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ACSR	Aluminum Conductor Steel Reinforced
CAISO	California Independent System Operator
CB	Circuit breaker
CDHS	California Department of Health Services
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
LST	lattice steel tower
LWS	light weight steel
MEER	Mechanical Electrical Equipment Room
mG	milligauss
NIEHS	National Institute of Environmental Health Sciences
NRPB	National Radiation Protection Board
PEA	Proponents Environmental Assessment
PVC	Polyvinyl chloride
RAPID	Research and Public Information Dissemination
ROW	Right-of-way
SAC	Stranded Aluminum Conductor
SB-R-T	San Bernardino-Redlands-Timoteo
SB-R-TN	San Bernardino-Redlands-Tennessee
SCE	Southern California Edison
T/L	transmission line
TSP	tubular steel pole
WOD	West of Devers
WHO	World Health Organization

I. EXECUTIVE SUMMARY

This document is Southern California Edison Company's ("SCE") Field Management Plan ("FMP") for the proposed West of Devers ("WOD") Upgrade Project ("Proposed Project"). SCE proposes to construct the Proposed Project to increase the power transfer capability of the WOD 220 kV transmission lines ("T/Ls") between Devers, El Casco, Vista, and San Bernardino substations. The Proposed Project is needed to facilitate the full deliverability of new electric generation resources being developed in eastern Riverside County, in an area designated by the California Independent System Operator ("CAISO") for planning purposes as the Blythe and Desert Center areas.

The Proposed Project would upgrade the existing WOD T/L system by replacing the existing WOD 220 kV T/Ls and associated structures with new, higher-capacity T/Ls and structures; installing new and/or upgraded substation facilities; and making telecommunication improvements. In particular, the Proposed Project would:

- Upgrade substation equipment within SCE's existing Devers, El Casco, Etiwanda, San Bernardino, and Vista Substations in order to accommodate continuous and emergency power on the upgraded WOD 220 kV T/Ls. Upgrade SCE's existing Timoteo and Tennessee substations in order to accommodate the 66 kV subtransmission line relocations.

- Remove and upgrade the following existing 220 kV T/Ls and structures with new 220 kV T/Ls and structures utilizing double-bundled 1590 kcmil Aluminum Conductor Steel-Reinforced 2B-1590 ("ACSR") conductor:
    - Devers – El Casco (approximately 30 miles);
    - El Casco – San Bernardino (approximately 14 miles);
    - Devers – San Bernardino (approximately 43 miles);
    - Devers – Vista No. 1 and No. 2 (approximately 45 miles each);
    - Etiwanda – San Bernardino (approximately 3.5 miles); and
    - San Bernardino – Vista (approximately 3.5 miles).

- Remove and relocate approximately 2 miles of two existing 66 kV subtransmission lines.
- Remove and relocate approximately 4 miles of existing 12 kV distribution lines.
- Install telecommunication lines and equipment for the protection, monitoring, and control of T/Ls and substation equipment.

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 the Proposed 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 mainly as follows:

- Utilize subtransmission structure heights that meet or exceed SCE's EMF preferred design criteria
- Utilize underground subtransmission construction for crossing other transmission structures and other engineering reasons
- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
- Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas
- Arrange conductors of the proposed T/Ls for magnetic field reduction ("Phasing")

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

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.

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

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
Segment 1 – Model 1	From San Bernardino Substation to West Lugonia Avenue in City of Redlands	3	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost[5] • No-Cost • Low-Cost	• Yes • Yes • Yes	
Segment 1 – Model 2	From West Lugonia Avenue to Redlands Boulevard in City of Redlands and Loma Linda	3	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	

3 This column shows the major cross streets, existing transmission lines, or substation name(s) 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 Proposed 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 1 – Model 3	From Redlands Boulevard to Barton Road in City of Loma Linda	2,3,5	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost[6] • No-Cost • Low-Cost	• Yes • Yes • Yes	
Segment 1 – Model 4	From Barton Road to the San Bernardino Junction in City of Loma Linda	2,3,5,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	

[6] This option was included in the preliminary design and continues to be included in the design of the Proposed 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 2 – Model 1	Near the west side of the intersection of Barton Road and East Hilltop Drive in Grand Terrace	1,2	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost[7] • No-Cost • Low-Cost	• Yes • Yes • Yes	
Segment 2 – Model 2	Near South Lauralwood Avenue & South Walter Court in Colton	2,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	

[7] This option was included in the preliminary design and continues to be included in the design of the Proposed 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 3	South of Helena Street inside the Fisherman's Retreat in the City of Redlands, approximately 1.3 mile north-west of El Casco Substation	2,4,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost[8] • No-Cost • Low-Cost	• Yes • Yes • Yes	
Segment 4 – Model 1	East of El Casco Substation, in existing SCE ROW north of the residential areas on the western limit of the City of Beaumont	2,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	

[8] This option was included in the preliminary design and continues to be included in the design of the Proposed 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 4 – Model 2	Cities of Beaumont, Calimesa, and Banning	1,2,3,4,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost[9] • No-Cost • Low-Cost	• Yes • Yes • Yes	
Segment 5 – Model 1	From North San Gorgonio to east side of Robertson's sand & gravel pit area in the City of Banning (lattice steel towers)	2,3,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	

[9] This option was included in the preliminary design and continues to be included in the design of the Proposed 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 5 – Model 2	From east side of the Robertson's sand & gravel pit area through the Morongo Reservation area to just east of the Malki Road and Seminole Drive intersection in the City of Cabazon (tubular steel poles)	6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction	• No-Cost[10] • No-Cost	• Yes • Yes	
Segment 5 – Model 3	From Malki Road and Seminole Drive to the eastern limit of the Morongo Reservation near Rushmore Avenue in the City of Cabazon (lattice steel towers)	2,3,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	

[10] This option was included in the preliminary design and continues to be included in the design of the Proposed 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 6 – Model 1	Near Rushmore Avenue in the community of Whitewater	2,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost[11] • No-Cost • Low-Cost	• Yes • Yes • Yes	
Segment 6 – Model 2	Near Amethyst Drive in the community of Whitewater	2,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes	

[11] This option was included in the preliminary design and continues to be included in the design of the Proposed 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 6 – Model 3	Near Desert View Road & 16th Avenue in the community of North Palm Springs	2,6	• Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction • Arrange conductors of T/Ls for magnetic field reduction • Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas	• No-Cost[12] • No-Cost • Low-Cost	• Yes • Yes • Yes	
San Bernardino-Redlands-Timoteo 66 kV Relocation – Model 1	On San Bernardino Avenue between the San Bernardino Substation and Marigold Avenue in the City of San Bernardino	3	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria • Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction, where applicable • Arrange conductors of subtransmission lines for magnetic field reduction	• No-Cost • No-Cost • No-Cost	• Yes • Yes • No	• Adjacent backup circuits normally have no currents

[12] This option was included in the preliminary design and continues to be included in the design of the Proposed 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
San Bernardino-Redlands-Timoteo 66 kV Relocation – Model 2	Overhead single circuit portion from the intersection of San Bernardino Avenue and Marigold Avenue in the City of San Bernardino to near the intersection of West Redlands Boulevard and Bryn Mawr Avenue in the City of Loma Linda	2,3,5	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria • Utilize subtransmission line construction that reduces the space between conductors compared with other designs	• No-Cost[13] • No-Cost	• Yes • Yes	
San Bernardino-Redlands-Timoteo 66 kV Relocation – Model 3	Underground portion from near the intersection of West Redlands Boulevard and Bryn Mawr Avenue in the City of Loma Linda to Timoteo Substation on Mountain View Avenue	2,3	• Utilize underground subtransmission construction for crossing other transmission structures and other engineering reasons	• No-Cost	• Yes	
San Bernardino-Redlands-Tennessee 66 kV Relocation – Model 1	On San Bernardino Avenue between the San Bernardino Substation and Marigold Avenue in the City of Redlands	3	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF 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	• No-Cost • No-Cost • No-Cost	• Yes • Yes • Yes	

[13] This option was included in the preliminary design and continues to be included in the design of the Proposed 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**
San Bernardino-Redlands-Tennessee 66 kV Relocation – Model 2	On San Bernardino Avenue between Marigold Avenue and Nevada Street in the City of Redlands	2,3,6	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria • Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction, where applicable • Arrange conductors of subtransmission lines for magnetic field reduction	• No-Cost[14] • No-Cost • No-Cost	• Yes • Yes • No	• Adjacent backup circuits normally have no currents
San Bernardino-Redlands-Tennessee 66 kV Relocation – Model 3	Overhead single circuit portion between the intersection of San Bernardino Avenue and Nevada Street to the intersection of Barton Road and Iowa Street in the City of Redlands	1,2,3,6	• Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria • Utilize subtransmission line construction that reduces the space between conductors compared with other designs • Locate subtransmission structures on west side of Nevada Street away from school • Using taller structures near the community day school	• No-Cost • No-Cost • No-Cost • Low-Cost	• Yes • Yes • Yes • No	• Not 15% or more reduction

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

II. BACKGROUND REGARDING EMF AND PUBLIC HEALTH RESEARCH ON EMF

There are many sources of power frequency[15] 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.[16]

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[17], the National Radiation Protection Board ("NRPB") 2001[18], the International Commission on non-Ionizing Radiation Protection ("ICNIRP") 2001, the California Department of Health Services ("CDHS") 2002[19], the International Agency for Research on Cancer ("IARC") 2002[20] and the World Health Organization ("WHO") 2007[21] .

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."[22]
- "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."[23]

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

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

17 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.

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

19 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.

20 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.

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

22 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."[24]

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."[25]

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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23 *Ibid.*, p. iii.

24 *Ibid.*, p. 37 – 38.

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

> between believing or not believing' and one was 'prone to believe' that EMFs cause some degree of increased risk."[26]

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

> "ELF magnetic fields are possibly carcinogenic to humans"[27], 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 "mG") 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."[28]

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."[29]
>
> "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."[30]
>
> "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"[31]
>
> "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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26 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.

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

28 *Ibid.*, p. 332 – 334.

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

30 *Ibid.*, p. 12.

31 *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."[32]

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,[33] and the policy direction that (1) use of numeric exposure limits was not appropriate in setting utility design guidelines to address EMF,[34] 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.[35]

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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32 *Ibid.*, p. 13.

33 CPUC Decision 06-01-042, Findings of Fact 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.").

34 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.").

35 CPUC Decision 06-01-042, Conclusion of Law No. 2, mimeo.p. 21, ("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]…"[36]

   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."[37]

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."[38] 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

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36 CPUC Decision 06-01-042, p. 10.

37 CPUC Decision 93-11-013, § 3.3.2, p.10.

38 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."[39]

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

IV. PROJECT DESCRIPTION

This document is Southern California Edison Company's ("SCE") Field Management Plan ("FMP") for the proposed West of Devers ("WOD") Upgrade Project ("Proposed Project"). SCE proposes to construct the Proposed Project to increase the power transfer capability of the WOD 220 kilovolt ("kV") transmission lines ("T/Ls") between Devers, El Casco, Vista, and San Bernardino substations (see Figure 1, West of Devers Project Area). The Proposed Project is needed to facilitate the full deliverability of new electric generation resources being developed in eastern Riverside County, in an area designated by the California Independent System Operator ("CAISO") for planning purposes as the Blythe and Desert Center areas.

For the purpose of EMF analysis, this FMP focuses only on major electrical components of the Proposed Project. Substation apparatus upgrade, distribution system modification, telecommunication, and construction details are not in the scope of this FMP.

This section provides a description of the Proposed Project. The Proposed Project would be located primarily within the existing WOD corridor in the incorporated and unincorporated areas of Riverside and San Bernardino Counties including the Reservation Trust Lands of the Morongo Band of Mission Indians ("Morongo Reservation"), and the Cities of Banning, Beaumont, Calimesa, Colton, Grand Terrace, Loma Linda, and Redlands (refer to Figure 1, West of Devers Project Area). The existing WOD corridor traverses a combination of residential, commercial, agricultural, recreation, and open space land uses.

Transmission Lines

The Proposed Project would upgrade the existing WOD system by replacing existing 220 kV T/Ls and associated structures with new, higher-capacity 220 kV T/Ls and structures; modifying existing substation facilities; removing and relocating existing subtransmission (66 kV) lines; removing and relocating existing distribution (12 kV) lines; and making various telecommunication improvements. In particular, the Proposed Project would:

- Remove and upgrade the existing 220 kV T/Ls and structures primarily within the existing WOD corridor as follows:[40]
    - Segment 1 would be approximately 3.5 miles in length and extend south from San Bernardino Substation to the San Bernardino Junction and include the following existing 220 kV T/Ls: Devers-San Bernardino, Etiwanda-San Bernardino, San Bernardino-Vista, and El Casco-San Bernardino.
    - Segment 2 would be approximately 5 miles in length and extend west from the San Bernardino Junction to Vista Substation and include the following existing 220 kV T/Ls: Devers-Vista No. 1 and Devers-Vista No. 2.

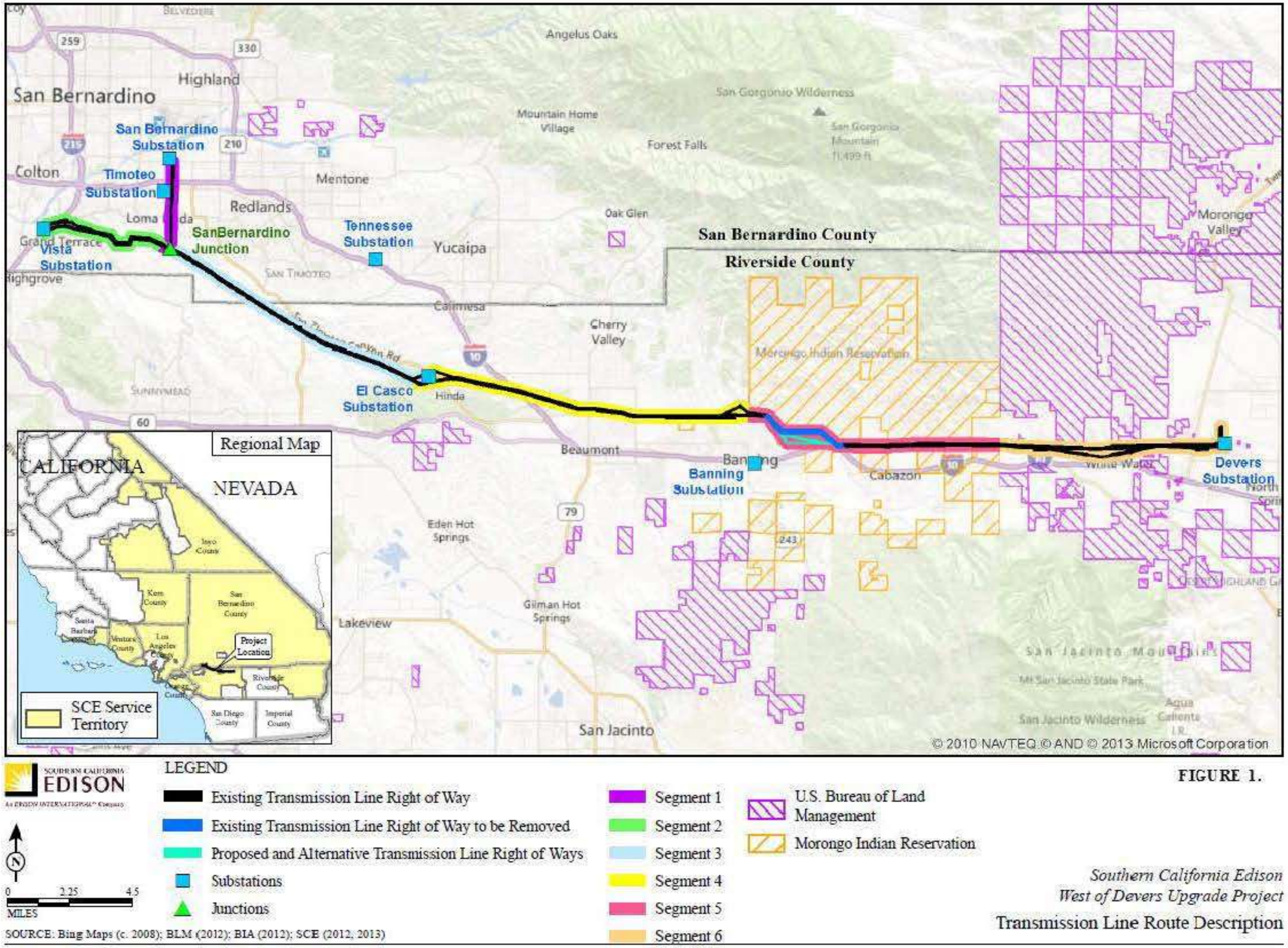
[40] The proposed transmission line elements have been divided into six segments for ease of description in this FMP.

- Segment 3 would be approximately 10 miles in length and extend east from the San Bernardino Junction to El Casco Substation and include the following existing 220 kV T/Ls: Devers-Vista No. 1, Devers-Vista No. 2, El Casco-San Bernardino, and Devers-San Bernardino.
- Segment 4 would be approximately 12 miles in length and extend east from the El Casco Substation to San Gorgonio Avenue in the City of Banning and include the following existing 220 kV T/Ls: Devers-Vista No. 1, Devers-Vista No. 2, Devers-El Casco, and Devers-San Bernardino.
- Segment 5 would be approximately 9 miles in length and extend east from San Gorgonio Avenue in the City of Banning to the eastern limit of the Morongo Reservation[41] at Rushmore Avenue and include the following existing 220 kV T/Ls: Devers-Vista No. 1, Devers-Vista No. 2, Devers-El Casco, and Devers-San Bernardino.
- Segment 6 would be approximately 8 miles in length and extend east from the eastern limit of the Morongo Reservation to Devers Substation and include the following existing 220 kV T/Ls: Devers-Vista No. 1, Devers-Vista No. 2, Devers-El Casco, and Devers-San Bernardino.

The project description is based on planning level assumptions. Exact details would be determined following completion of final engineering, identification of field conditions, availability of labor, material, and equipment, and compliance with applicable environmental and permitting requirements.

41 Approximately 3 miles of existing ROW would be abandoned and replaced with a new 3-mile alignment pursuant to the SCE-Morongo ROW agreement. In addition, this segment consists of an alternative to a new 3-mile alignment (220 kV Transmission Line Route Alternative 1), which is further explained in the Proponents Environmental Assessment (PEA) Section 3.14 Project Alternatives.

Figure 1. West of Devers Upgrade Project Area



Substations

There are no new substations proposed as part of the Proposed Project. Modifications to existing substation equipment would be performed to accommodate continuous and emergency power on the WOD 220 kV T/Ls between Vista, San Bernardino, El Casco, Etiwanda, and Devers substations.

Additionally, modifications to Timoteo and Tennessee substations would also be performed to accommodate the 66 kV subtransmission line relocations.

Modifications to Existing Substations Description

Work at Vista, San Bernardino, El Casco, and Devers substations would occur on the Proposed Project-related 220 kV facilities and would include replacement of disconnect switches, circuit breakers, foundations, and reconductoring line positions. Work at Etiwanda Substation would occur within the existing Mechanical and Electrical Equipment Room ("MEER") and include installation of new protection relay equipment. Work at Tennessee and Timoteo Substations would include replacement of 66 kV circuit breakers and foundations.

All substation-related work would be conducted within the existing substation walls or fence lines. Based on the limited substation project scope, there are no opportunities to reduce EMF for the substation work. Therefore this FMP does not further analyze the substation work of the Proposed Project.

66 kV Subtransmission Lines

The Proposed Project would require relocation of portions of the existing San Bernardino-Redlands-Timoteo and the San Bernardino-Redlands-Tennessee 66 kV subtransmission lines located within Segment 1 to new routes within existing ROW or franchise, or newly acquired ROW.[42] These two existing 66 kV subtransmission lines are currently located on approximately nine double-circuit lattice steel towers ("LSTs") and 28 double-circuit wood poles that would be removed from the existing Segment 1 ROW.

San Bernardino-Redlands-Timoteo 66 kV Subtransmission Line Route

A portion of the existing San Bernardino-Redlands-Timoteo 66 kV Subtransmission Line would be removed and relocated outside of the existing WOD corridor.

The relocated single-circuit San Bernardino-Redlands-Timoteo 66 kV Subtransmission Line would connect to the existing San Bernardino Substation. The relocated 66 kV subtransmission line would exit San Bernardino Substation on existing poles and then transition underground to the east for approximately 800 feet within a new duct bank requiring the installation of two new vaults. The relocated 66 kV subtransmission line would then rise to an

42 The relocated subtransmission facilities would be outside of the existing 220 kV ROW but generally within the vicinity of the geographic area defined as Segment 1.

overhead position via a tubular steel pole ("TSP") riser pole that would be located along West San Bernardino Avenue. From the TSP riser pole, the 66 kV subtransmission line would transition to the south side of San Bernardino Avenue and extend approximately 1,350 feet along San Bernardino Avenue in a double-circuit configuration with the existing Calectric-Homart-Mentone 115 kV line. This portion of the line would extend to the corner of Marigold Avenue and would include the installation of approximately three TSPs, nine LWS/wood poles, and the removal of six wood poles. The 66 kV subtransmission line would then extend south for approximately 1,350 feet along a private property line to Almond Avenue and would include the installation of approximately one TSP and eight LWS/wood poles. The 66 kV subtransmission line would then extend west on Almond Avenue for approximately 600 feet. This portion of the subtransmission line would include the installation of approximately one TSP and four new LWS/wood poles. The 66 kV subtransmission line would extend south for 1,250 feet along an existing property line to Lugonia Avenue. This portion of the subtransmission line would include the installation of approximately one TSP and seven new LWS/wood poles. From this location, the 66 kV subtransmission line would proceed south overbuilt with existing distribution for about 1,200 feet to Interstate 10. This portion of the subtransmission line would include the installation of approximately one TSP and seven new LWS/wood poles. In order to accommodate the crossing of Interstate 10, the new 66 kV subtransmission line would require the installation of two new TSPs. From the south side of Interstate 10, the subtransmission line would extend south along Bryn Mawr Avenue for approximately 1,200 feet on approximately five new LWS/wood poles and would then transition from overhead to underground via a TSP riser pole. The 66 kV subtransmission line would be located underground for approximately 3,200 feet from the TSP riser pole, south along a portion of Bryn Mawr Avenue (includes installation of one vault), and east along Redlands Boulevard (includes installation of one vault). Then it reaches an alley where it would proceed south (includes installation of one vault) and then west along the alley (includes installation of one vault) until it reaches Mountain View Avenue, where it would then rise to an overhead position via a TSP riser and extend overhead south for 160 feet to connect to the existing Timoteo Substation. This portion of the subtransmission line would include three LWS/wood poles.

In summary, the relocated single-circuit San Bernardino-Redlands-Timoteo 66 kV Subtransmission Line would be approximately 2 miles in length, constructed within new ROW or existing franchise[43] and would include the following components:

- Installation of approximately 51 subtransmission LWS or wood poles, with associated guying, and approximately 11 TSPs;
- Installation of approximately 4,000 circuit feet of 3,000 kcmil underground conductor, approximately seven vaults (10 feet × 20 feet × 11feet) and approximately 4,000 feet of new duct bank;
- Installation of approximately 7,100 circuit feet of 954 Stranded Aluminum Conductor ("SAC") overhead conductor ; and
- Removal of six wood poles.

43 Franchise is a right or privilege conferred by agreement between SCE and local jurisdictions.

San Bernardino-Redlands-Tennessee 66 kV Subtransmission Line Route

A portion of the San Bernardino-Redlands-Tennessee 66 kV Subtransmission Line would be removed and relocated outside of the existing WOD corridor.

