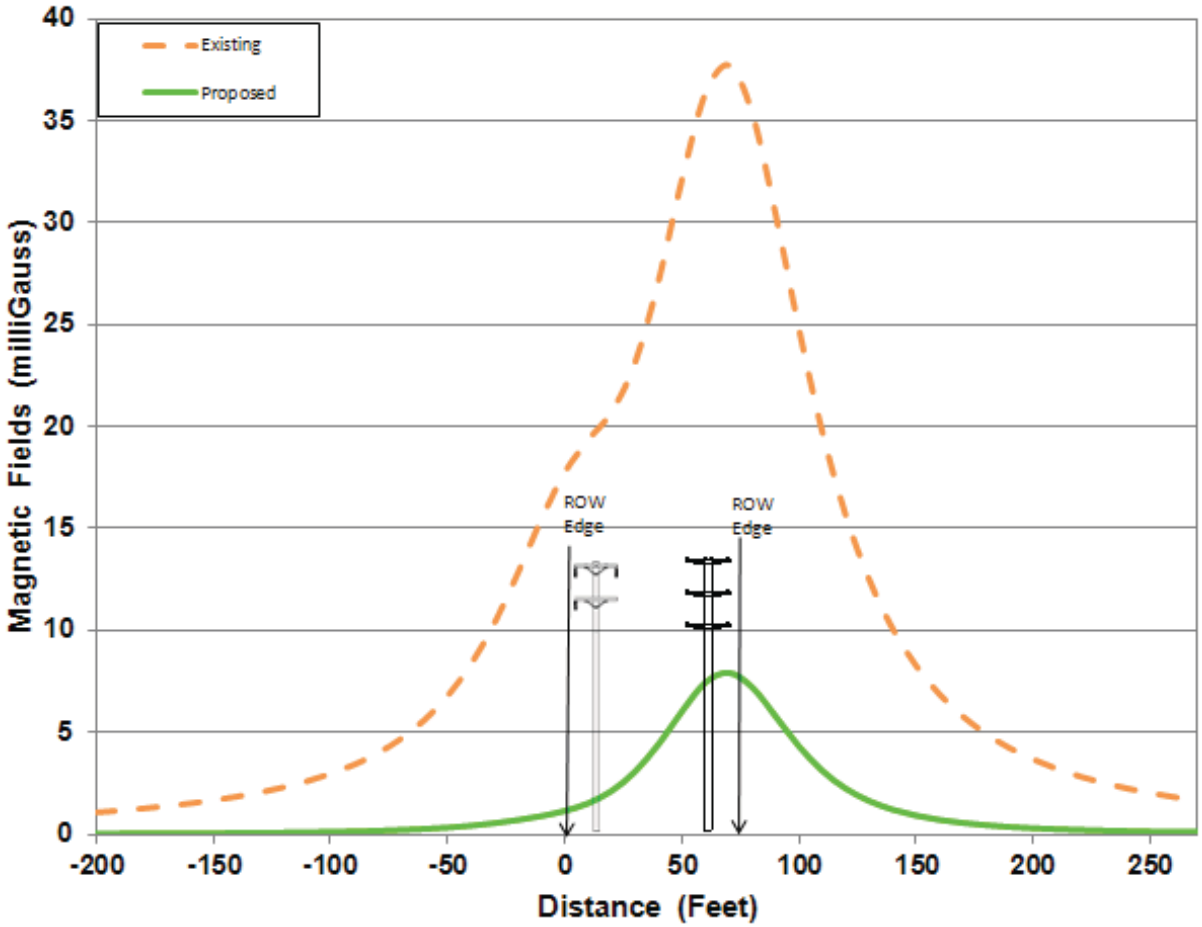


Table 7. Calculated Magnetic Field Levels[60] for Segment 4b

Design Options	Left edge of ROW (mG)	% Reduction	Right edge of ROW (mG)	% Reduction
Existing	17.8	-	37.0	-
Proposed	1.1	93.8	7.7	79.2

[59] This figure shows calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

[60] This table lists calculated magnetic field levels for design comparison only and is not meant to predict actual magnetic field levels.