The relocated single-circuit San Bernardino-Redlands-Tennessee 66 kV Subtransmission Line would connect to the existing San Bernardino Substation. The relocated 66 kV subtransmission line would exit San Bernardino Substation on existing poles and then transition underground to the east for approximately 800 feet in a new duct bank requiring the installation of two new vaults. The relocated 66 kV subtransmission line would then rise to an overhead position via a TSP riser pole that would be located along West San Bernardino Avenue. From the TSP riser pole, the 66 kV subtransmission line would extend approximately 1,350 feet along San Bernardino Avenue to the corner of Marigold Avenue and would include the installation of approximately one TSP and nine LWS/wood poles. The 66 kV subtransmission line would then continue east along the south side of West San Bernardino Avenue in a double circuit configuration with the Calectric-Homart-Mentone 115 kV line for approximately 4,700 feet on approximately 26 LWS/wood poles and two TSPs to Nevada Street. The 66 kV subtransmission line would then extend south on Nevada Avenue for approximately 3,800 feet on approximately 21 LWS/wood poles and four TSPs to Interstate 10. In order to accommodate the crossing of Interstate 10, the new 66 kV subtransmission line would require the installation of 3 new TSPs. From the south side of Interstate 10, the subtransmission line would extend south along Nevada Street for approximately 4,000 feet on approximately 20 LWS/wood poles and 2 TSPs to Citrus Avenue. The 66 kV subtransmission line would then extend east on Citrus Avenue for approximately 1,300 feet on approximately 11 LWS/wood poles and 1 TSP to Iowa Avenue. From Iowa Avenue, the 66 kV subtransmission line would extend south along Iowa Avenue for 2,700 feet on approximately 16 LWS/wood poles and 1 TSP where it would connect to the existing San Bernardino-Redlands-Tennessee 66 kV Subtransmission Line.

In summary, the relocated single-circuit San Bernardino-Redlands-Tennessee 66 kV Subtransmission Line would be approximately 3.5 miles in length, constructed within new ROW or existing franchise and would include the following components:

- Installation of approximately 103 subtransmission LWS or wood poles, with associated guying, and approximately 15 TSPs;
- Installation of approximately 800 circuit feet of 3,000 kcmil underground conductor, approximately two vaults (10 feet × 20 feet × 11 feet) and approximately 800 feet of new duct bank;
- Installation of approximately 18,480 of circuit feet 954 SAC overhead conductor ; and
- Removal of 19 wood poles.

Additional minor subtransmission relocations and associated work may be required after the completion of final engineering of the 220 kV upgrades. The exact locations and extent of such work is not known at this time.

66 kV Subtransmission Underground

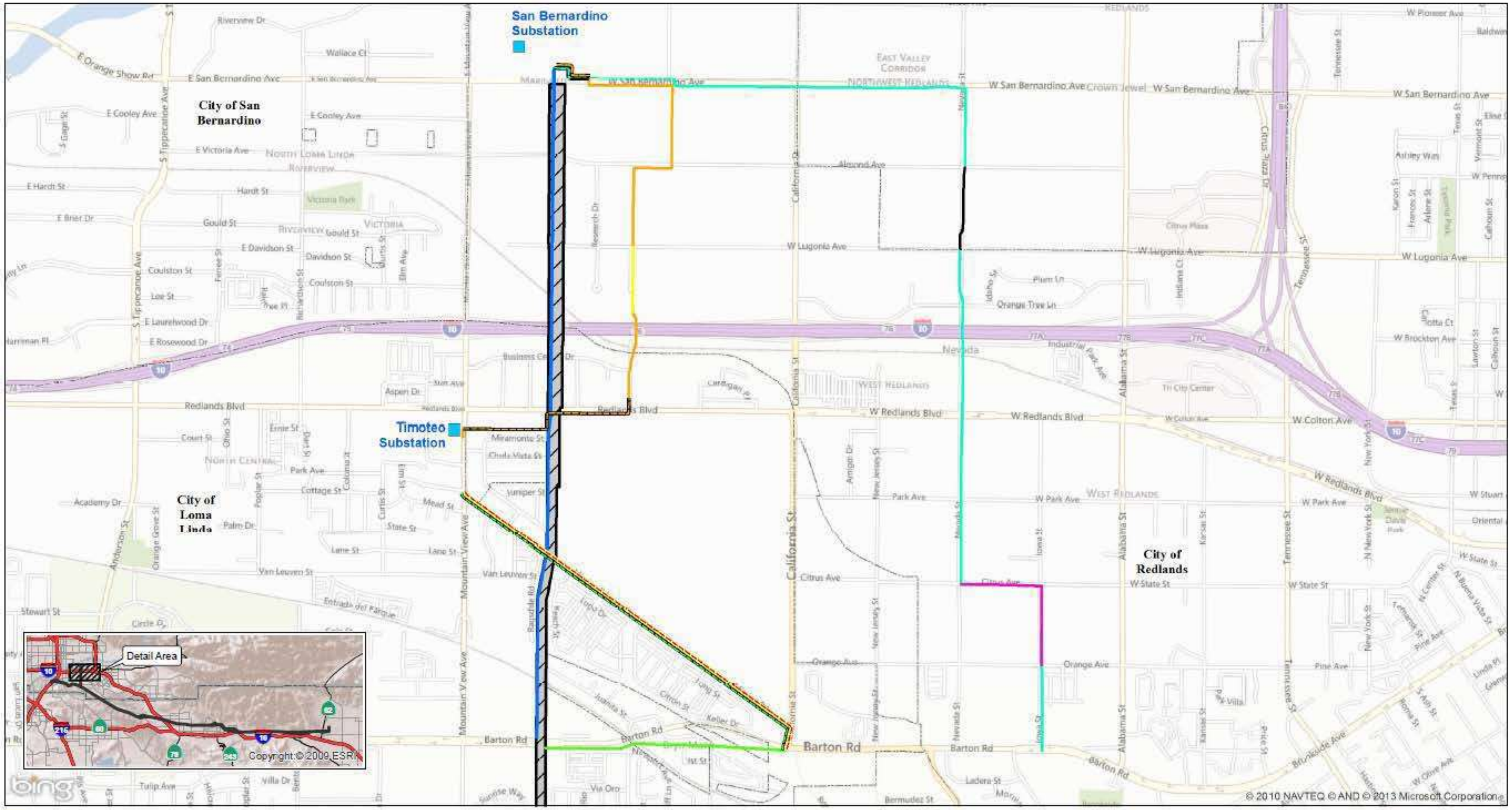
Underground 66 kV subtransmission facilities would be installed from San Bernardino Substation for approximately 800 feet along West San Bernardino Avenue to accommodate both the San Bernardino-Redlands-Timoteo 66 kV Subtransmission Line relocation and the San Bernardino-Redlands-Tennessee 66 kV Subtransmission Line relocation. The underground 66 kV subtransmission facilities portion of the San Bernardino-Redlands-Timoteo 66 kV Subtransmission Line route near Timoteo Substation would be approximately 3,100 feet from Bryn Mawr Avenue to Mountain View Avenue. The final determination on the number of required underground subtransmission vaults would be determined during final engineering; however, nine vaults have been estimated for purposes of the project description.

Trenches approximately 20–24 inches wide by a minimum of 63 inches deep would be required for installation of underground facilities. Following completion of trench excavation, duct banks would be installed in the trench, including conduit, spacers, ground wire, and concrete encasement. The duct bank typically consists of six 5-inch diameter polyvinyl chloride ("PVC") conduits fully encased with a minimum of 3 inches of concrete all around. Typical subtransmission (66 kV) duct bank installations would accommodate six cables. The Proposed Project would utilize all six conduits for the first 800 feet (at San Bernardino Substation) and, for the remaining 2,300 feet, only three conduits would be utilized (near Timoteo Substation), leaving three spare conduits for any potential future circuit. The subtransmission duct banks would typically be installed in a vertically stacked configuration and each duct bank would be approximately 21 inches high by 20 inches wide.

Vaults are below-grade concrete enclosures that would be installed where the duct banks terminate. The inside dimensions of the underground vaults would be approximately 10 feet wide by 20 feet long with an inside height of 9.5 feet. The vaults would be placed no more than 1,500 feet apart along the proposed underground route. TSP riser poles would be located at the ends of each underground segment, at which the cables would transition from the underground duct bank to the overhead pole. The transition structure would support cable terminations, lightning arresters, and dead-end hardware for overhead conductors.

Figure 2 depicts the overview of the subtransmission relocation routes.

Figure 2. West of Devers Upgrade Project Subtransmission Relocation



SOUTHERN CALIFORNIA EDISON

LEGEND

Transmission Line Right-of-Way

Substations

Relocated 66kV Subtransmission Line Routes

- Proposed SB-Redlands-Tennessee OH 66kV
- Proposed SB-Redlands-Timoteo OH 66kV

Relocated 66kV Subtransmission Line Routes

- Proposed SB-Redlands-Tennessee UG 66kV
- Proposed SB-Redlands-Timoteo UG 66kV
- Existing SB-Redlands-Tennessee OH 66kV and SB-Redlands-Timoteo OH 66kV to be Removed

Relocated 12kV Distribution Line Routes

- Location 1: Removal of 12kV and Relocation on New 66kV Structure
- Location 2: Removal of 12kV and Relocation on New 66kV Structure
- Location 3: Removal of 12kV and Relocation on New 66kV Structure
- Location 4: Underground System (Dental 12kV Circuit)

Relocated 12kV Distribution Line Routes

- Location 5 : Relocation of 12kV on Existing 66kV Structures
- Location 5: Underground System (Intern 12kV Circuit)

0 750 1500 FEET

SOURCE: Bing Maps (c.2010); SCE (5/2012, 2/2013)

Southern California Edison
West of Devers Upgrade Project

Relocated Subtransmission and Distribution Line Routes Description

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 transmission 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 three parts:

- Part 1 - Proposed Substation Work
- Part 2 - Proposed 220 kV Transmission Line Work
- Part 3 - Proposed 66 kV Subtransmission Line Work

Part 1 - Proposed Substation Work

All the substation work for the Proposed Project would not impact EMF exposure to areas outside of substation property lines of any substations in this project. Therefore, this FMP does not further evaluate the substation portion of the work.

Part 2 - Proposed 220 kV Transmission Line Work

Segment 1

For the purpose of EMF analysis, four EMF computer models were utilized in populated areas to determine the best EMF reduction measures for Segment 1.

<u>Segment 1 – Model 1</u>

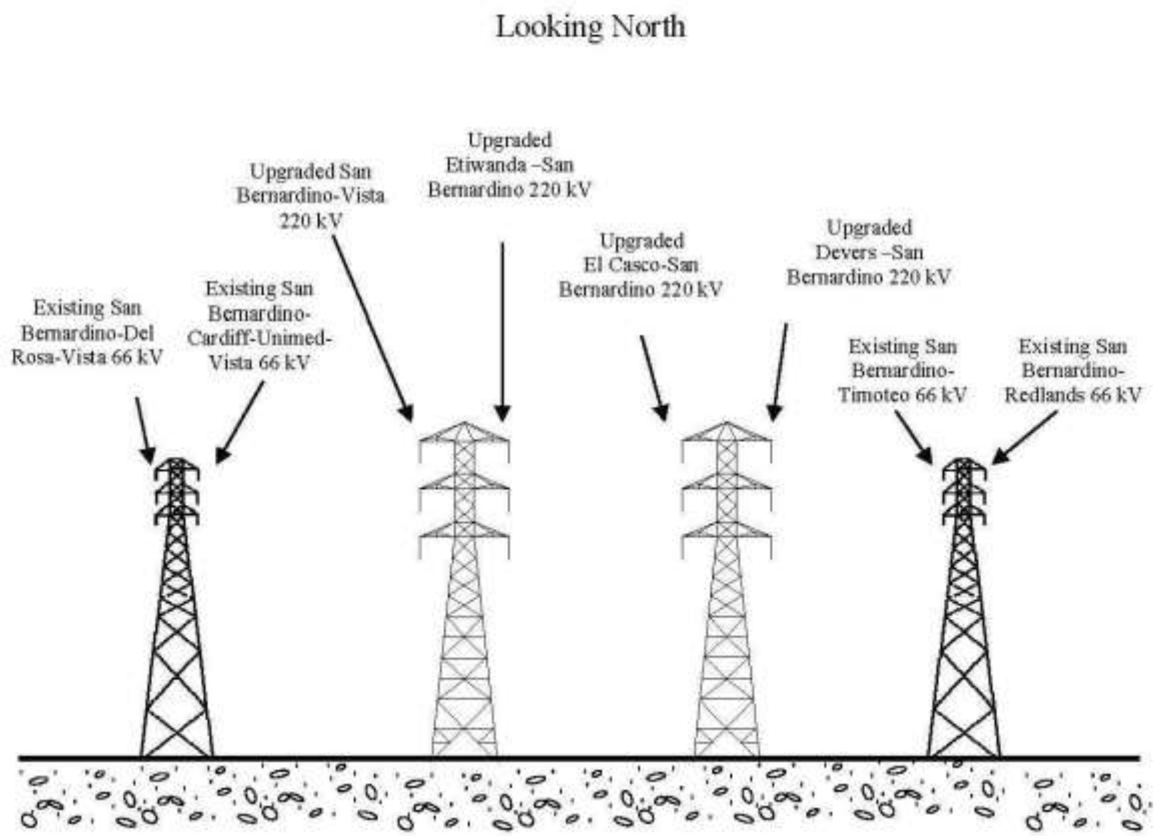
Segment 1 Model 1 analyzes the section of existing and proposed SCE ROW designs from San Bernardino Substation to West Lugonia Avenue in the City of Redlands. The proposed typical design for this section is shown in Figure 3. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 245-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to commercial/industrial area.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 3. Proposed 220 kV Structures Design - Segment 1 Model 1[44]



Magnetic Field Calculations: Figure 4 and Table 2 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

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44 Figure is not to scale.

Figure 4. Calculated Magnetic Field Levels[45] for Segment 1 Model 1 Proposed 220 kV Line Upgrade (Looking North)

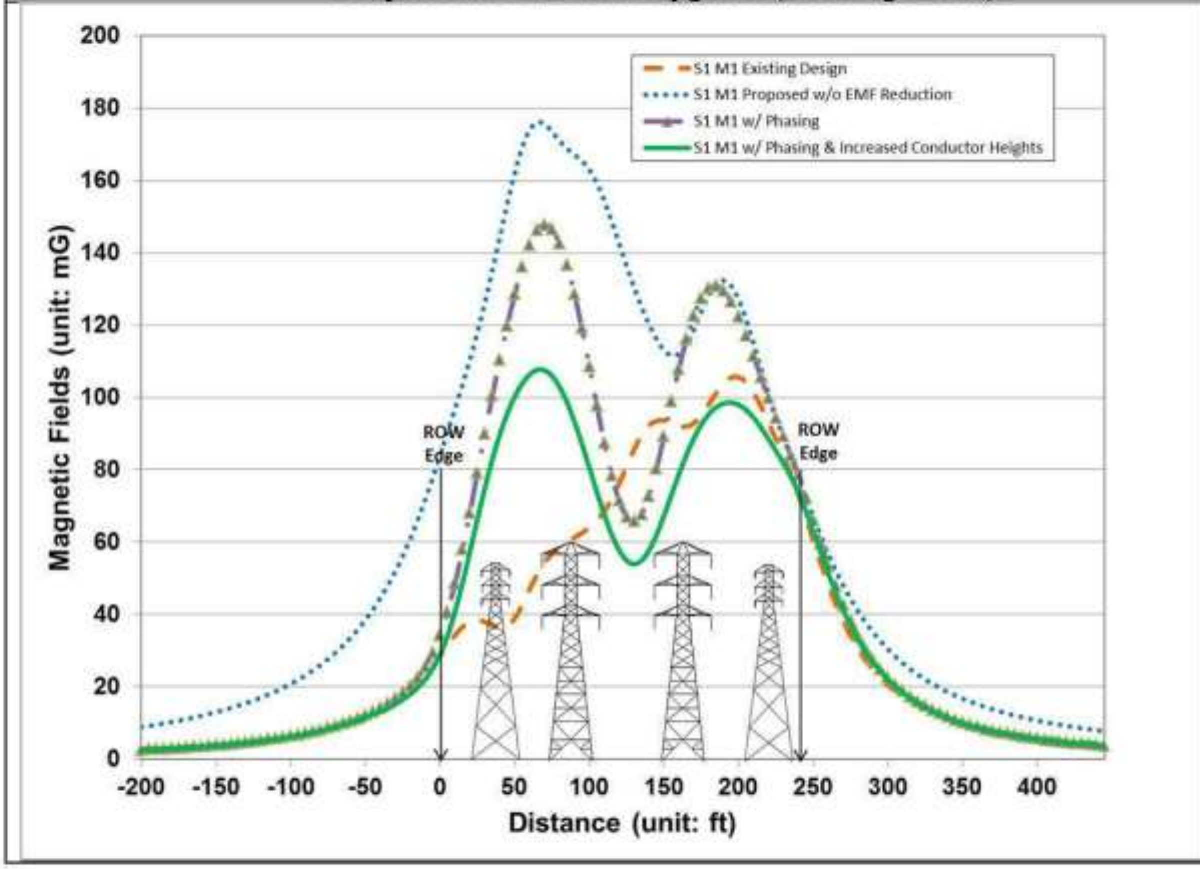


Table 2. Calculated Magnetic Field Levels[46] for Segment 1 Model 1

Design Options	West Edge of ROW (mG)	% Reduction[47]	East Edge of ROW (mG)	% Reduction
Existing	28.5	-	67.0	-
Proposed w/o EMF Reduction	83.9	-	72.5	-
Proposed w/ Phasing	34.4	59.0	72.4	0.1
Proposed w/ Phasing & Increased Conductor Heights	29.0	15.7	68.6	5.2

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

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

47 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 1 Model 1: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 1 – Model 2

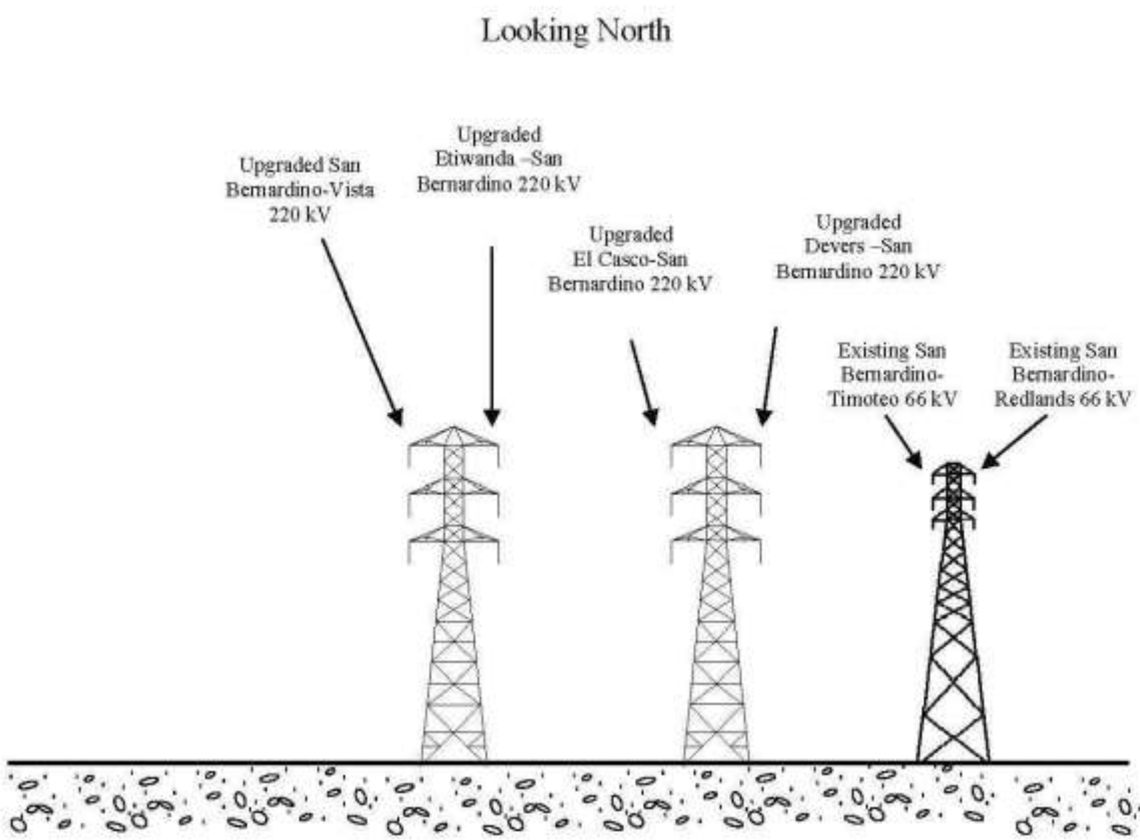
Segment 1 Model 2 analyzes the section of existing and proposed SCE ROW designs from West Lugonia Avenue to Redlands Boulevard in the City of Redlands. The proposed typical design for this section is shown in Figure 5. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 225-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to commercial/industrial area.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 5. Proposed 220 kV Structures Design - Segment 1 Model 2[48]



Magnetic Field Calculations: Figure 6 and Table 3 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[48] Figure is not to scale.

Figure 6. Calculated Magnetic Field Levels[49] for Segment 1 Model 2 Proposed 220 kV Line Upgrade (Looking North)

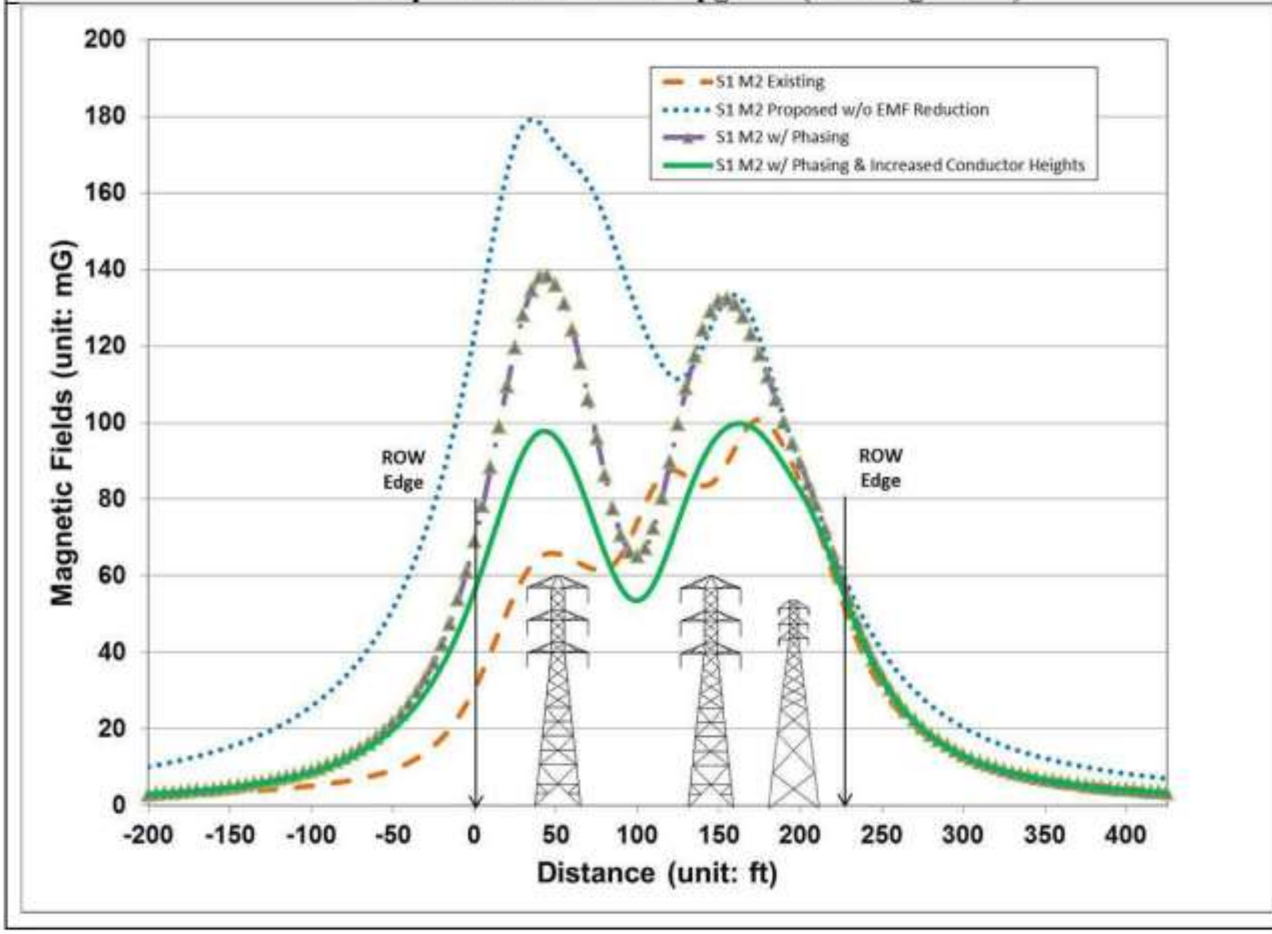


Table 3. Calculated Magnetic Field Levels[50] for Segment 1 Model 2

Design Options	West Edge of ROW (mG)	% Reduction[51]	East Edge of ROW (mG)	% Reduction
Existing	30.5	-	54.1	-
Proposed w/o EMF Reduction	123.0	-	61.5	-
Proposed w/ Phasing	69.2	43.7	59.6	3.1
Proposed w/ Phasing & Increased Conductor Heights	56.1	18.9	57.1	4.2

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

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

51 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 1 Model 2: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 1 – Model 3

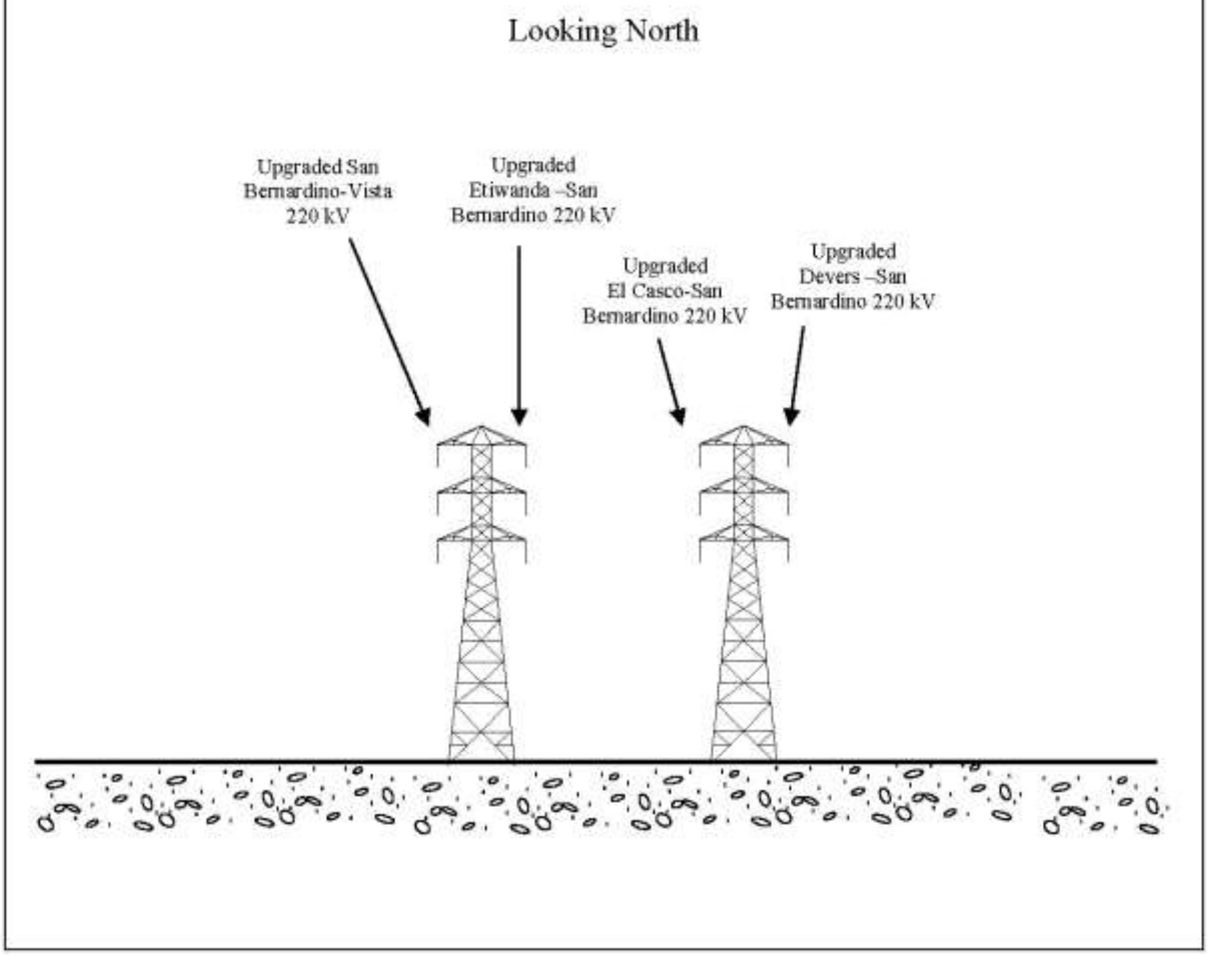
Segment 1 Model 3 analyzes the section of existing and proposed SCE ROW designs from Redlands Boulevard to Barton Road in the City of Redlands and Loma Linda. The proposed typical design for this section is shown in Figure 7. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 150-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential, commercial/industrial, and agricultural areas.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 7. Proposed 220 kV Structures Design - Segment 1 Model 3[52]



Magnetic Field Calculations: Figure 8 and Table 4 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[52] Figure is not to scale.

Figure 8. Calculated Magnetic Field Levels[53] for Segment 1 Model 3 Proposed 220 kV Line Upgrade (Looking North)

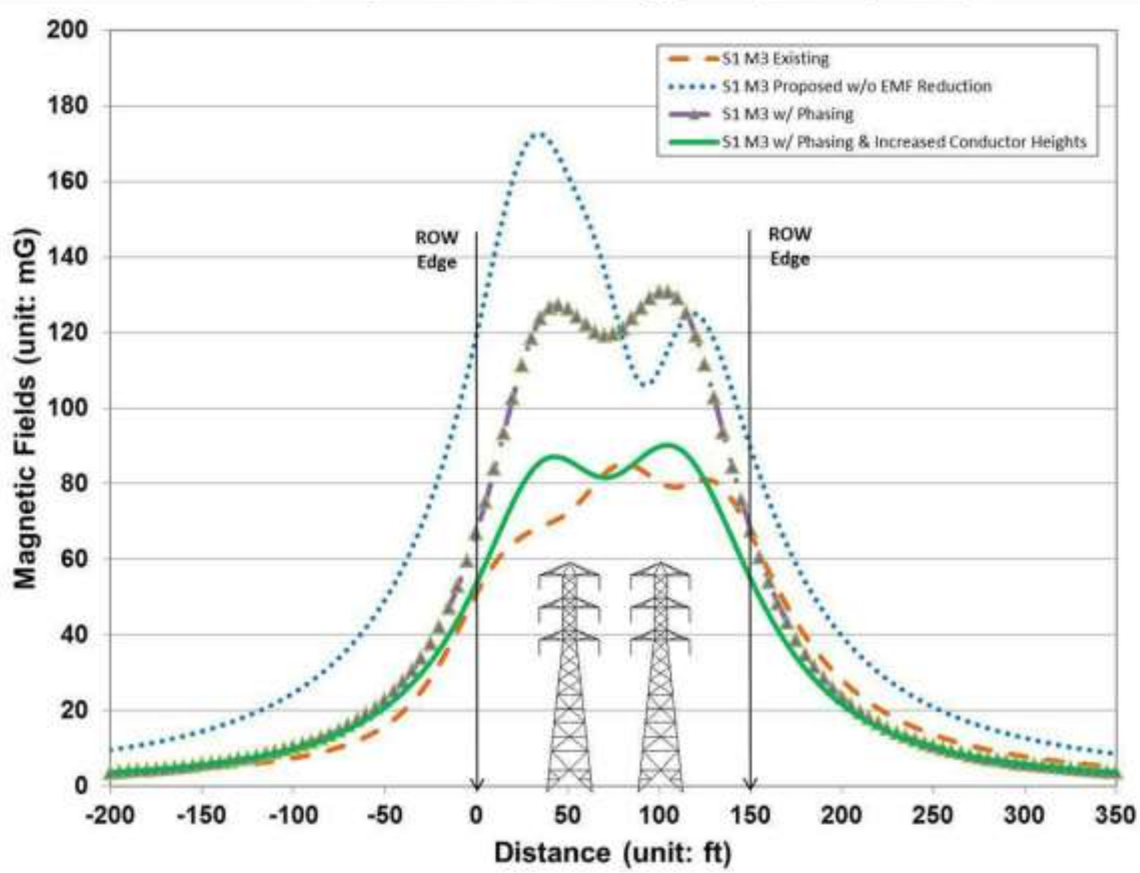


Table 4. Calculated Magnetic Field Levels[54] for Segment 1 Model 3				
Design Options	West Edge of ROW (mG)	% Reduction[55]	East Edge of ROW (mG)	% Reduction
Existing	50.9	-	66.7	-
Proposed w/o EMF Reduction	119.2	-	89.4	-
Proposed w/ Phasing	67.0	43.8	67.8	24.2
Proposed w/ Phasing & Increased Conductor Heights	53.6	20.0	54.9	19.0

[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.

[55] "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 1 Model 3: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 1 – Model 4

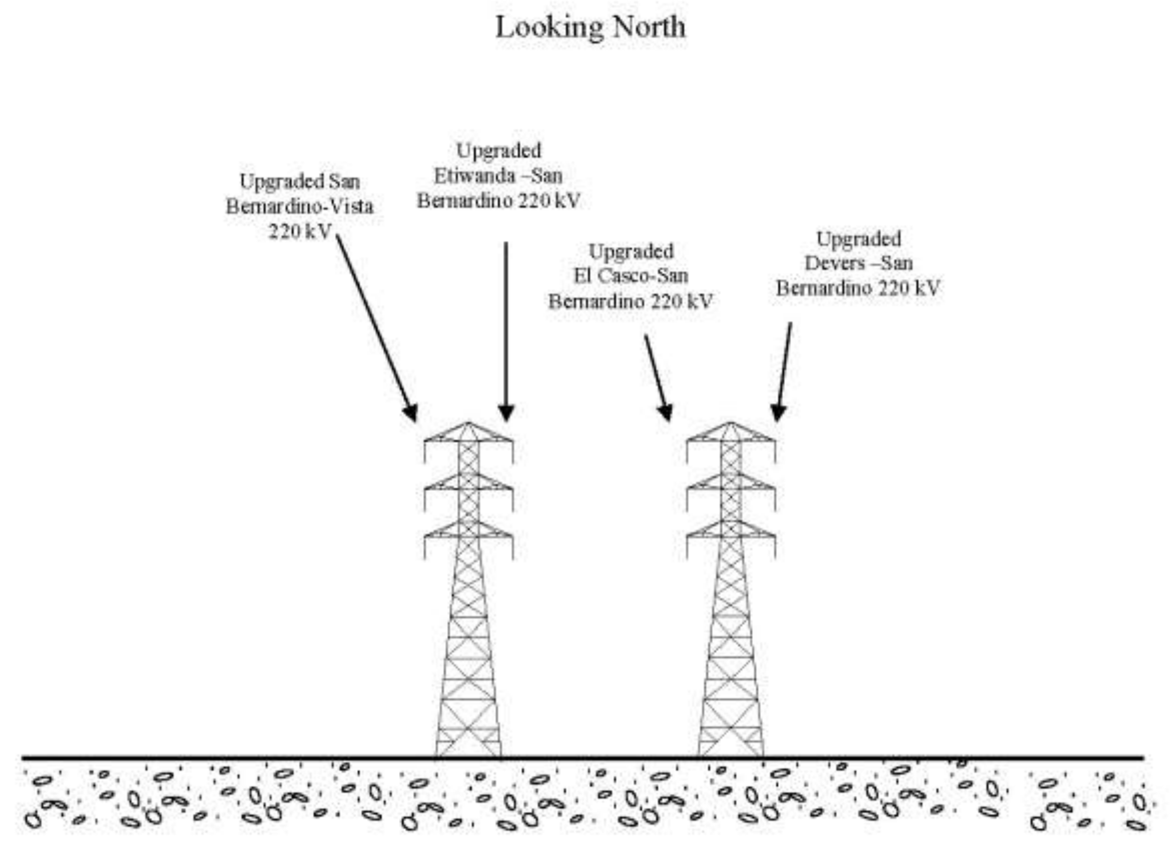
Segment 1 Model 4 analyzes the section of existing and proposed SCE ROW designs from Barton Road to the San Bernardino Junction in the City of Loma Linda. The proposed typical design for this section is shown in Figure 9. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 150-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential, commercial/industrial, and agricultural area.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 9. Proposed 220 kV Structures Design - Segment 1 Model 4[56]



Magnetic Field Calculations: Figure 10 and Table 5 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[56] Figure is not to scale.

Figure 10. Calculated Magnetic Field Levels[57] for Segment 1 Model 4 Proposed 220 kV Line Upgrade (Looking North)

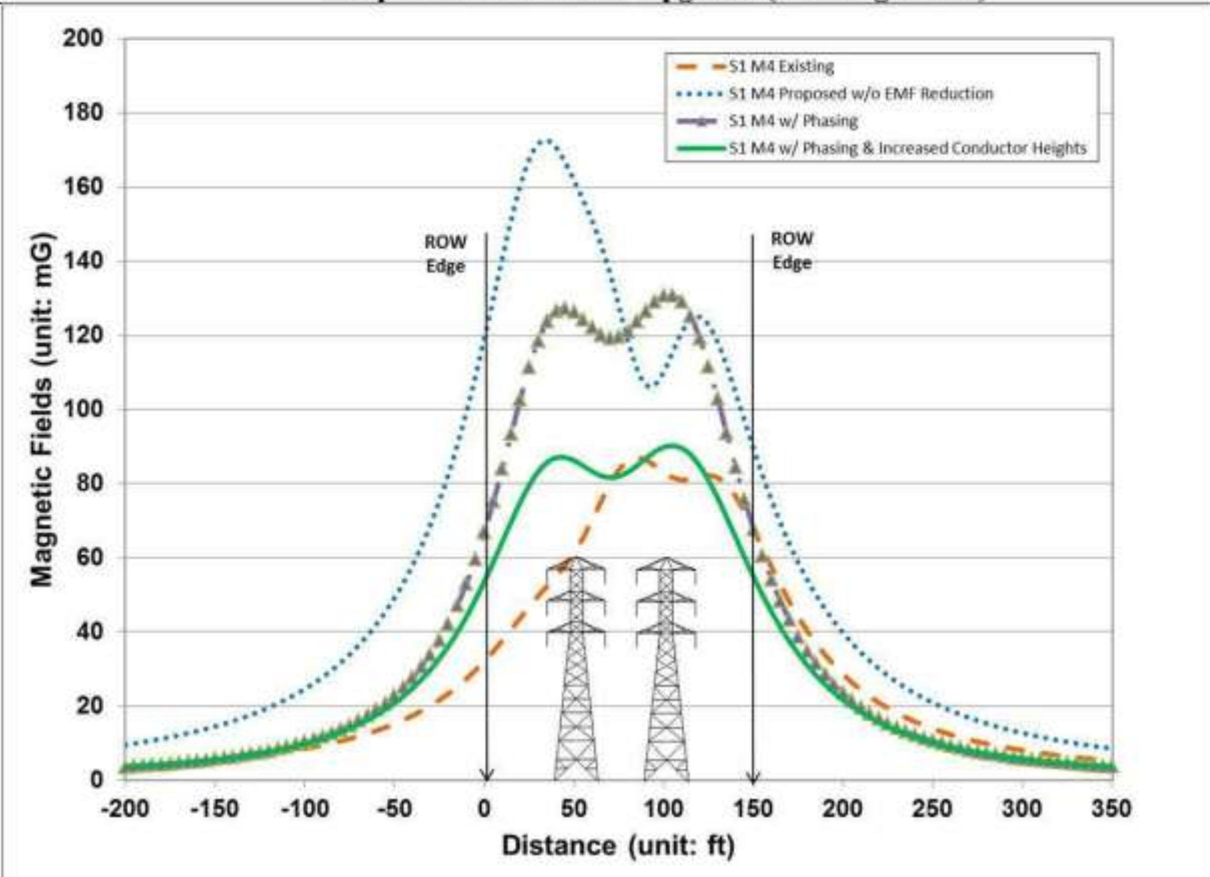


Table 5. Calculated Magnetic Field Levels[58] for Segment 1 Model 4

Design Options	West Edge of ROW (mG)	% Reduction[59]	East Edge of ROW (mG)	% Reduction
Existing	32.1	-	67.6	-
Proposed w/o EMF Reduction	119.2	-	89.4	-
Proposed w/ Phasing	67.0	43.8	67.8	24.2
Proposed w/ Phasing & Increased Conductor Heights	53.6	20.0	54.9	19.0

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

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

59 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 1 Model 4: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 2

For the purpose of EMF analysis, two EMF computer models in populated areas were utilized to determine the best EMF reduction measures for Segment 2.

Segment 2 – Model 1

Segment 2 Model 1 analyzes the section of existing and proposed SCE ROW design near Barton Road and East Hilltop Drive in the City of Grand Terrace, California. The proposed typical design for this section is shown in Figure 11. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 115-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential area.

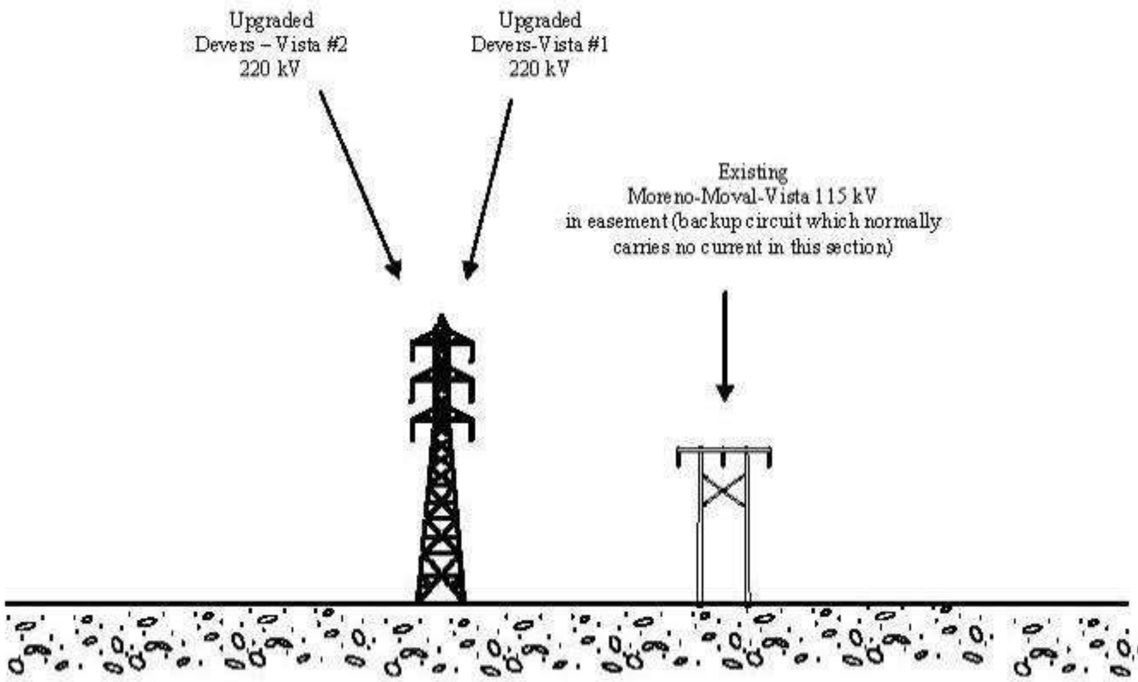
No-Cost Field Reduction Measures: The proposed design for this section includes the following no-cost field reduction measures:

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 11. Proposed 220 kV Structures Design - Segment 2 Model 1[60]

Looking East



Magnetic Field Calculations: Figure 12 and Table 6 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

60 Figure is not to scale.

Figure 12. Calculated Magnetic Field Levels[61] for Segment 2 Model 1 Proposed 220 kV Line Upgrade (Looking East)

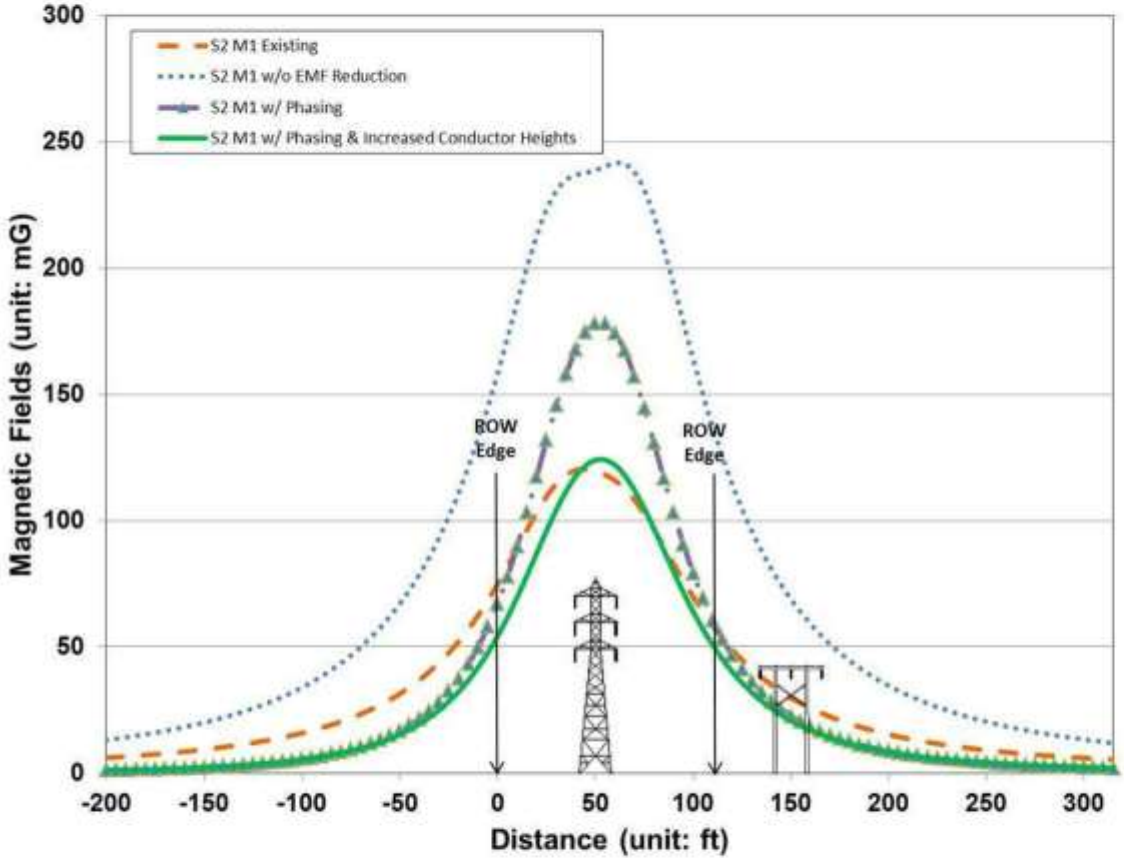


Table 6. Calculated Magnetic Field Levels[62] for Segment 2 Model 1				
Design Options	North Edge of ROW (mG)	% Reduction[63]	South Edge of ROW (mG)	% Reduction
Existing	74.8	-	53.4	-
Proposed w/o EMF Reduction	158.3	-	125.1	-
Proposed w/ Phasing	67.2	57.5	53.1	57.6
Proposed w/ Phasing & Increased Conductor Heights	54.3	19.2	45.1	15.1

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

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

63 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 2 Model 1: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 2 – Model 2

Segment 2 Model 2 analyzes the section of existing and proposed SCE ROW designs near South Lauralwood Avenue & South Walter Court in the City of Colton, California. The proposed typical design for this section is shown in Figure 13. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 450-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential and undeveloped areas.