Recommendations for Segment 4b: *The proposed design includes no-cost field reduction measures. Because the proposed design already incorporates structures with heights meeting or exceeding SCE's preferred design criteria, utilizes double-circuit construction that reduces spacing between circuits as compared with single-circuit construction, and arranges phase conductors for magnetic field reduction, no low-cost field reduction measures are recommended.*

VI. FINAL RECOMMENDATIONS FOR IMPLEMENTING "NO-COST AND LOW-COST" MAGNETIC FIELD REDUCTION DESIGN OPTIONS

In accordance with the "EMF Design Guidelines", filed with the CPUC in compliance with CPUC Decisions 93-11-013 and 06-01-042, SCE would implement the following "no-cost and low-cost" magnetic field reduction design options for the Project:

Part 1: Proposed Substation Work

For Existing Moorpark Substation:

- Place new substation electrical equipment (such as underground duct banks) away from the substation property lines closest to populated areas.

For Existing Newbury Substation:

- There are no significant opportunities to reduce magnetic fields based on the scope of the substation work within Newbury Substation as part of this Project.

Part 2: Proposed 66 kV Subtransmission Lines

Segment 2 (Project Section 2) – The proposed Moorpark-Newbury 66 kV Subtransmission Line within SCE's 220 kV ROW:

- Utilize structure heights that meet or exceed SCE's EMF preferred design criteria
- Arrange conductors of proposed subtransmission line for magnetic field reduction:
  - Moorpark-Newbury: **B-C-A** (top to bottom phase arrangement)

Segment 3a (Project Section 3) – The proposed Moorpark-Newbury 66 kV Subtransmission Line and the existing Moorpark–Newbury-Pharmacy 66 kV Subtransmission Line would be double-circuited subtransmission lines within SCE's 220 kV ROW:

- Utilize structure heights that meet or exceed SCE's EMF preferred design criteria.
- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction.
- Arrange conductors of subtransmission lines for magnetic field reduction:

- Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line: **A-C-B** (top to bottom phase re-arrangement); and maintaining the Moorpark-Newbury 66 kV Subtransmission Line phase arrangement from Segment 2: **B-C-A** (top to bottom). An equivalent "cross-phasing" arrangement can be chosen during the construction phase.

Segment 3b (Project Section 3) – The proposed Moorpark-Newbury 66 kV Subtransmission Line and the existing Moorpark–Newbury-Pharmacy 66 kV Subtransmission Line would be double-circuited subtransmission lines within SCE's ROW:

- Utilize structure heights that meet or exceed SCE's EMF preferred design criteria.
- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction.
- Arrange conductors of subtransmission lines for magnetic field reduction:
  - Maintaining the Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line phase arrangement from Segment 3a: **A-C-B** (top to bottom phase arrangement); and maintaining the Moorpark-Newbury 66 kV Subtransmission Line phase arrangement from Segment 2: **B-C-A** (top to bottom). An equivalent "cross-phasing" arrangement can be chosen during the construction phase.

Segment 4a (Project Section 4) – The proposed Moorpark-Newbury 66 kV Subtransmission Line and the existing Moorpark–Newbury-Pharmacy 66 kV Subtransmission Line would be double-circuited subtransmission lines within SCE's ROW:

- Utilize structure heights that meet or exceed SCE's EMF preferred design criteria.
- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction.
- Arrange conductors of subtransmission lines for magnetic field reduction:
  - Maintaining the Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line phase arrangement from Segment 3a: **A-C-B** (top to bottom phase arrangement); and maintaining the Moorpark-Newbury 66 kV Subtransmission Line phase arrangement from Segment 2: **B-C-A** (top to bottom). An equivalent "cross-phasing" arrangement can be chosen during the construction phase.

Segment 4b (Project Section 4) – The proposed Moorpark-Newbury 66 kV Subtransmission Line and the existing Moorpark–Newbury-Pharmacy 66 kV Subtransmission Line would be double-circuited subtransmission lines within the same ROW as the existing single-circuit Newbury-Thousand Oaks 66 kV Subtransmission Line:

- Utilize structure heights that meet or exceed SCE's EMF preferred design criteria.
- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction.