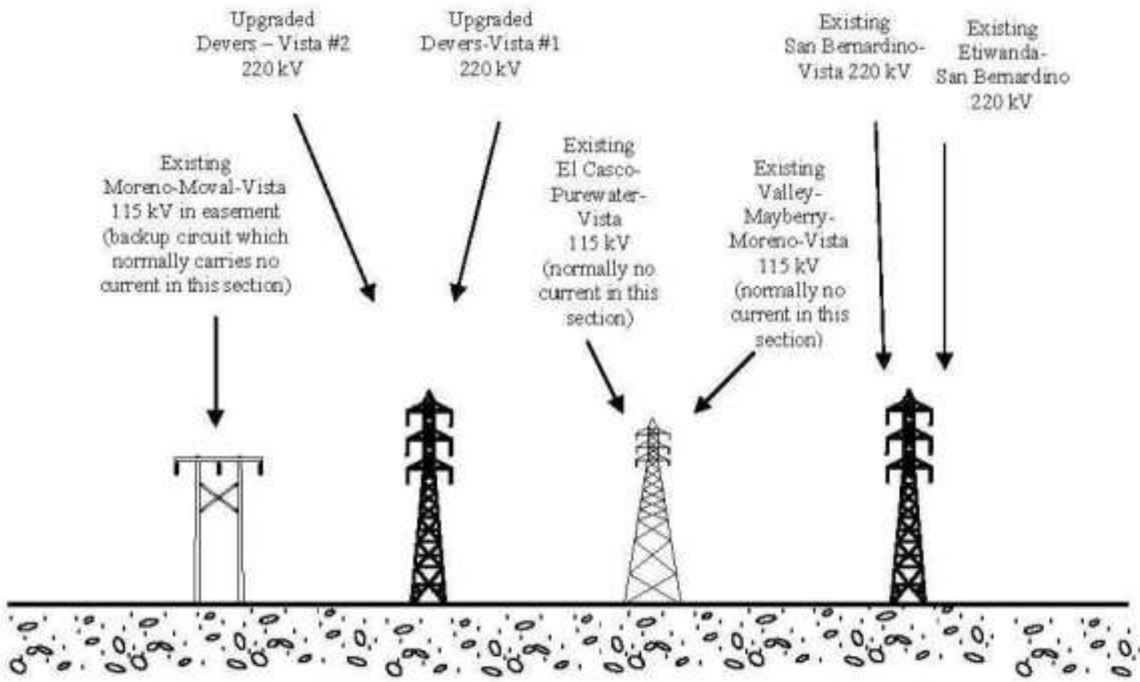
No-Cost Field Reduction Measures: The proposed design for this section includes the following no-cost field reduction measures:

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 13. Proposed 220 kV Structures Design - Segment 2 Model 2[64]

Looking East



Magnetic Field Calculations: Figure 14 and Table 7 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

64 Figure is not to scale.

Figure 14. Calculated Magnetic Field Levels[65] for Segment 2 Model 2 Proposed 220 kV Line Upgrade (Looking East)

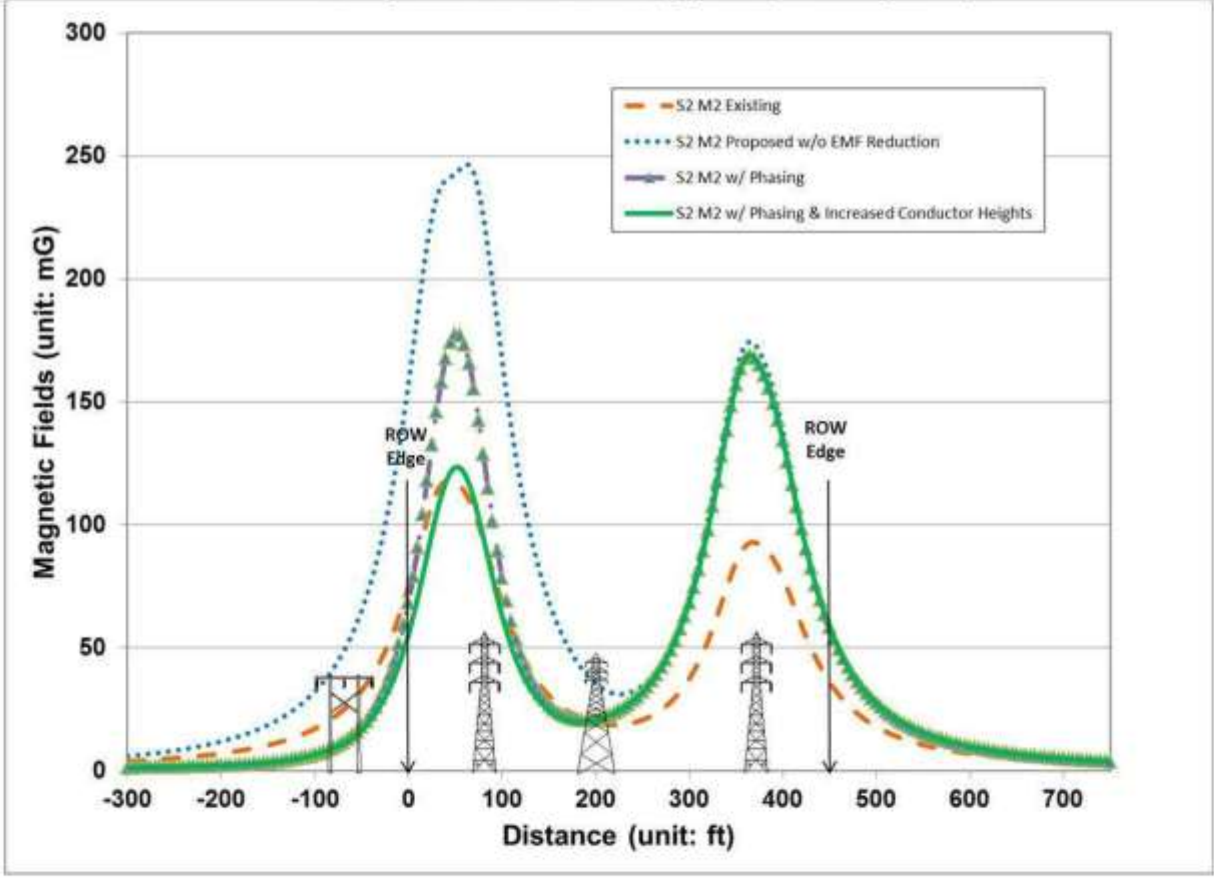


Table 7. Calculated Magnetic Field Levels[66] for Segment 2 Model 2

Design Options	North Edge of ROW (mG)	% Reduction[67]	South Edge of ROW (mG)	% Reduction
Existing	75.0	-	36.1	-
Proposed w/o EMF Reduction	157.6	-	56.5	-
Proposed w/ Phasing	68.5	56.5	58.3	Less than 15% increase
Proposed w/ Phasing & Increased Conductor Heights	55.5	19.0	58.4	Less than 15% increase

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

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

67 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 2 Model 2: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas as the proposed T/L would be located on the north side of the ROW.*

Segment 3

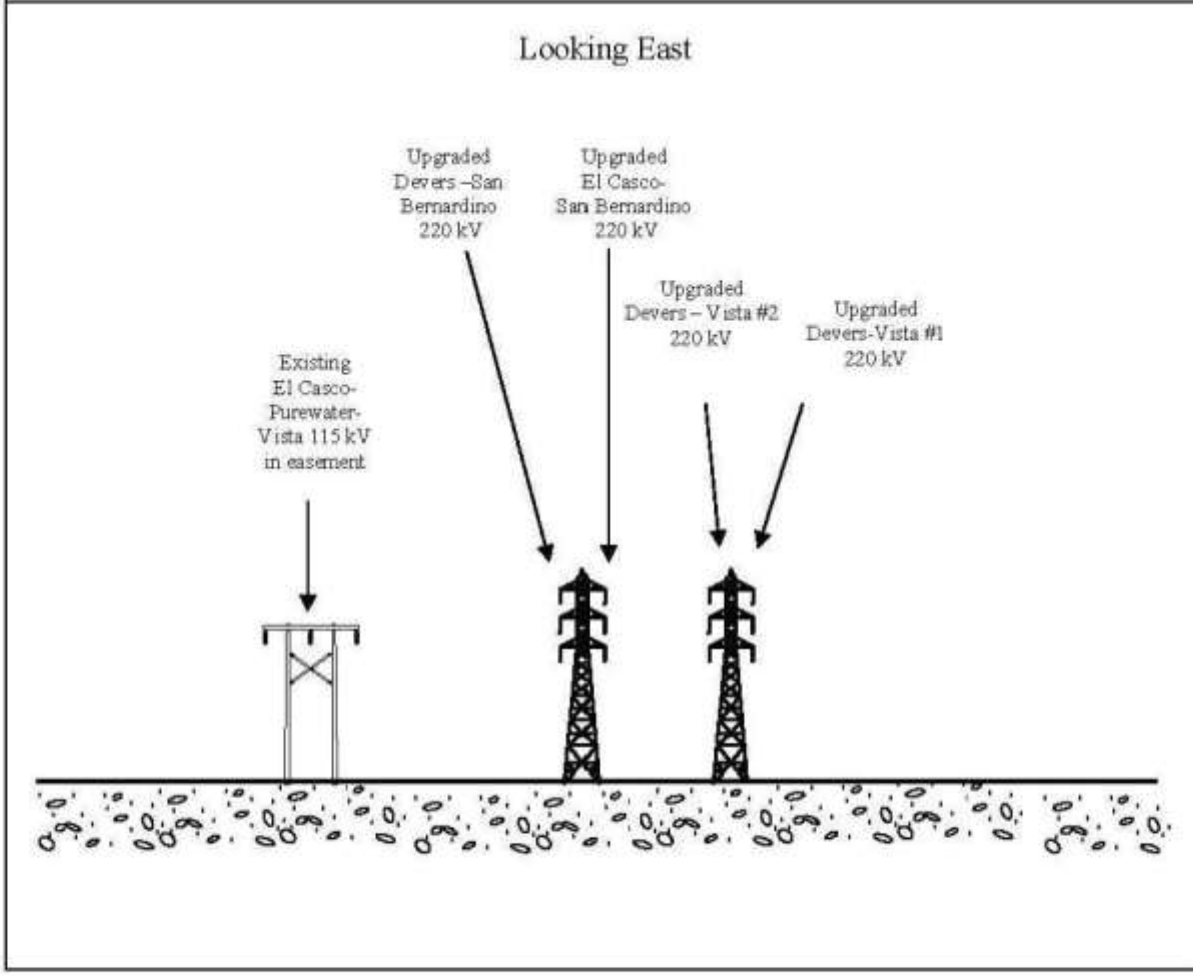
The Segment 3 model analyzes the section of existing and proposed SCE ROW designs south of Helena Street inside the Fisherman's Retreat in the City of Redlands, approximately 1.3 mile north-west of El Casco Substation. The proposed typical design for this section is shown in Figure 15. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 400-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to trailer-park residential, recreational, and undeveloped areas.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 15. Proposed 220 kV Structures Design - Segment 3[68]



Magnetic Field Calculations: Figure 16 and Table 8 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[68] Figure is not to scale.

Figure 16. Calculated Magnetic Field Levels[69] for Segment 3 Proposed 220 kV Line Upgrade (Looking East)

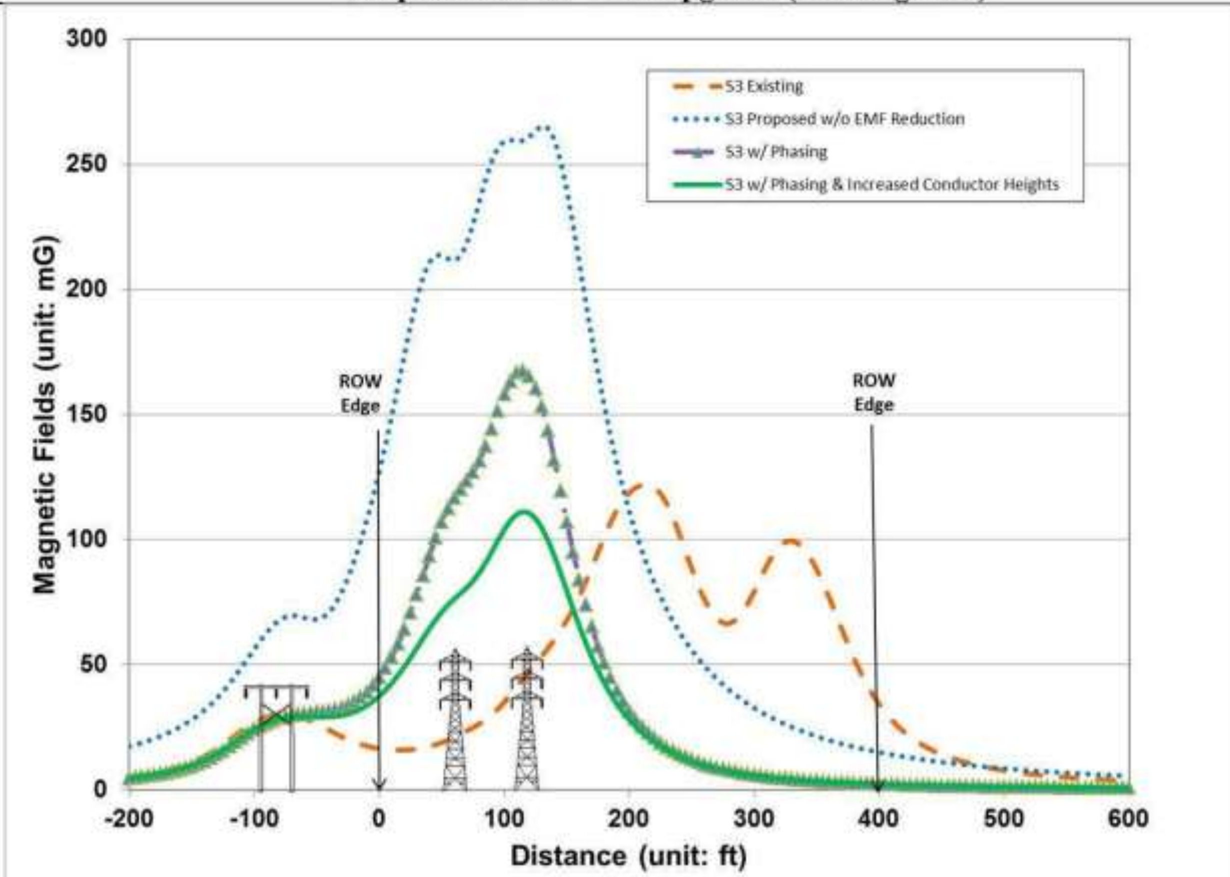


Table 8. Calculated Magnetic Field Levels[70] for Segment 3				
Design Options	North Edge of ROW (mG)	% Reduction[71]	South Edge of ROW (mG)	% Reduction
Existing	16.5	-	34.0	-
Proposed w/o EMF Reduction	127.5	-	15.0	-
Proposed w/ Phasing	44.9	64.8	2.3	84.7
Proposed w/ Phasing & Increased Conductor Heights	37.5	16.5	2.2	4.3

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

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

71 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 3: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 4

For the purpose of EMF analysis, two EMF computer models in populated areas were utilized to determine the best EMF reduction measures for Segment 4.

Segment 4 – Model 1

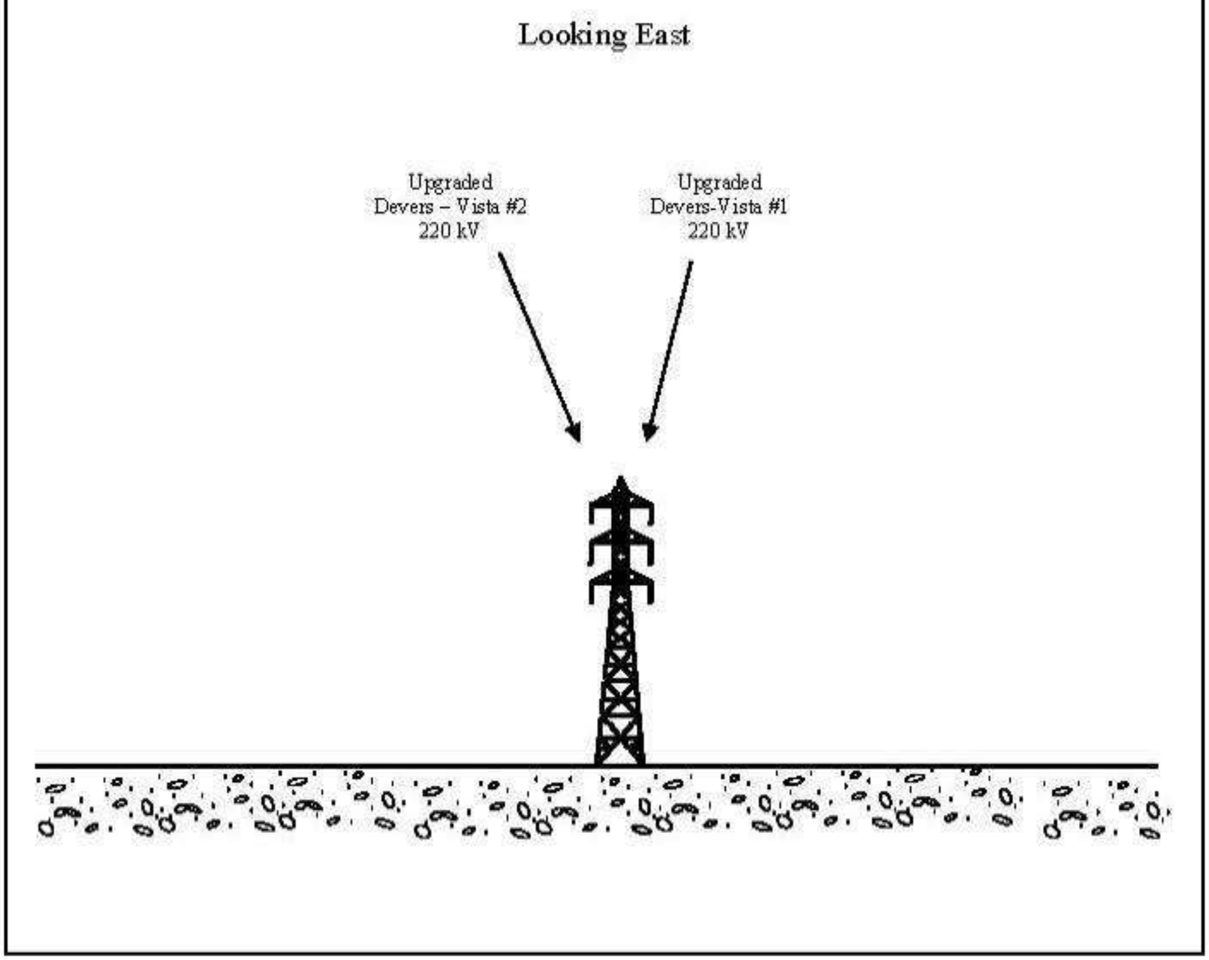
Segment 4 Model 1 analyzes the section of existing and proposed SCE ROW designs just east of El Casco Substation in existing SCE ROW north of the residential areas on the western limit of the City of Beaumont, California. This section is in the Devers-Vista No.1 and No.2 220 kV T/L ROW before it merges with the Devers-El Casco 220 kV T/L ROW further eastward. The proposed typical design for this section is shown in Figure 17. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 300-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential and undeveloped areas.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 17. Proposed 220 kV Structures Design - Segment 4 Model 1[72]



Magnetic Field Calculations: Figure 18 and Table 9 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

72 Figure is not to scale.

Figure 18. Calculated Magnetic Field Levels[73] for Segment 4 Model 1 Proposed 220 kV Line Upgrade (Looking East)

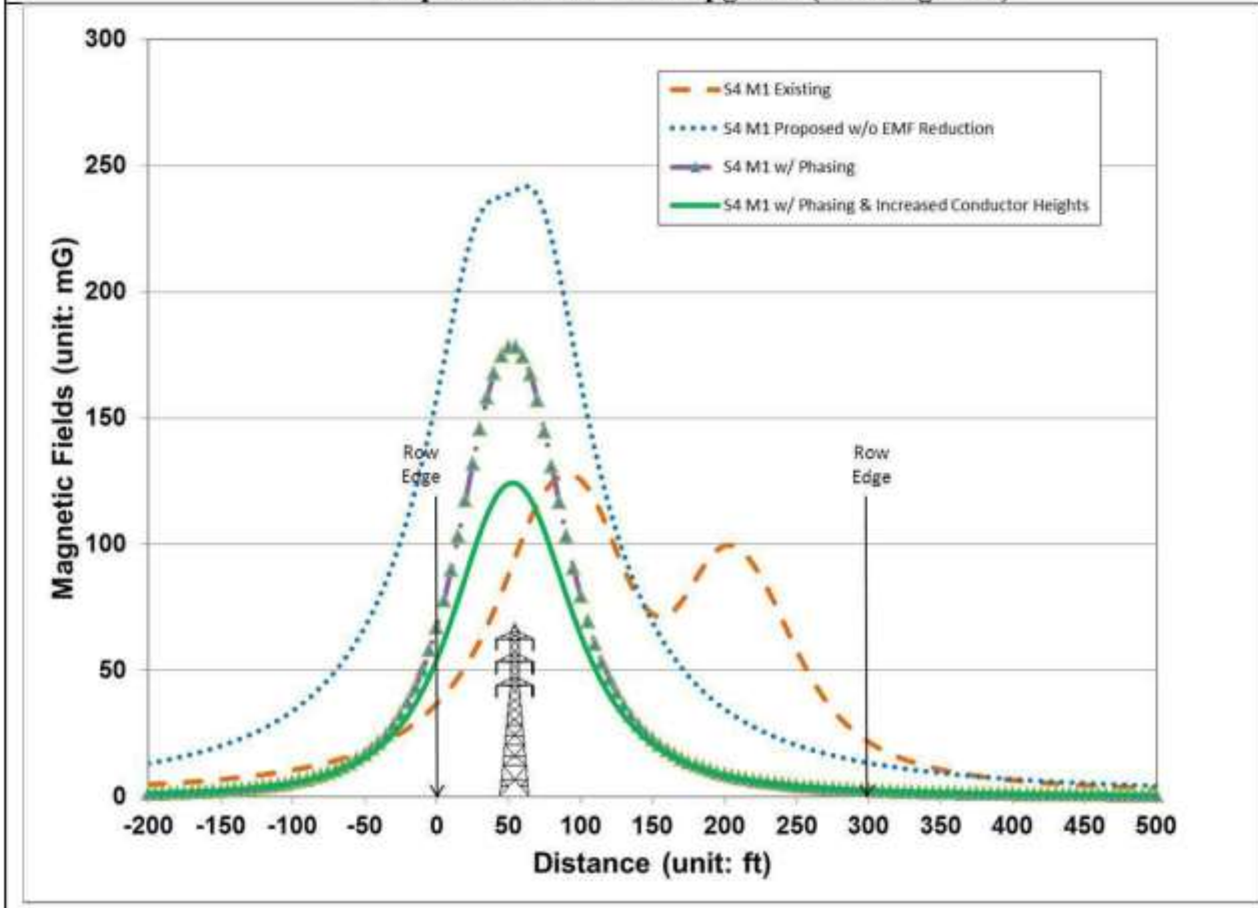


Table 9. Calculated Magnetic Field Levels[74] for Segment 4 Model 1

Design Options	North Edge of ROW (mG)	% Reduction[75]	South Edge of ROW (mG)	% Reduction
Existing	36.8	-	21.6	-
Proposed w/o EMF Reduction	158.3	-	13.3	-
Proposed w/ Phasing	67.2	57.5	2.4	82.0
Proposed w/ Phasing & Increased Conductor Heights	54.3	19.2	2.3	4.2

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

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

75 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 4 Model 1: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 4 – Model 2

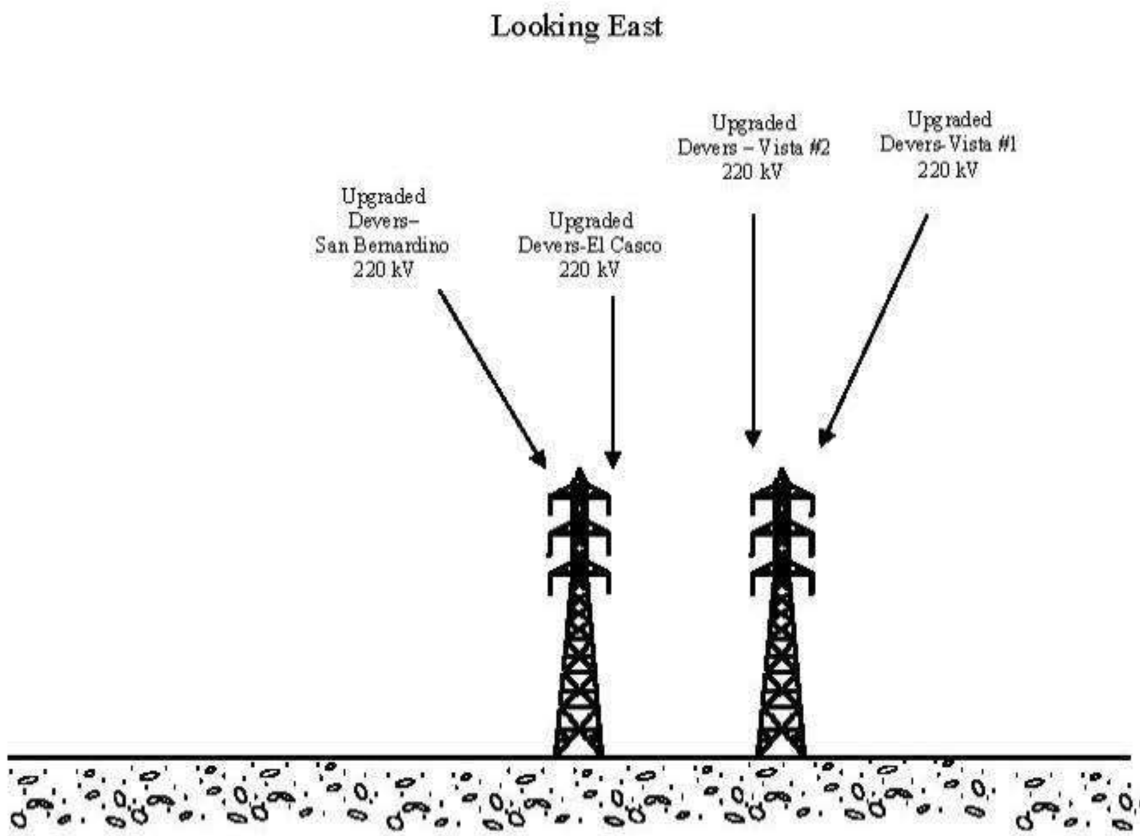
Segment 4 Model 2 analyzes the section of existing and proposed SCE ROW designs in the City of Beaumont and the City of Banning, California. This section is in the combined Devers-El Casco 220 kV T/L and the Devers-Vista No.1 and No.2 220 kV T/L ROWs. The proposed typical design for this section is shown in Figure 19. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 400-foot wide ROW. Presently, the San Gorgonio Middle School of Beaumont is immediately north of this section of the ROW. The proposed route for this section is adjacent to school, residential, commercial, recreational, and undeveloped areas.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 19. Proposed 220 kV Structures Design - Segment 4 Model 2[76]



Magnetic Field Calculations: Figure 20 and Table 10 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[76] Figure is not to scale.

Figure 20. Calculated Magnetic Field Levels[77] for Segment 4 Model 2 Proposed 220 kV Line Upgrade (Looking East)

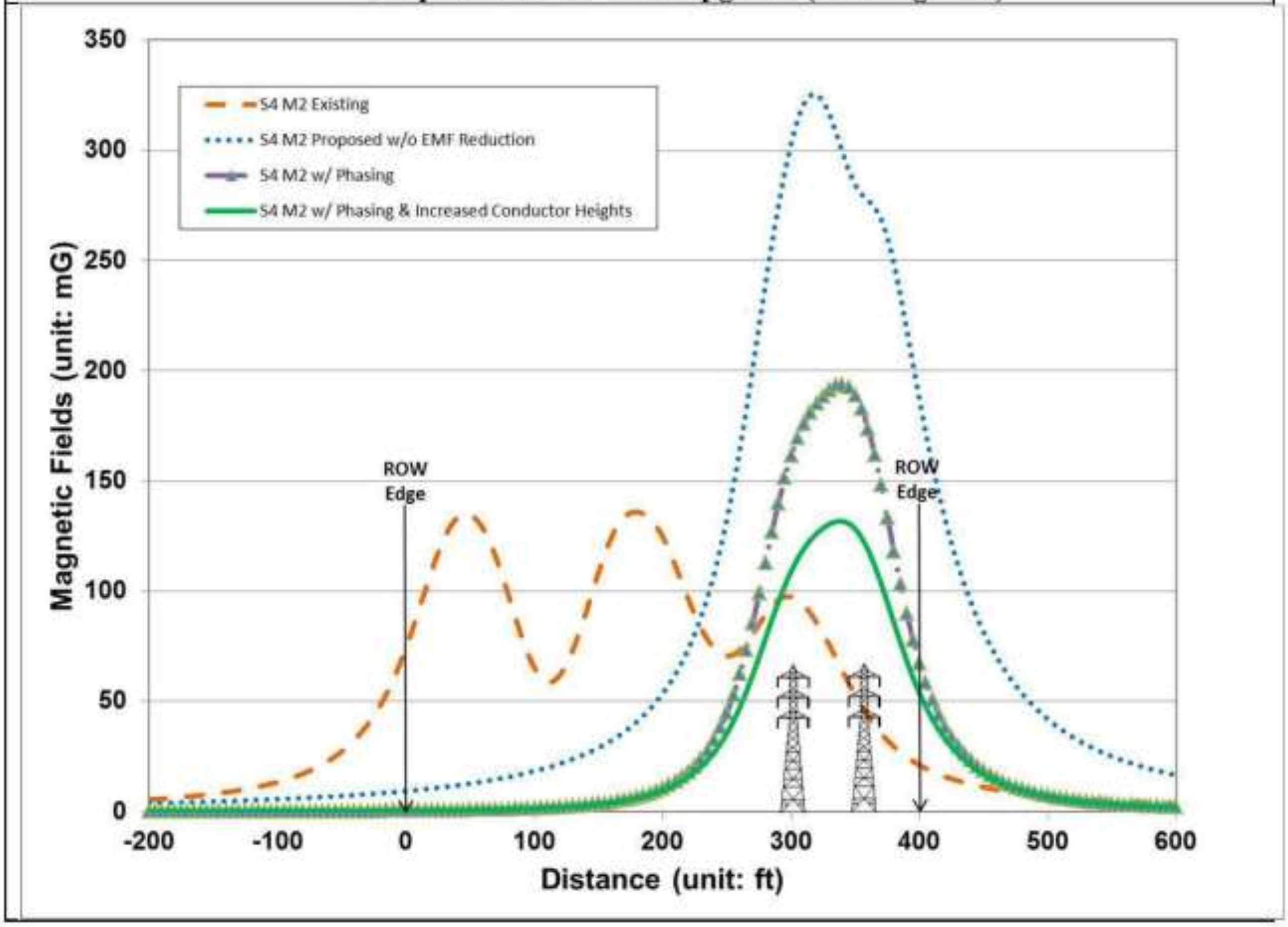


Table 10. Calculated Magnetic Field Levels[78] for Segment 4 Model 2				
Design Options	North Edge of ROW (mG)	% Reduction[79]	South Edge of ROW (mG)	% Reduction
Existing	74.3	-	21.0	-
Proposed w/o EMF Reduction	9.3	-	186.5	-
Proposed w/ Phasing	0.4	95.7	67.4	63.9
Proposed w/ Phasing & Increased Conductor Heights	0.4	0	53.6	20.5

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

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

79 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 4 Model 2: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 5

For the purpose of EMF analysis, three EMF computer models in populated areas were utilized to determine the best EMF reduction measures for Segment 5.

Segment 5 – Model 1

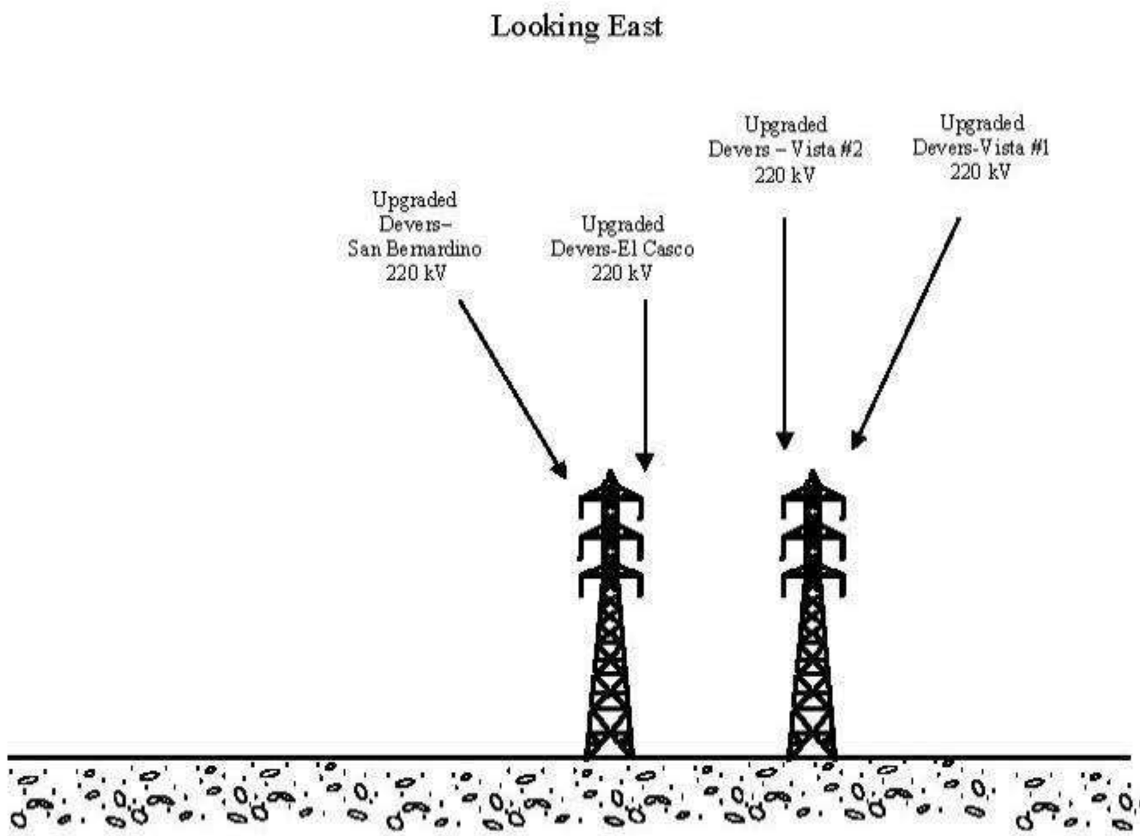
Segment 5 Model 1 analyzes the section of existing and proposed designs from San Gorgonio Avenue to east side of the Robertson's sand & gravel pit area in the City of Banning, California. This section would utilize LST construction. The proposed typical design for this section is shown in Figure 21. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 400-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential, commercial/industrial, and undeveloped areas.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 21. Proposed 220 kV Structures Design - Segment 5 Model 1[80]



Magnetic Field Calculations: Figure 22 and Table 11 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[80] Figure is not to scale.

Figure 22. Calculated Magnetic Field Levels[81] for Segment 5 Model 1 Proposed 220 kV Line Upgrade (Looking East)

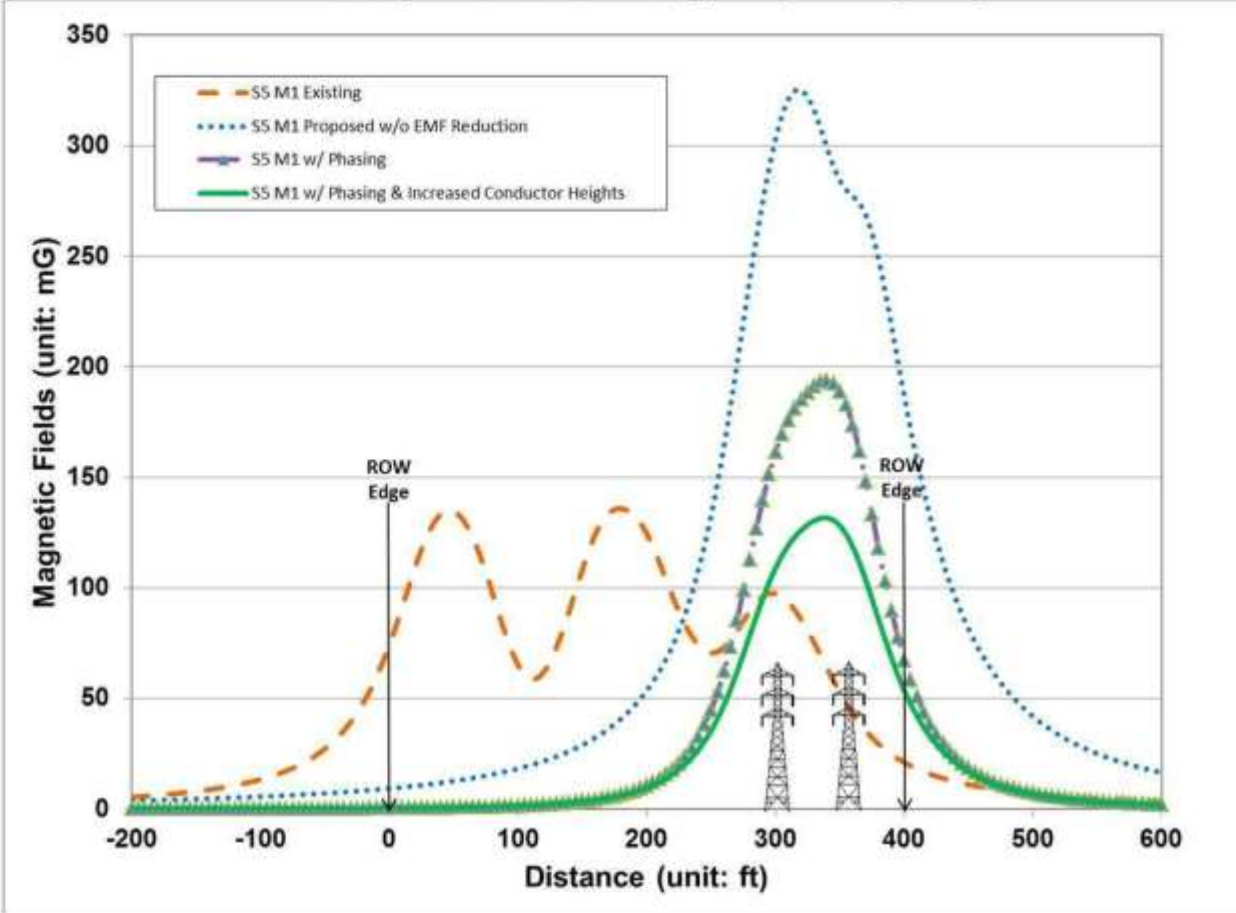


Table 11. Calculated Magnetic Field Levels[82] for Segment 5 Model 1

Design Options	North Edge of ROW (mG)	% Reduction[83]	South Edge of ROW (mG)	% Reduction
Existing	74.3	-	21.0	-
Proposed w/o EMF Reduction	9.3	-	186.5	-
Proposed w/ Phasing	0.4	95.7	67.4	63.9
Proposed w/ Phasing & Increased Conductor Heights	0.4	0	53.6	20.5

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

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

[83] "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 5 Model 1: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 5 – Model 2

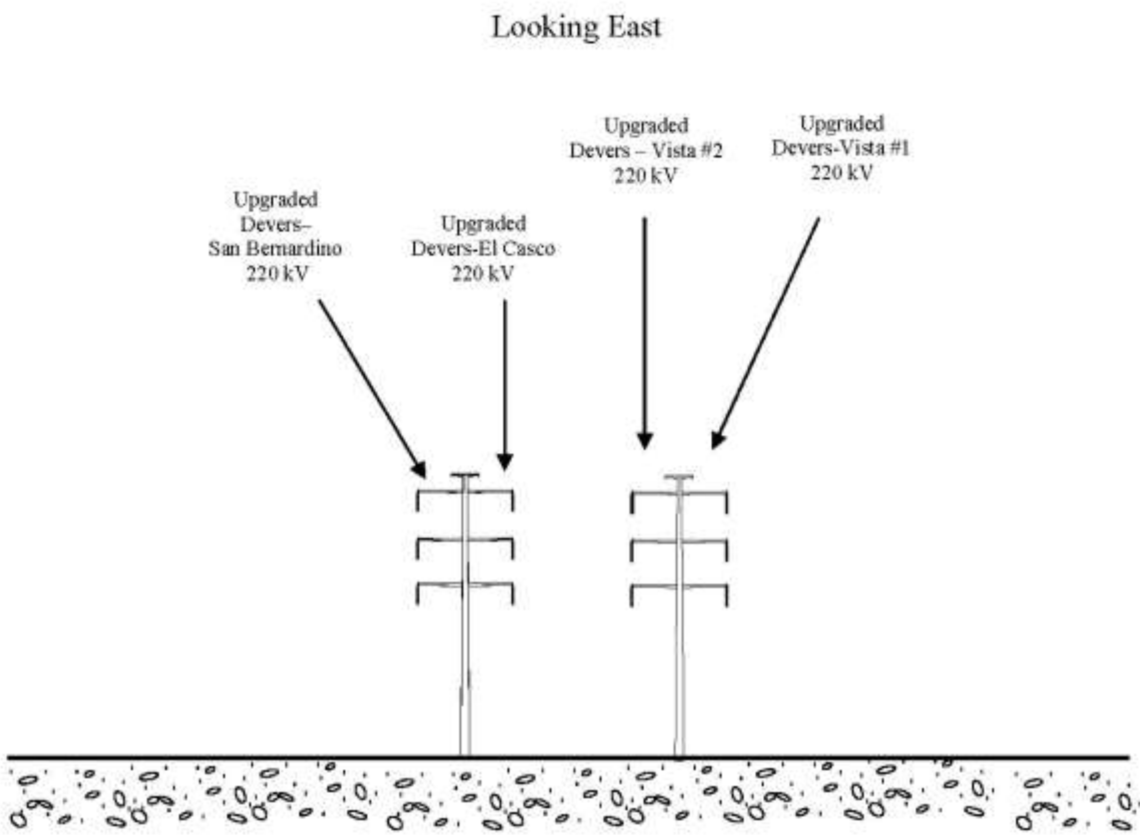
Segment 5 Model 2 analyzes the section of existing and proposed designs from the east side of the Robertson's sand & gravel pit area through the Morongo Reservation area to just east of the Malki Road and Seminole Drive intersection in the City of Cabazon, California. This section would utilize TSP construction. The proposed typical design for this section is shown in Figure 23. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 150-foot wide new SCE ROW, which would be relocated away from populated area. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to undeveloped areas.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")
3. Relocate ROW away from populated areas

Low-Cost Field Reduction Options: The proposed design incorporates the above listed no-cost field reduction measures; no low-cost reduction measures such as utilizing taller structures were considered for this section of the Proposed Project because the T/Ls in this section would be relocated to new ROW away from populated areas.

Figure 23. Proposed 220 kV Structures Design - Segment 5 Model 2[84]



Magnetic Field Calculations: Figure 24 and Table 12 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[84] Figure is not to scale.

For informational purpose, Figure 24 and Table 12 show the calculated magnetic field values of existing configuration in the existing ROW.

Figure 24. Calculated Magnetic Field Levels[85] for Segment 5 Model 2 in Existing ROW (Looking East)

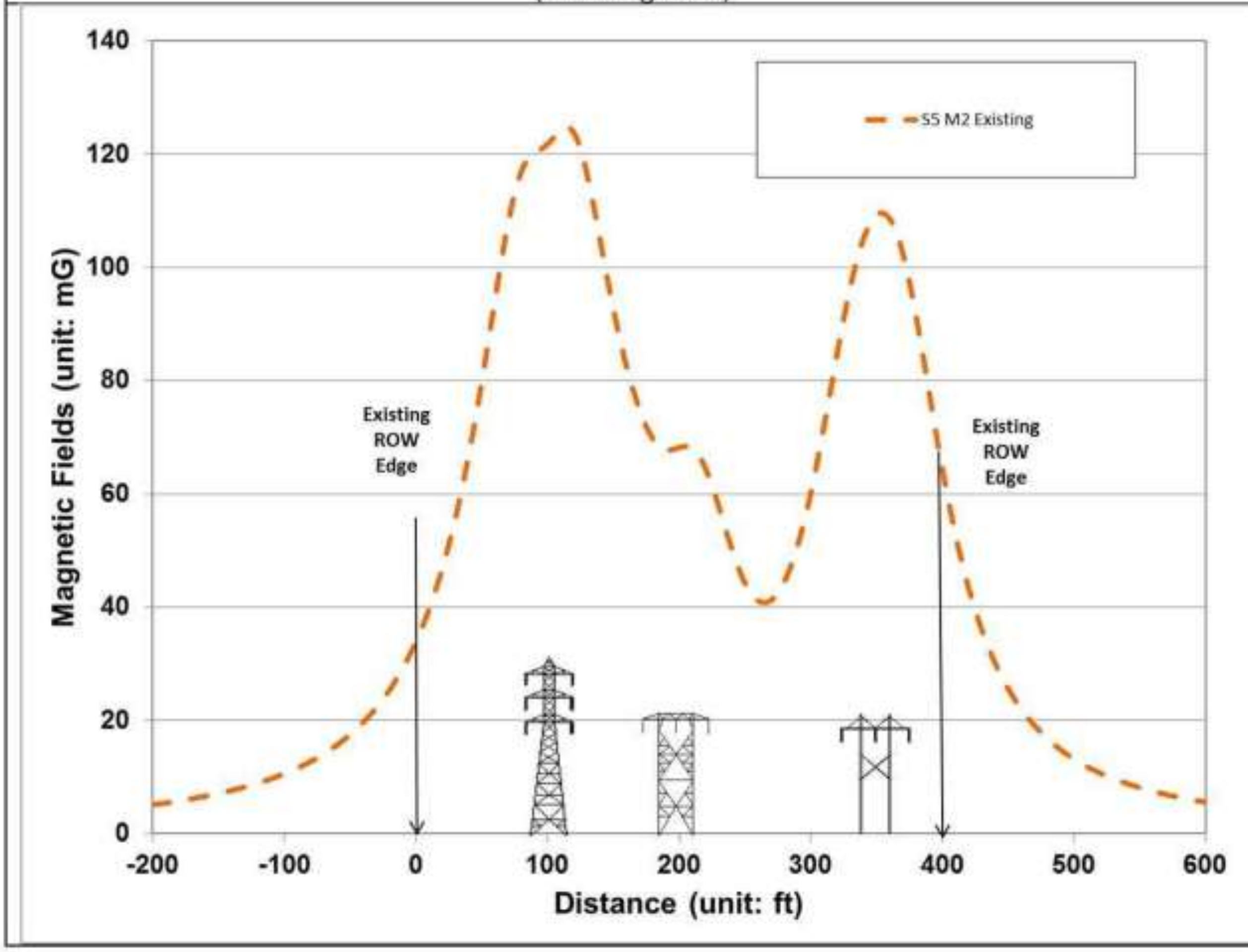


Table 12. Calculated Existing Magnetic Field Levels[86] for Segment 5 Model 2				
Design Options	North Edge of ROW (mG)	% Reduction	South Edge of ROW (mG)	% Reduction
Existing	33.9	-	64.4	-

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

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

Figure 25. Calculated Magnetic Field Levels[87] for Segment 5 Model 2 Proposed 220 kV Line Upgrade (Looking East)