- Arrange conductors of subtransmission lines for magnetic field reduction:
    - Maintaining the Moorpark-Newbury-Pharmacy 66 kV Subtransmission Line phase arrangement from Segment 3a: **A-C-B** (top to bottom phase arrangement); and maintaining the Moorpark-Newbury 66 kV Subtransmission Line phase arrangement from Segment 2: **B-C-A** (top to bottom). An equivalent "cross-phasing" arrangement can be chosen during the construction phase.

The recommended "no-cost and low-cost" magnetic field reduction design options listed above are based upon preliminary engineering design. If the preliminary engineering design is significantly modified (in the context of evaluating and implementing CPUC's "no-cost and low-cost" EMF Policy), then an Addendum to the FMP will be prepared.

SCE's plan for applying the above "no-cost and low-cost" magnetic field reduction design options uniformly for the Project is consistent with the CPUC's EMF Decisions No. 93-11-013 and No. 06-01-042. Furthermore, the recommendations above meet the CPUC approved EMF Design Guidelines as well as all applicable national and state safety standards for new electrical facilities.

VII. APPENDIX A: TWO-DIMENSIONAL MODEL ASSUMPTIONS AND YEAR 2016 FORECASTED LOADING CONDITIONS

Magnetic Field Model Assumptions:

SCE uses a computer program titled "MFields"[61] to model the magnetic field characteristics of various transmission designs options. All magnetic field models and the calculated results of magnetic field levels presented in this document are intended only for purposes of identifying the relative differences in magnetic field levels among various transmission line and subtransmission line design alternatives under a specific set of modeling assumptions and determining whether particular design alternatives can achieve magnetic field level reductions of 15 percent or more. The calculated results are not intended to be predictors of the actual magnetic field levels at any given time or at any specific location if and when the Project is constructed.

Typical two-dimensional magnetic field modeling assumptions include:

- All subtransmission lines were modeled using forecasted peak loads (see Tables 8 and 9).
- All conductors were assumed to be straight and infinitely long.
- Average conductor heights accounted for line sag used in the calculation for the subtransmission line designs.
- Magnetic field strength was calculated at a height of three feet above ground.
- Resultant magnetic fields values were presented in this FMP.
- All line currents were assumed to be balanced. (i.e. neutral or ground currents are not considered)
- Terrain was assumed to be flat.
- Project dominant power flow directions were used.

61 SCE, MFields for Excel, Version 2.0, 2007.

Table 8. Year 2016 Forecasted Loading Conditions for Proposed Project (After Project Completion)		
Line Name	**Current (Amps)**	**Power Flow Direction**
Newbury-Thousand Oaks 66 kV	13	Thousand Oaks to Newbury
Moorpark-Newbury 66 kV	537	Moorpark to Newbury
Moorpark-Newbury-Pharmacy 66 kV	512	Moorpark to Newbury
Moorpark-Ormond Beach 220 kV No. 1	910	Ormond Beach to Moorpark
Moorpark-Ormond Beach 220 kV No. 2	910	Ormond Beach to Moorpark
Moorpark-Ormond Beach 220 kV No. 3	910	Ormond Beach to Moorpark
Moorpark-Ormond Beach 220 kV No. 4	910	Ormond Beach to Moorpark

Table 9. Year 2016 Forecasted Loading Conditions (Before Project Completion)		
Line Name	**Current (Amps)**	**Power Flow Direction**
Newbury-Thousand Oaks 66 kV	205	Thousand Oaks to Newbury
Moorpark-Newbury-Pharmacy 66 kV	876	Moorpark to Newbury
Moorpark-Ormond Beach 220 kV No. 1	908	Ormond Beach to Moorpark
Moorpark-Ormond Beach 220 kV No. 2	908	Ormond Beach to Moorpark
Moorpark-Ormond Beach 220 kV No. 3	908	Ormond Beach to Moorpark
Moorpark-Ormond Beach 220 kV No. 4	908	Ormond Beach to Moorpark

Notes:

1. Forecasted loading data is based upon scenarios representing load forecasts for 2016. The forecasting data is subject to change depending upon availability of generations, load increase, changes in load demand, and by many other factors.
2. Based on historical data, the Moorpark-Ormond Beach 220 kV Transmission Lines are only utilized during peak load conditions.