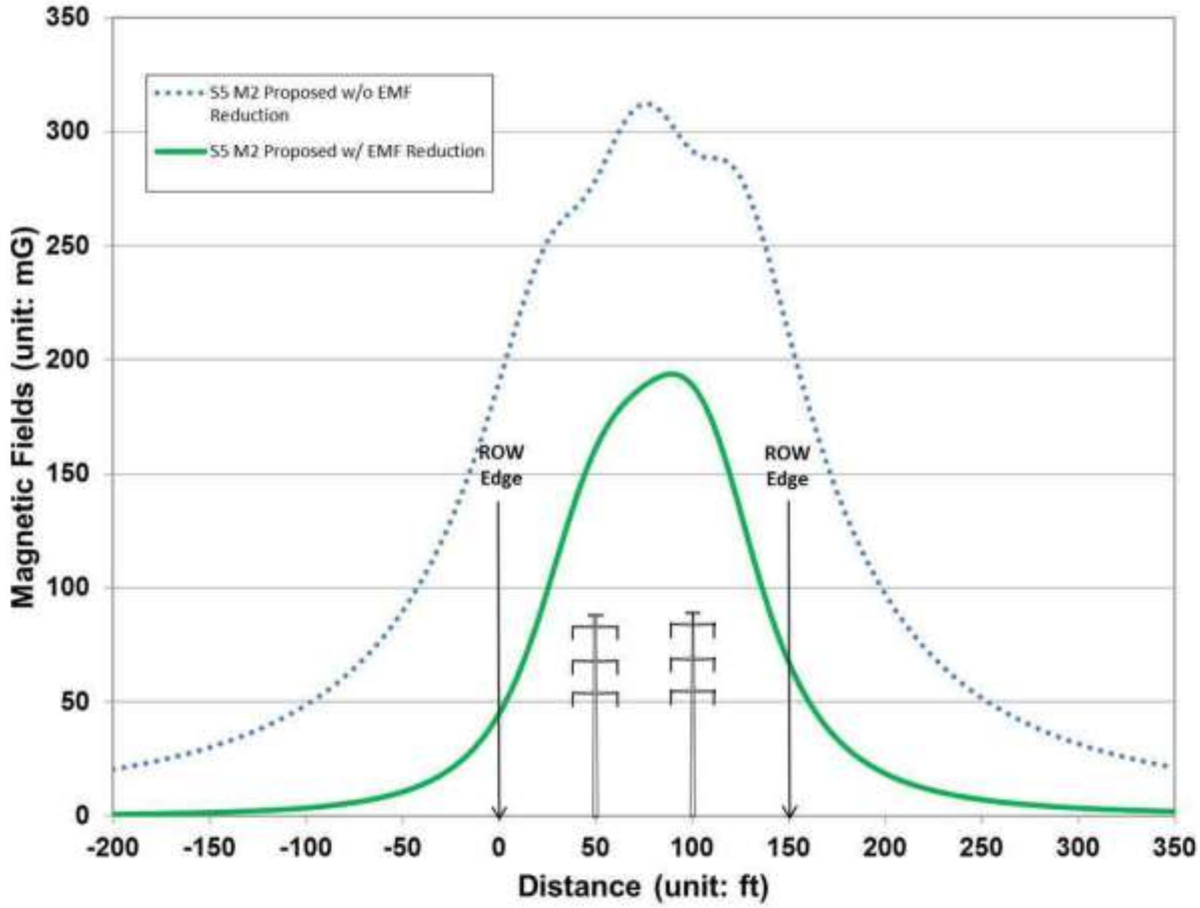


Table 13. Calculated Magnetic Field Levels[88] for Segment 5 Model 2

Design Options	North Edge of ROW (mG)	% Reduction[89]	South Edge of ROW (mG)	% Reduction
Proposed w/o EMF Reduction	190.5	-	211.2	-
Proposed w/ Phasing	45.0	76.4	67.4	68.1

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

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

89 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 5 Model 2: *Because the proposed design already includes no-cost field reduction measures in the preliminary design, no low-cost field reduction measures are recommended.*

Segment 5 – Model 3

Segment 5 Model 3 analyzes the section of existing and proposed designs from the east side of the intersection of Malki Road and Seminole Drive to the eastern limit of Morongo Reservation near Rushmore Avenue in the community of Whitewater, California. This section would utilize LST construction. The proposed typical design for this section is shown in Figure 25. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 150-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential, commercial/industrial, and undeveloped areas.

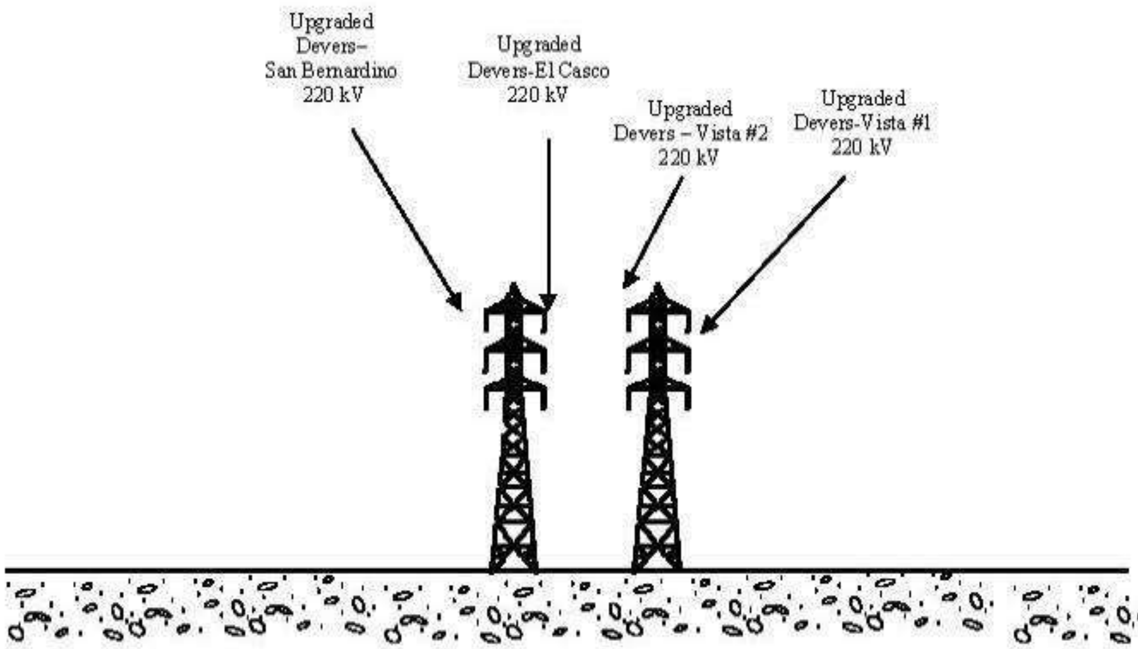
No-Cost Field Reduction Measures: The proposed design for this section includes the following no-cost field reduction measures:

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 26. Proposed 220 kV Structures Design - Segment 5 Model 3[90]

Looking East



Magnetic Field Calculations: Figure 26 and Table 13 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[90] Figure is not to scale.

Figure 27. Calculated Magnetic Field Levels[91] for Segment 5 Model 3
Proposed 220 kV Line Upgrade (Looking East)

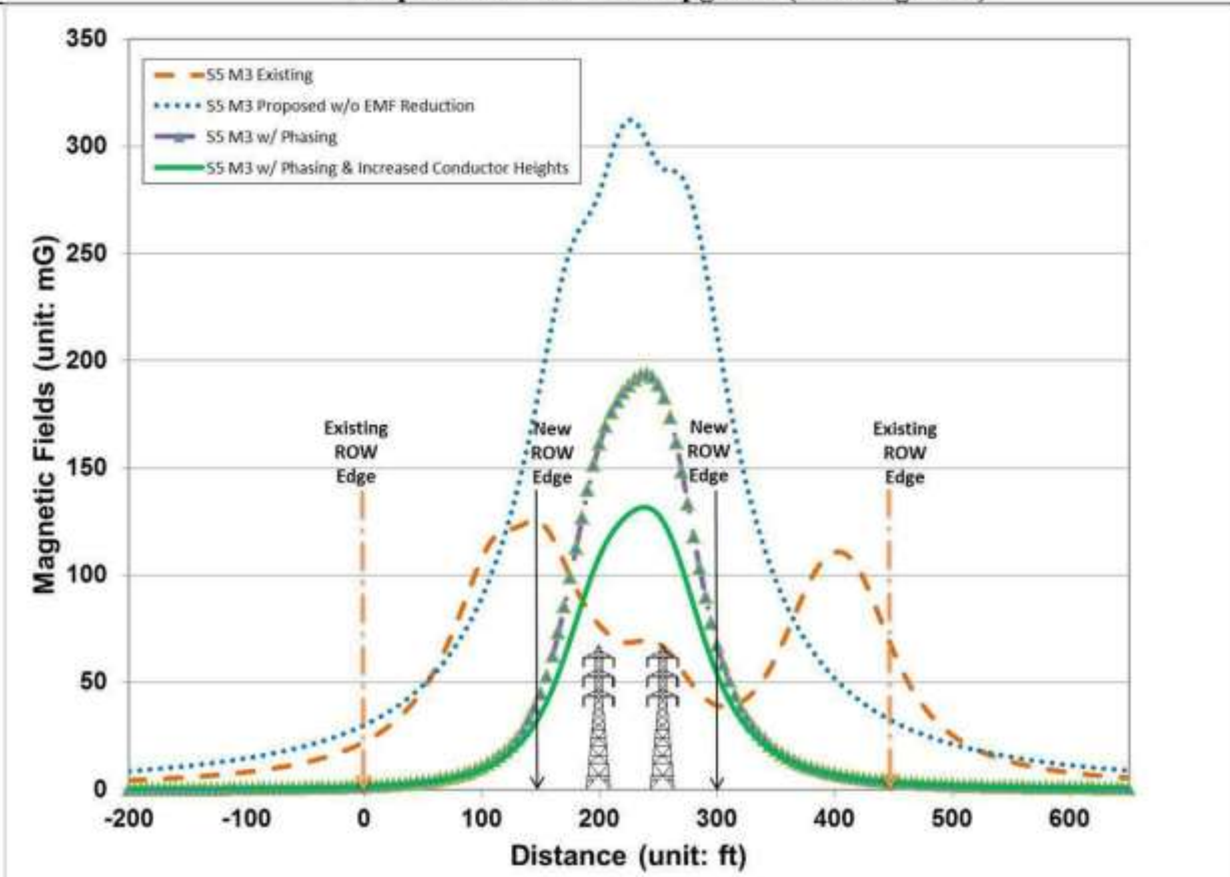


Table 14. Calculated Magnetic Field Levels[92] for Segment 5 Model 3				
Design Options	North Edge of ROW (mG)	% Reduction[93]	South Edge of ROW (mG)	% Reduction
Existing	22.3	-	64.1	-
Proposed w/o EMF Reduction	190.5	-	211.2	-
Proposed w/ Phasing	45.0	76.4	67.4	68.1
Proposed w/ Phasing & Increased Conductor Heights	35.5	21.1	53.6	20.5

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

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

93 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 5 Model 3: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 6

For the purpose of EMF analysis, three EMF computer models in populated areas were utilized to determine the best EMF reduction measures for Segment 6.

Segment 6 – Model 1

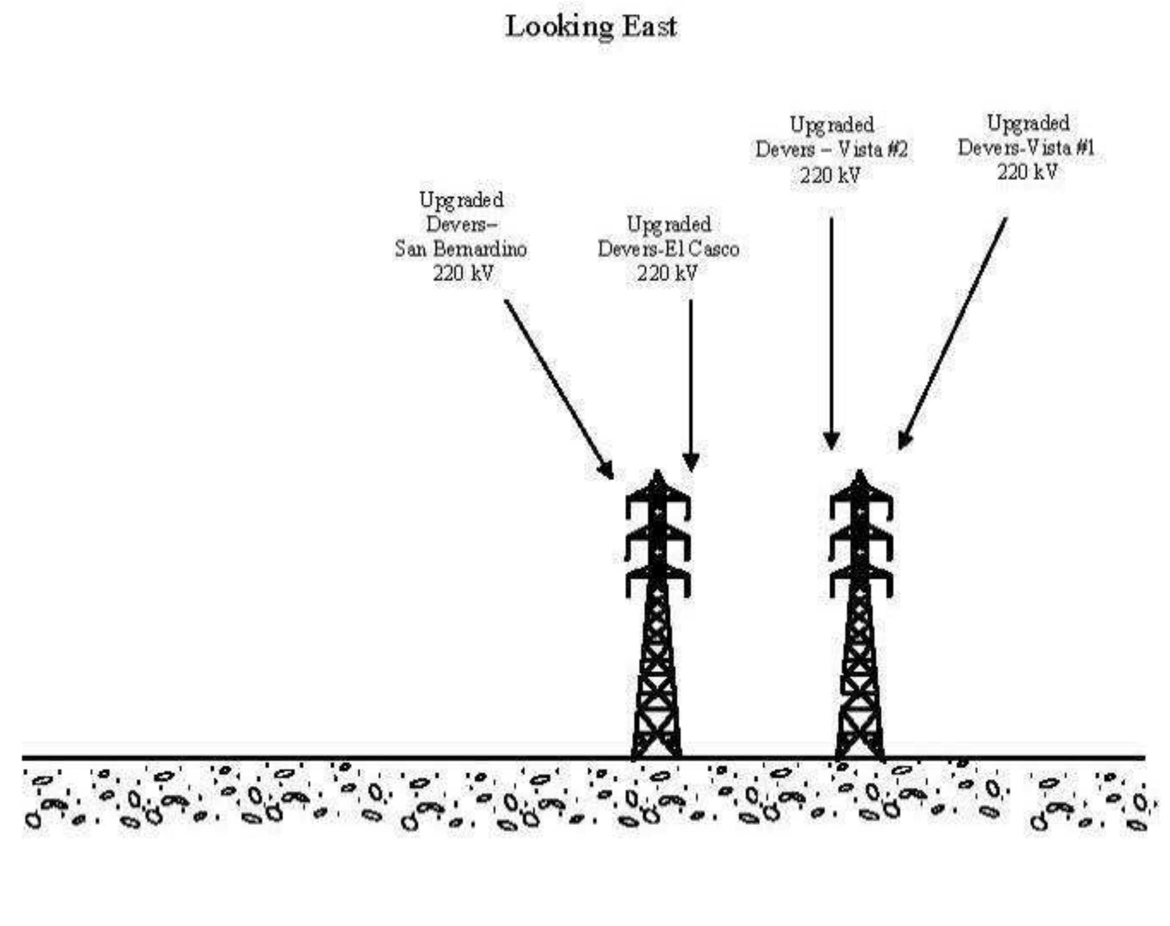
Segment 6 Model 1 analyzes the section of existing and proposed designs near Rushmore Avenue in the community of Whitewater, California. This section would utilize LST construction. The proposed typical design for this section is shown in Figure 27. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 400-foot wide ROW. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential and undeveloped areas.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 28. Proposed 220 kV Structures Design - Segment 6 Model 1[94]



Magnetic Field Calculations: Figure 28 and Table 14 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

94 Figure is not to scale.

Figure 29. Calculated Magnetic Field Levels[95] for Segment 6 Model 1 Proposed 220 kV Line Upgrade (Looking East)

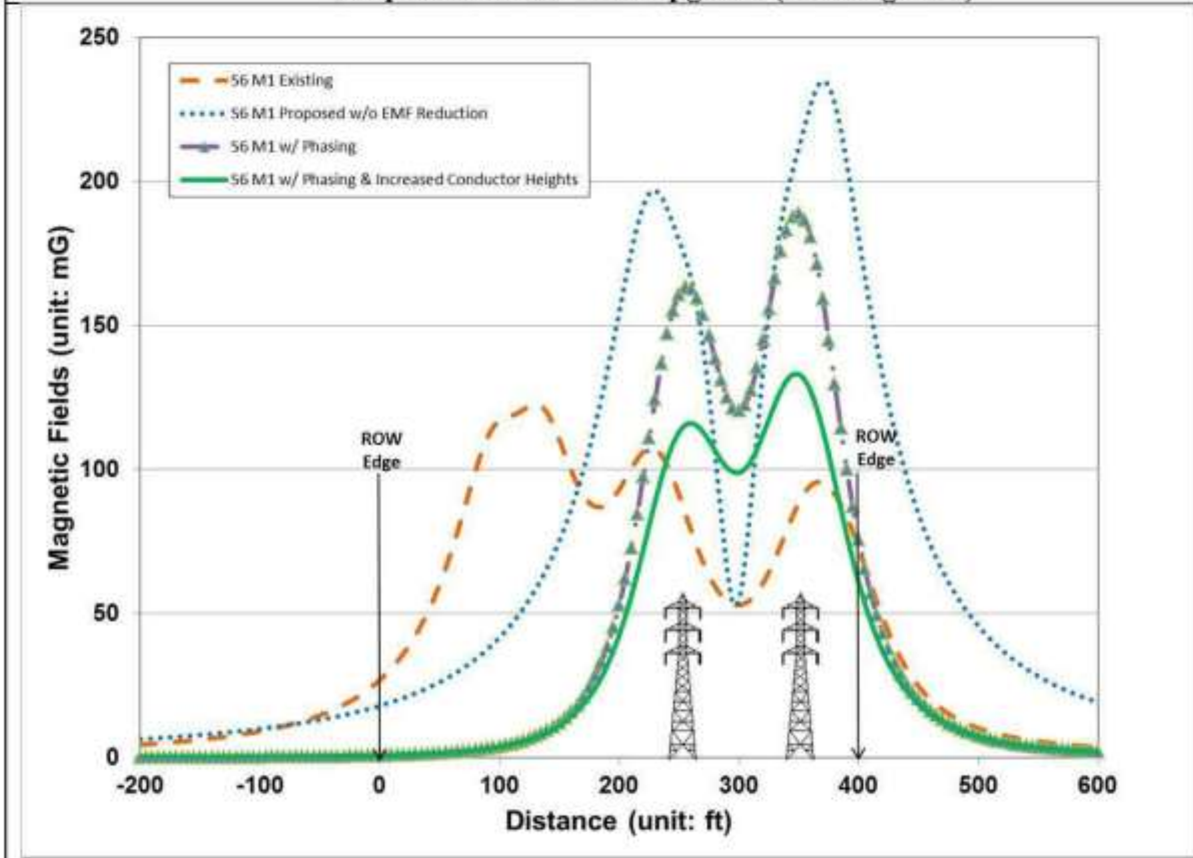


Table 15. Calculated Magnetic Field Levels[96] for Segment 6 Model 1				
Design Options	North Edge of North ROW (mG)	% Reduction[97]	South Edge of North ROW (mG)	% Reduction
Existing	27.0	-	72.6	-
Proposed w/o EMF Reduction	18.0	-	180.4	-
Proposed w/ Phasing	0.7	96.1	75.6	58.1
Proposed w/ Phasing & Increased Conductor Heights	0.7	0	60.7	19.7

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

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

97 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for Segment 6 Model 1: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 6 – Model 2

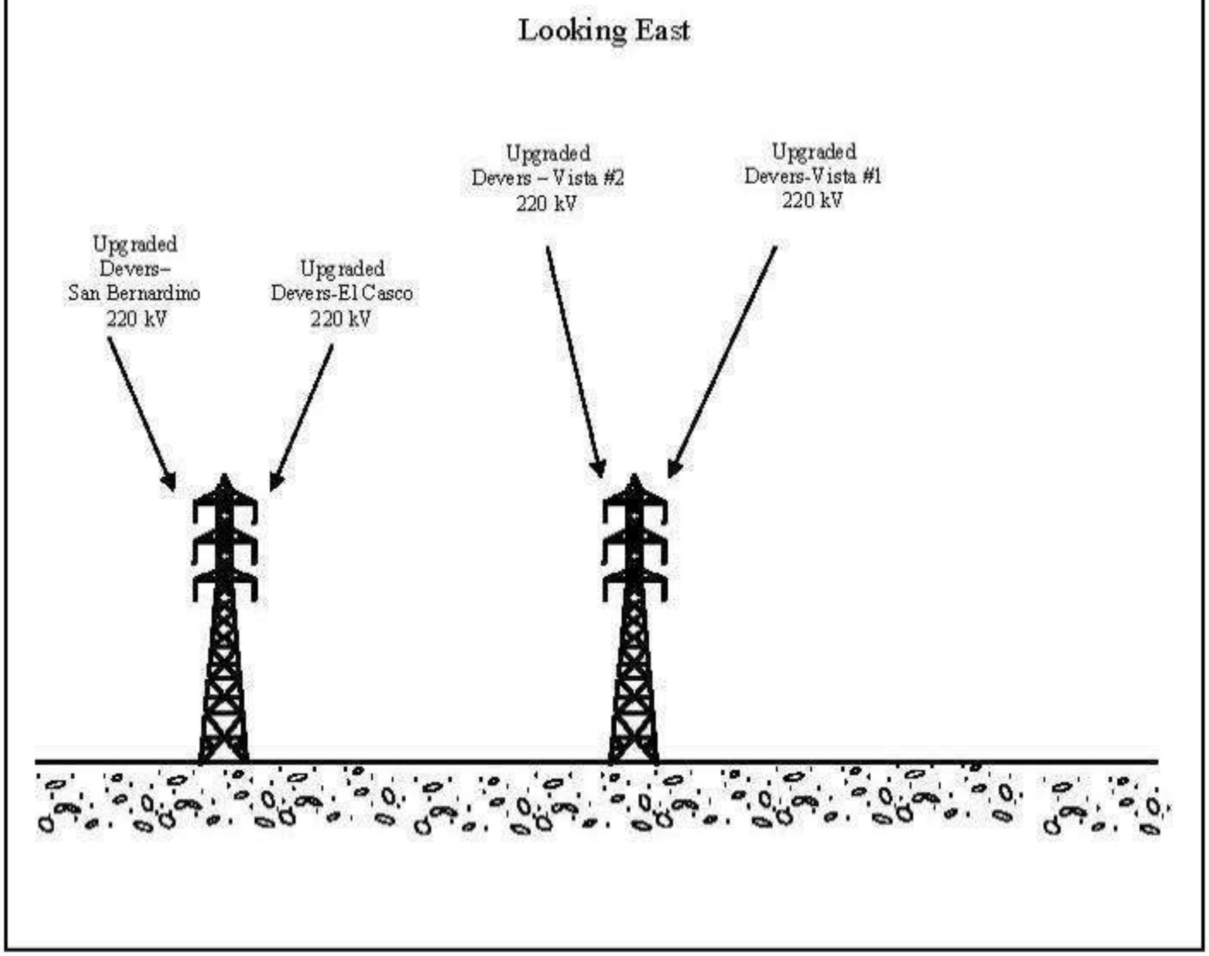
Segment 6 Model 2 analyzes the section of existing and proposed designs near Amethyst Drive in the community of Whitewater, California. This section would utilize LST construction. The proposed typical design for this section is shown in Figure 29. There are two separate ROW in this section. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 300 feet wide ROW on the north side, and approximately 100-foot wide ROW on the south side. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential and undeveloped areas.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 30. Proposed 220 kV Structures Design - Segment 6 Model 2[98]



Magnetic Field Calculations: Figure 30 and Table 15 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[98] Figure is not to scale.

Figure 31. Calculated Magnetic Field Levels[99] for Segment 6 Model 2 Proposed 220 kV Line Upgrade (Looking East)

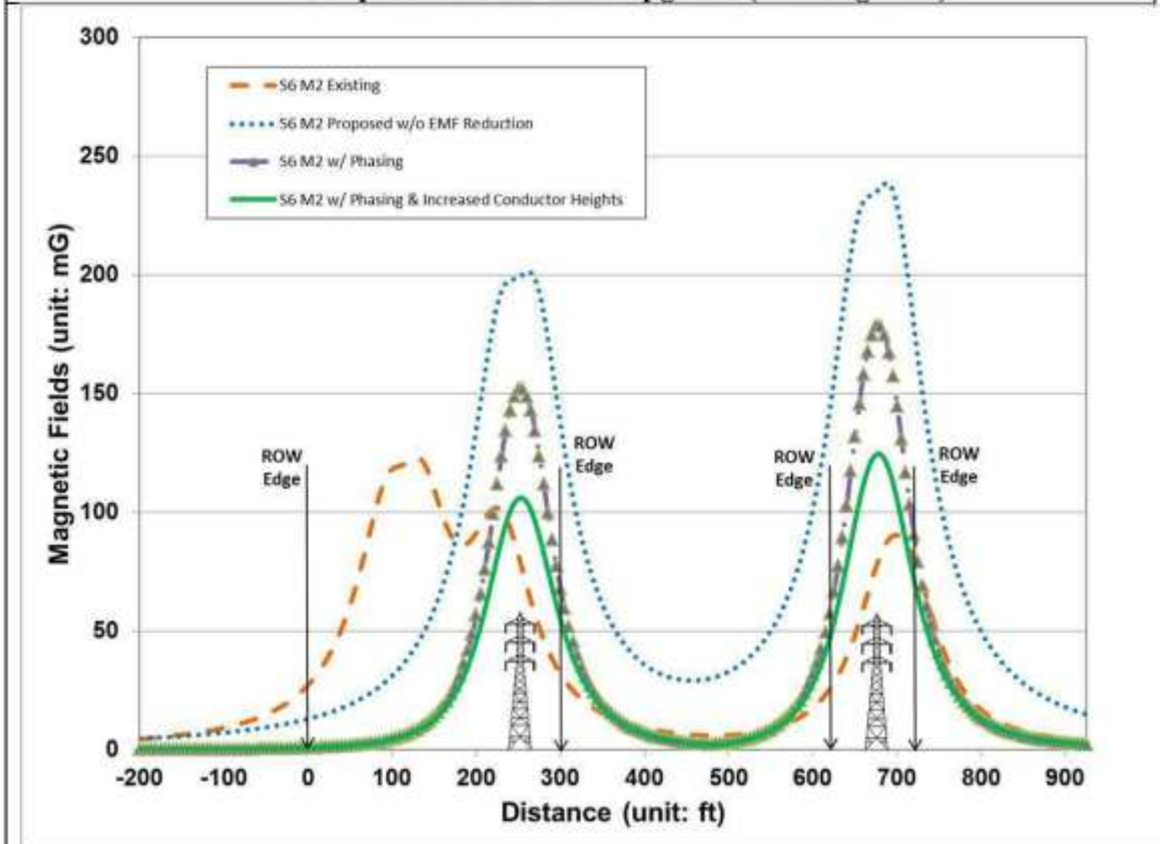


Table 16. Calculated Magnetic Field Levels[100] for Segment 6 Model 2				
Design Options	North Edge of North ROW (mG)	% Reduction[101]	South Edge of North ROW (mG)	% Reduction
Existing (North)	27.3	-	31.9	-
Proposed w/o EMF Reduction	13.0	-	137.2	-
Proposed w/ Phasing	0.9	93.1	67.9	50.5
Proposed w/ Phasing &	0.9	0	54.8	19.3

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

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

101 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Increased Conductor Heights				

Design Options	North Edge of South ROW (mG)	% Reduction	South Edge of South ROW (mG)	% Reduction
Existing (South)	28.4	-	75.3	-
Proposed w/o EMF Reduction	156.2	-	164.0	-
Proposed w/ Phasing	66.8	57.2	79.3	51.6
Proposed w/ Phasing & Increased Conductor Heights	53.9	19.3	63.9	19.4

Recommendations for Segment 6 Model 2: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Segment 6 – Model 3

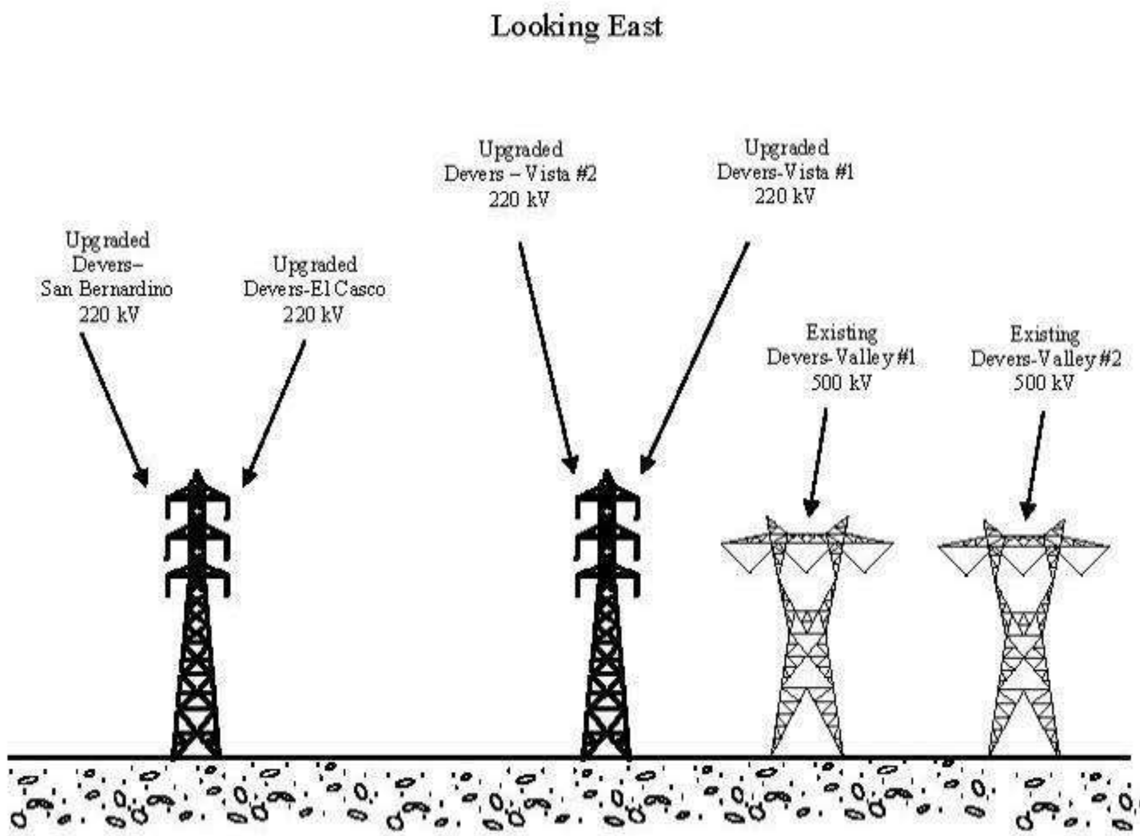
Segment 6 Model 3 analyzes the section of existing and proposed designs west of Devers Substation near Desert View Road & 16th Avenue in the community of North Palm Springs, California. This section would be utilizing LST construction. The proposed typical design for this section is shown in Figure 31. There are two separate ROW in this section. For EMF analysis, calculated field levels were evaluated at the edges of the approximately 300-foot wide ROW on the north side, and approximately 415-foot wide ROW on the south side. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential and undeveloped areas.

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

1. Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
2. Arrange conductors of T/Ls for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The initial no-cost analysis was based on minimum structure heights of 110 feet above ground. The low-cost option of using a minimum of 125 feet structure heights or raising the conductor ground clearance by an additional 8 feet from the preliminary design is considered for locations adjacent to populated areas.

Figure 32. Proposed 220 kV Structures Design - Segment 6 Model 3[102]



Magnetic Field Calculations: Figure 32 and Table 16 show the calculated magnetic field levels for the proposed design comparing existing and proposed design without and with field reduction measures.

[102] Figure is not to scale.

Figure 33. Calculated Magnetic Field Levels[103] for Segment 6 Model 3 Proposed 220 kV Line Upgrade (Looking East)

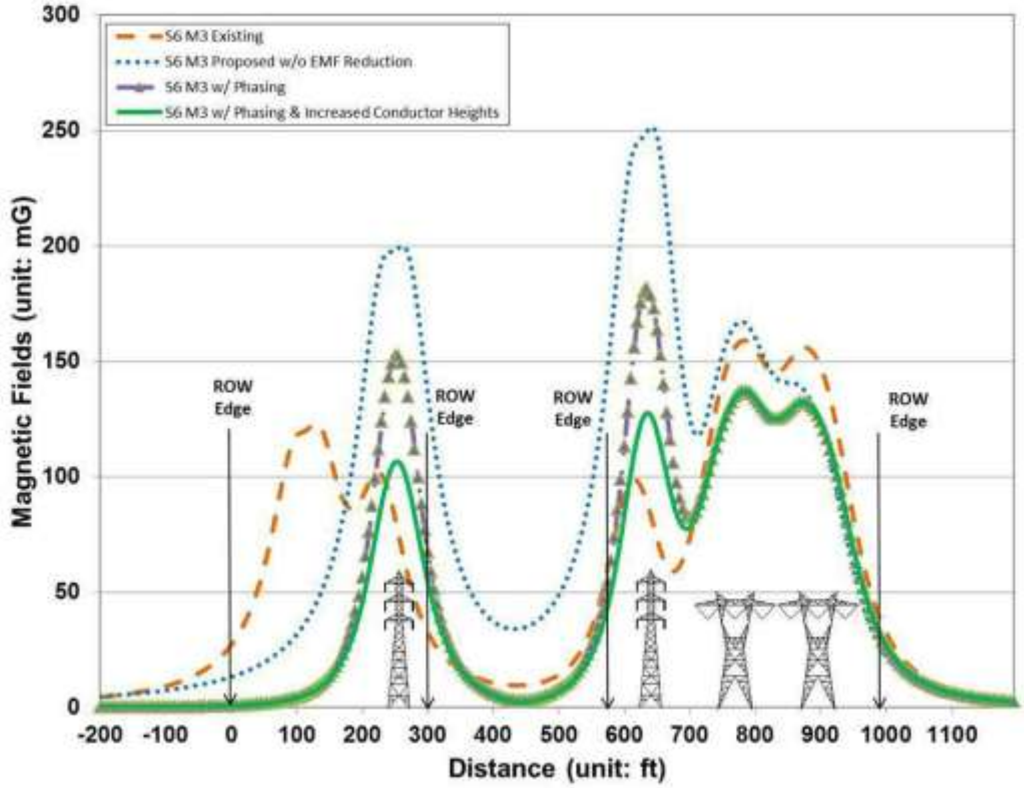


Table 17. Calculated Magnetic Field Levels[104] for Segment 6 Model 3

Design Options	North Edge of North ROW (mG)	% Reduction[105]	South Edge of North ROW (mG)	% Reduction
Existing (North)	27.2	-	32.4	-
Proposed w/o EMF Reduction	13.3	-	135.5	-
Proposed w/ Phasing	0.8	94.0	67.5	50.2
Proposed w/ Phasing & Increased Conductor Heights	0.8	0	54.4	19.4

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

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

[105] "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Design Options	North Edge of South ROW (mG)	% Reduction	South Edge of South ROW (mG)	% Reduction
Existing (South)	67.2	-	35.2	-
Proposed w/o EMF Reduction	162.0	-	23.6	-
Proposed w/ Phasing	63.6	60.7	29.3	Increase
Proposed w/ Phasing & Increased Conductor Heights	50.7	20.3	29.3	0

Recommendations for Segment 6 Model 3: *The low-cost measure of raising structure heights or raising conductor ground clearance is recommended in this section near populated areas.*

Part 3 - Proposed 66 kV Subtransmission Line Work

San Bernardino-Redlands-Timoteo 66 kV Subtransmission Line Relocation

For the purpose of EMF analysis, three EMF computer models were utilized in populated areas to determine the best EMF reduction measures for the relocated San Bernardino-Redlands-Timoteo ("SB-R-T") 66 kV Subtransmission Line.

SB-R-T Model 1

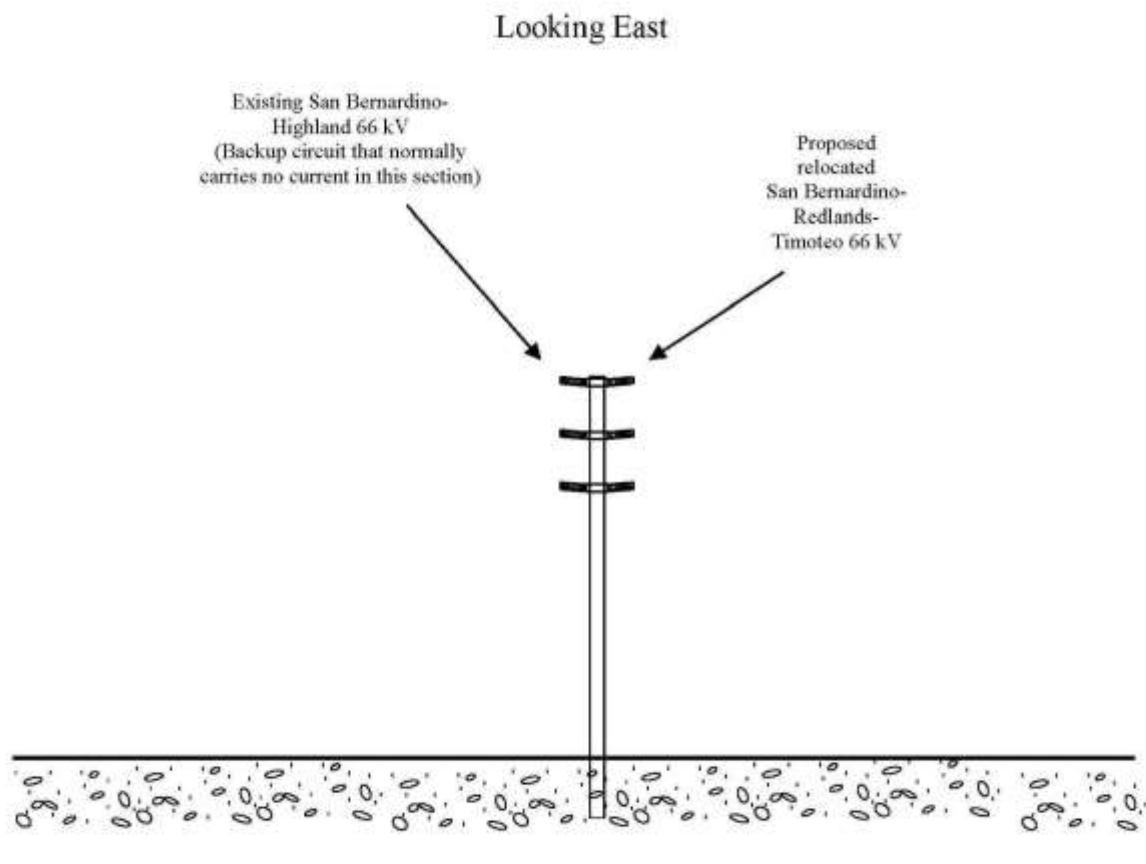
SB-R-T Model 1 analyzes the typical cross section of on San Bernardino Avenue between San Bernardino Substation and Marigold Avenue in the City of Redlands, California. This section would utilize mostly light weight steel (LWS) or wood structures. The proposed typical design for this section is shown in Figure 33. This section of the circuit would be built to 115 kV design specifications. Typical 115 kV circuits have 30-foot wide easements. For EMF analysis, calculated field levels were evaluated 15 feet from the centerline of the structures. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to commercial/industrial area.

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

1. Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF 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 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 section of the Proposed Project.

Figure 34. Proposed 66 kV Structure Design – San Bernardino-Redlands-Timoteo 66 kV Relocation Model 1[106]



Magnetic Field Calculations: Figure 34 and Table 17 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed structure with a minimum height of 65 feet (above ground).

[106] Figure is not to scale.

Figure 35. Calculated Magnetic Field Levels[107] for SB-R-T Model 1 Relocation (on San Bernardino Avenue Looking East)

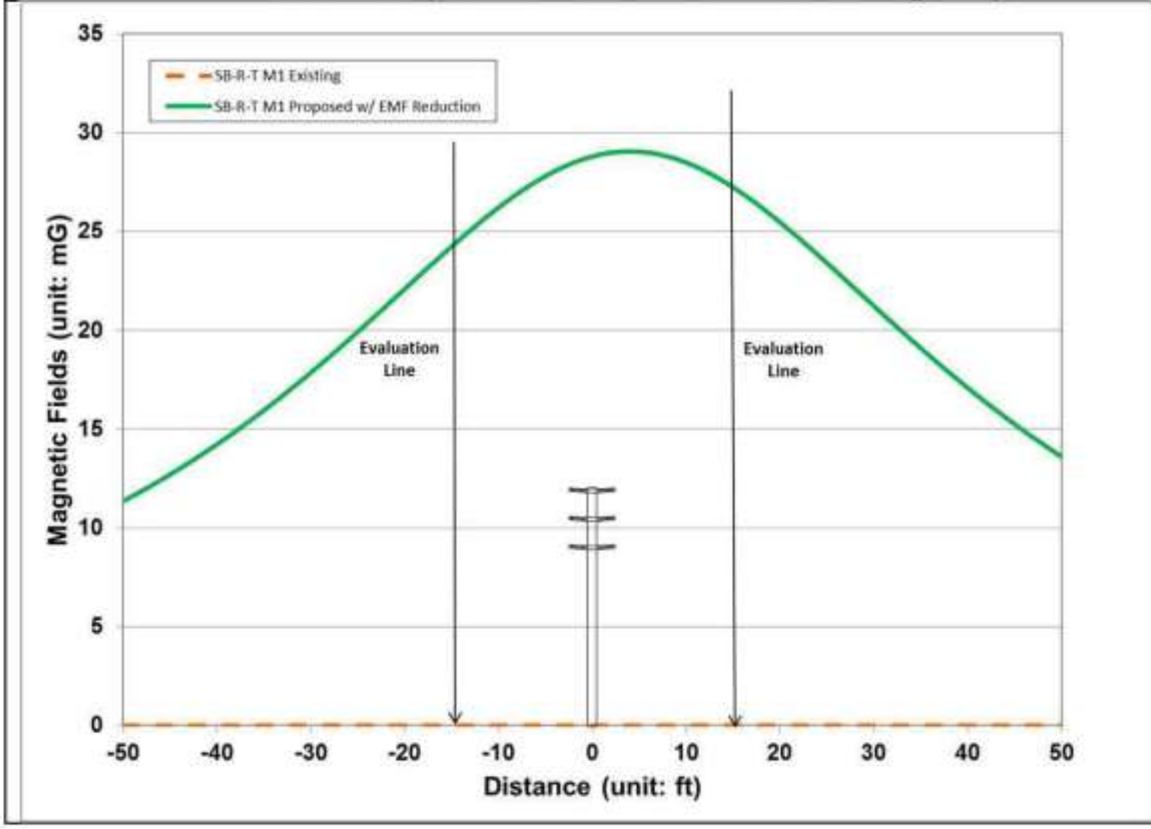


Table 18. Calculated Magnetic Field Levels[108] for SB-R-T Model 1

Design Options	15 Feet Left of Centerline of structures (mG)	% Reduction	15 Feet Right of Centerline of structures (mG)	% Reduction
Existing (normally no current)	0	-	0	-
Proposed	24.3	-	27.2	-

Recommendations for SB-R-T Model 1: *Because the proposed design already includes no-cost field reduction measures including structural heights that met the SCE EMF preferred design criteria in the preliminary design, no low-cost field reduction measures such as utilizing taller structures are recommended.*

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

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

SB-R-T Model 2

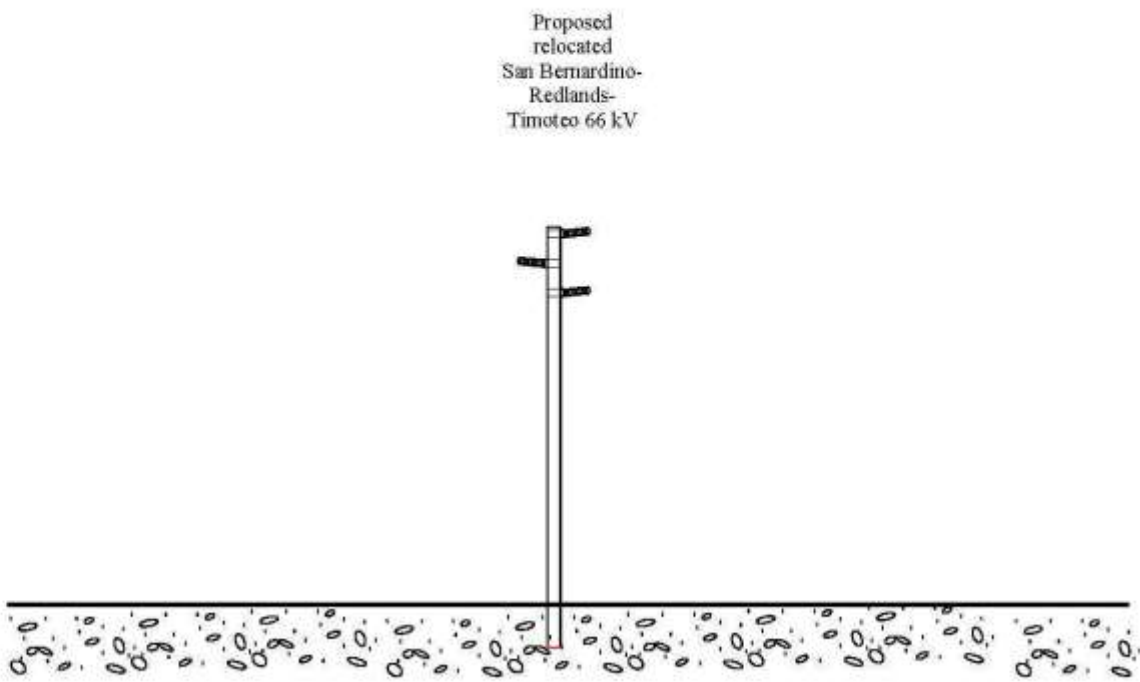
SB-R-T Model 2 analyzes the typical design where the San Bernardino-Redlands-Timoteo 66 kV line is an overhead single circuit from the intersection of San Bernardino Avenue and Marigold Avenue in the City of Redlands to near the intersection of West Redlands Boulevard and Bryn Mawr Avenue in the City of Loma Linda, California. This section would utilize mostly LWS or wood structures. The proposed typical design for this section is shown in Figure 35. Typical 66 kV circuits have 25-foot wide easements. For EMF analysis, calculated field levels were evaluated 12.5 feet from the centerline of the structures, and the effects for any distribution located on the same structures were not considered. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential, commercial/industrial, and agricultural areas.

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

1. Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria
2. Utilize subtransmission line construction that reduces the space between conductors compared with other designs

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 were considered for this section of the Proposed Project.

Figure 36. Proposed 66 kV Structures Design – San Bernardino-Redlands-Timoteo 66 kV Relocation Model 2[109]



Magnetic Field Calculations: Figure 36 and Table 18 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed structure with a minimum height of 60 feet (above ground).

[109] Figure is not to scale.

Figure 37. Calculated Magnetic Field Levels[110] for SB-R-T Model 2 Relocation (Overhead)

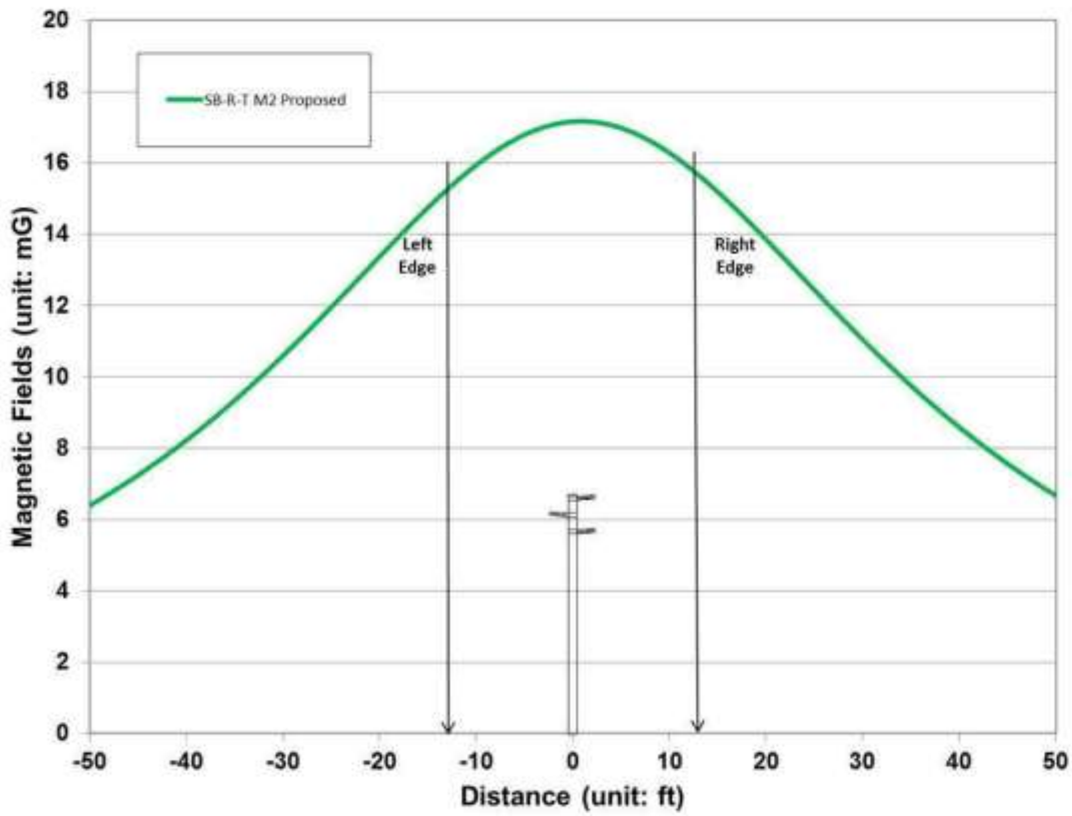


Table 19. Calculated Magnetic Field Levels[111] for SB-R-T Model 2				
Design Options	12.5 Feet Left of Centerline of structures (mG)	% Reduction	12.5 Feet Right of Centerline of structures (mG)	% Reduction
Proposed	15.4	-	15.8	-

Recommendations for SB-R-T Model 2: *Because the proposed design already includes no-cost field reduction measures including structural heights that met the SCE EMF preferred design criteria in the preliminary design, no low-cost field reduction measures such as utilizing taller structures are recommended.*

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

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

SB-R-T Model 3

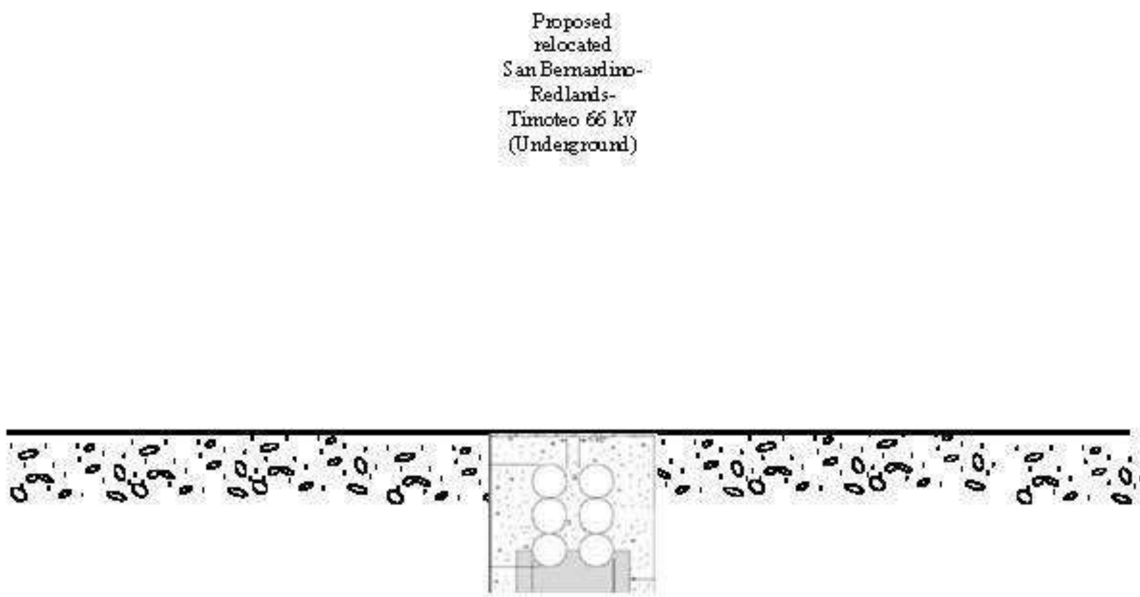
SB-R-T Model 3 analyzes the typical design where the San Bernardino-Redlands-Timoteo 66 kV line is an underground single circuit from near the intersection of West Redlands Boulevard and Bryn Mawr Avenue in the City of Loma Linda, California to Timoteo Substation on Mountain View Avenue. This section would utilize underground duct bank and cables. The proposed typical design for this section is shown in Figure 37. For EMF analysis, calculated field levels were evaluated 12.5 feet from the centerline of the structures. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential and commercial/industrial areas.

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

1. Utilize underground subtransmission construction for crossing other transmission structures and other engineering reasons

Low-Cost Field Reduction Options: The proposed design incorporates the above listed no-cost field reduction measure; no low-cost reduction measures were considered for this section of the Proposed Project.

Figure 38. Proposed 66 kV Structures Design – San Bernardino-Redlands-Timoteo 66 kV Relocation Model 3 (Underground)[112]



Magnetic Field Calculations: Figure 38 and Table 19 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed duct bank with a minimum depth of 36 inches below grade.

[112] Figure is not to scale.

Figure 39. Calculated Magnetic Field Levels[113] for SB-R-T Model 3 Proposed Relocation (Underground)

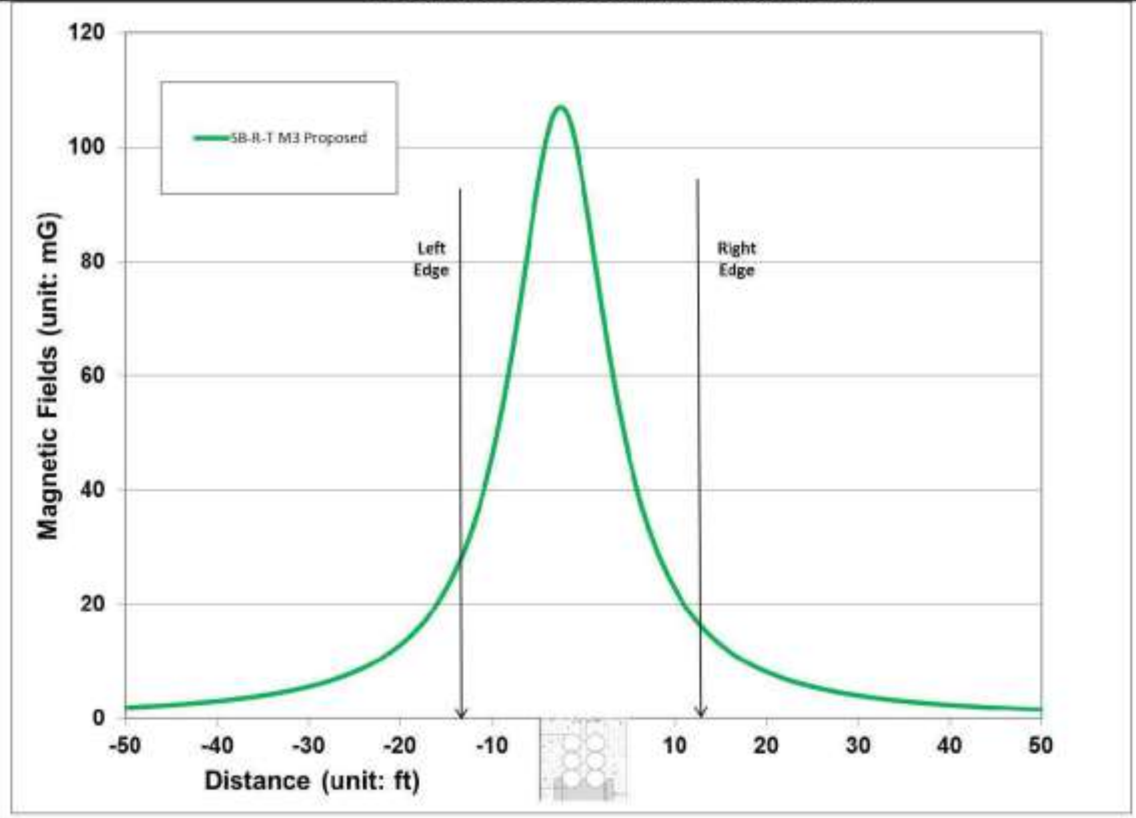


Table 20. Calculated Magnetic Field Levels[114] for SB-R-T Model 3				
Design Options	12.5 Feet Left of Centerline of structures (mG)	% Reduction	12.5 Feet Right of Centerline of structures (mG)	% Reduction
Proposed	24.6	-	13.1	-

***Recommendations for SB-R-T Model 3:** Because the proposed design already includes no-cost field reduction measure in the preliminary design, no low-cost field reduction measures are recommended.*

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

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

San Bernardino-Redlands-Tennessee 66 kV Subtransmission Line Relocation

For the purpose of EMF analysis, three EMF computer models were utilized in populated areas to determine the best EMF reduction measures for the relocated San Bernardino-Redlands-Tennessee ("SB-R-TN") 66 kV Subtransmission Line.

SB-R-TN Model 1

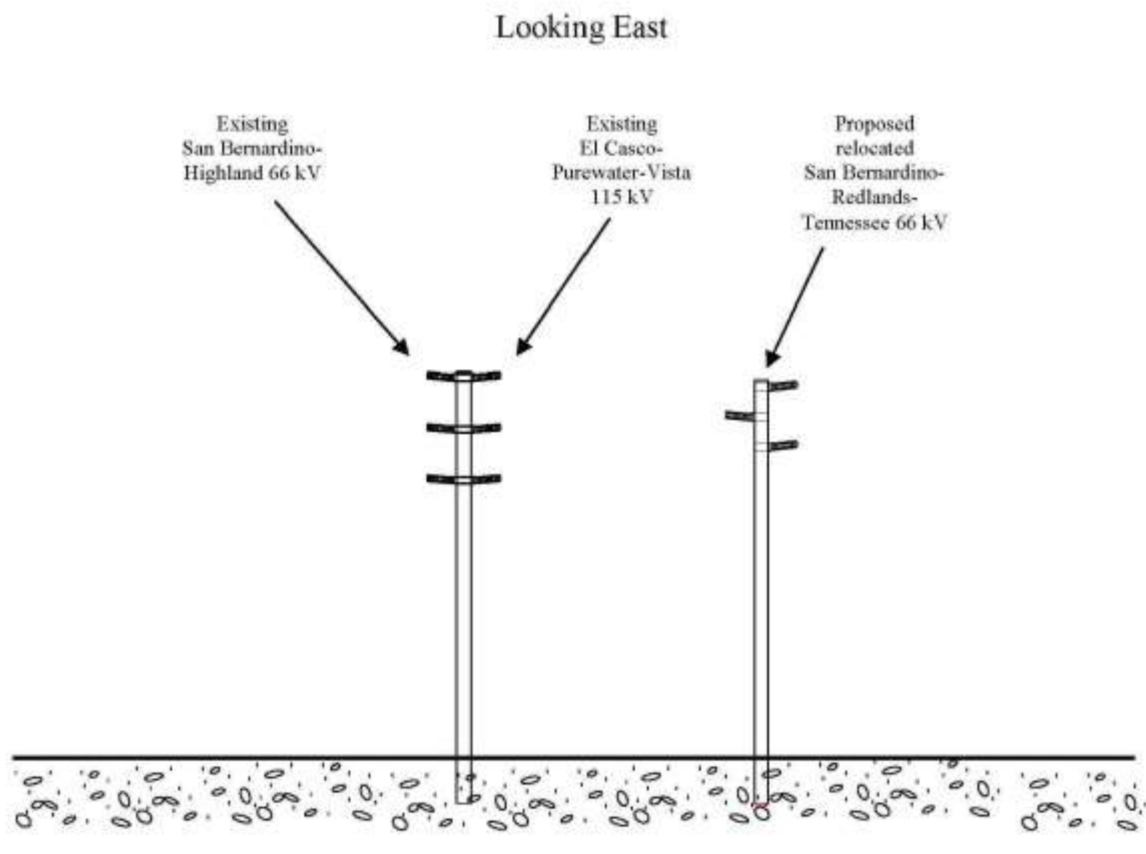
SB-R-TN Model 1 analyzes the typical cross section on San Bernardino Avenue between San Bernardino Substation and Marigold Avenue in the City of Redlands, California. This section would utilize mostly LWS or wood structures. The proposed typical design for this section is shown in Figure 39. For EMF analysis, calculated field levels were evaluated 12.5 feet from the centerline of the structures. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to commercial/industrial area.

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

1. Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria
2. Utilize subtransmission line construction that reduces the space between conductors compared with other designs
3. Arrange conductors of subtransmission lines for magnetic field reduction ("Phasing")

Low-Cost Field Reduction Options: The proposed design incorporates the above listed no-cost field reduction measures; no low-cost reduction measures such as utilizing taller structures were considered for this section of the Proposed Project.

Figure 40. Proposed 66 kV Structures Design – San Bernardino-Redlands-Tennessee 66 kV Relocation Model 1[115]



Magnetic Field Calculations: Figure 40 and Table 20 show the calculated magnetic field levels for the proposed design comparing existing, and proposed design without and with arranging conductors for field reduction. These calculations were made using the proposed structure with a minimum height of 60 feet (above ground).

[115] Figure is not to scale.

Figure 41. Calculated Magnetic Field Levels[116] for SB-R-TN Model 1 Relocation (on San Bernardino Avenue Looking East)

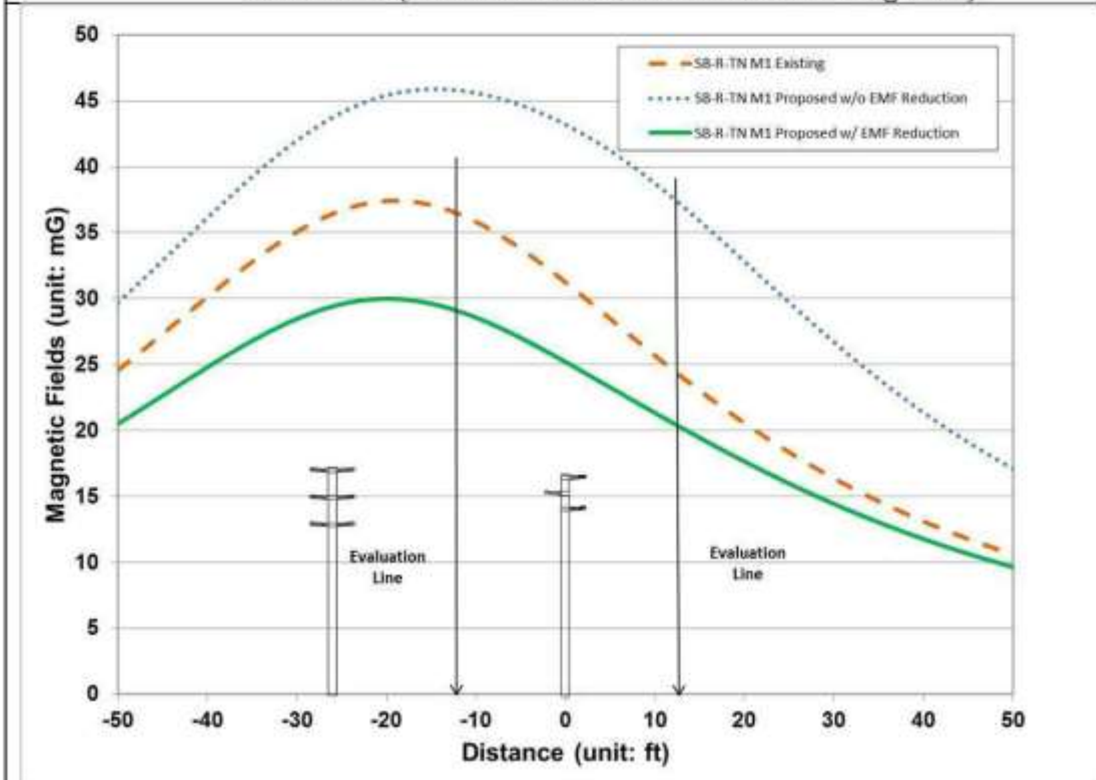


Table 21. Calculated Magnetic Field Levels[117] for SB-R-TN Model 1

Design Options	12.5 Feet Left of Centerline of structures (mG)	% Reduction[118]	12.5 Feet Right of Centerline of structures (mG)	% Reduction
Existing	36.6	-	24.4	
Proposed w/o Phasing	45.9	-	37.4	-
Proposed w/ Phasing	29.2	36.4	20.5	45.2

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

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

118 "% Reduction" represents the percentage of reduction achieved with the implementation of the referenced no-cost and/or low-cost magnetic field reduction measures as compared to the proposed design in the previous row in this table.

Recommendations for SB-R-TN Model 1: *Because the proposed design already includes no-cost field reduction measures including structural heights that met the SCE EMF preferred design criteria in the preliminary design, no low-cost field reduction measures such as utilizing taller structures are recommended.*

SB-R-TN Model 2

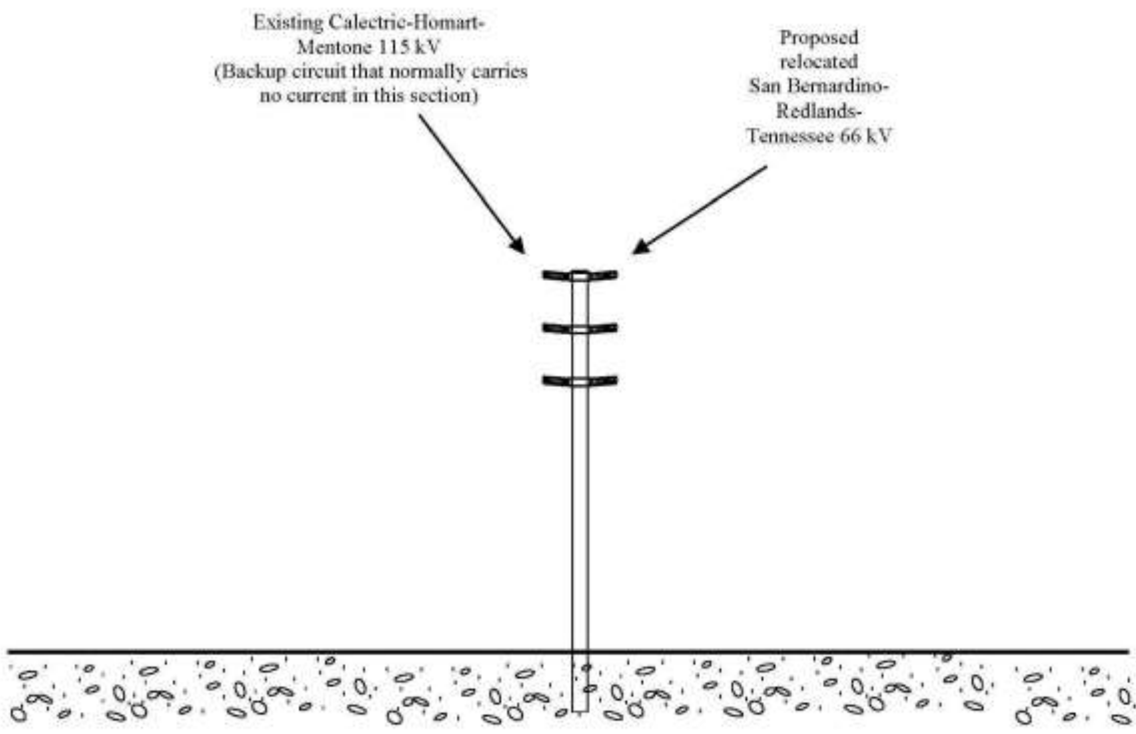
SB-R-TN Model 2 analyzes the typical cross section on San Bernardino Avenue between Marigold Avenue and Nevada Street in the City of Redlands, California. This section would utilize mostly LWS or wood structures. The proposed typical design for this section is shown in Figure 41. This section of the circuit would be built to the 115 kV specifications. Typical 115 kV circuits have 30-foot wide easements. For EMF analysis, calculated field levels were evaluated 15 feet from the centerline of the structures. Presently, there are no schools immediately adjacent to this section. The proposed route for this section is adjacent to residential, commercial/industrial, and agricultural areas.

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

1. Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF 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 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 section of the Proposed Project.

Figure 42. Proposed 66 kV Structures Design – San Bernardino-Redlands-Tennessee 66 kV Relocation Model 2 (on San Bernardino Avenue Looking East)[119]



Magnetic Field Calculations: Figure 42 and Table 21 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed structure with a minimum height of 65 feet (above ground).

119 Figure is not to scale.

Figure 43. Calculated Magnetic Field Levels[120] for SB-R-TN Model 2 Relocation (on San Bernardino Avenue Looking East)

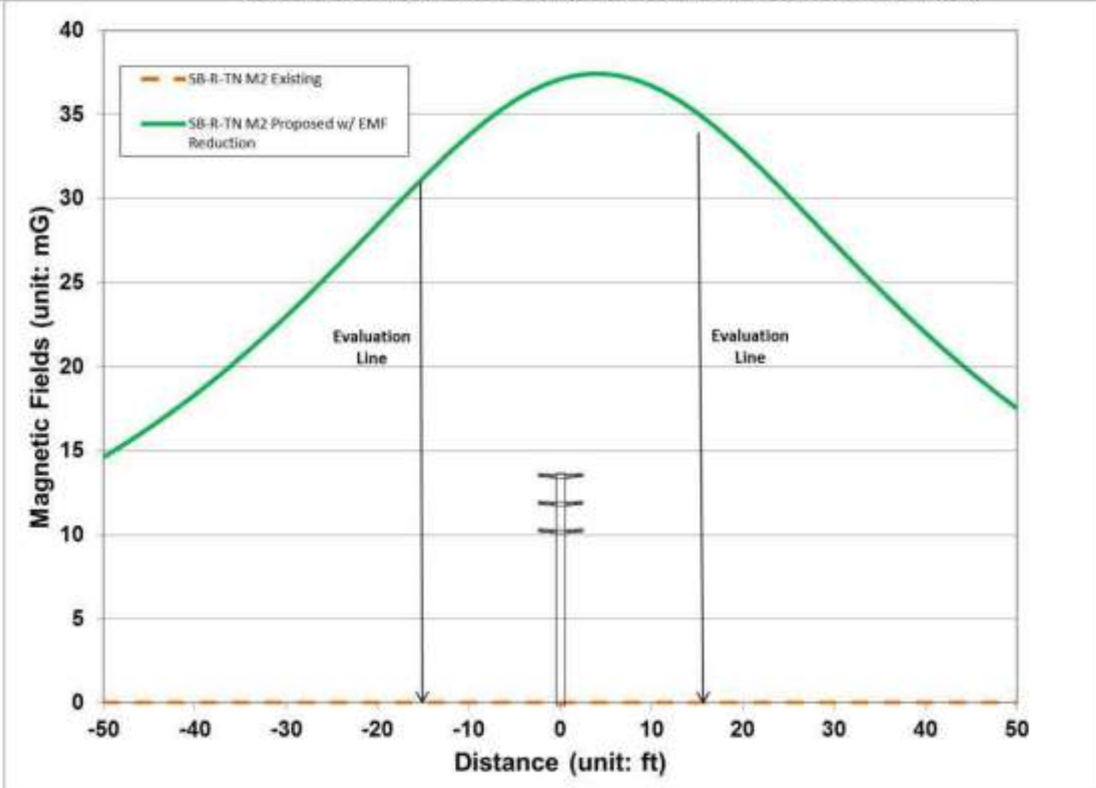


Table 22. Calculated Magnetic Field Levels[121] for SB-R-TN Model 2				
Design Options	15 Feet Left of Centerline of structures (mG)	% Reduction	15 Feet Right of Centerline of structures (mG)	% Reduction
Existing	0	-	0	-
Proposed	31.2	-	35.1	-

Recommendations for SB-R-TN Model 2: *Because the proposed design already includes no-cost field reduction measures including structural heights that met the SCE EMF preferred design criteria in the preliminary design, no low-cost field reduction measures such as utilizing taller structures are recommended.*

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

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

SB-R-TN Model 3

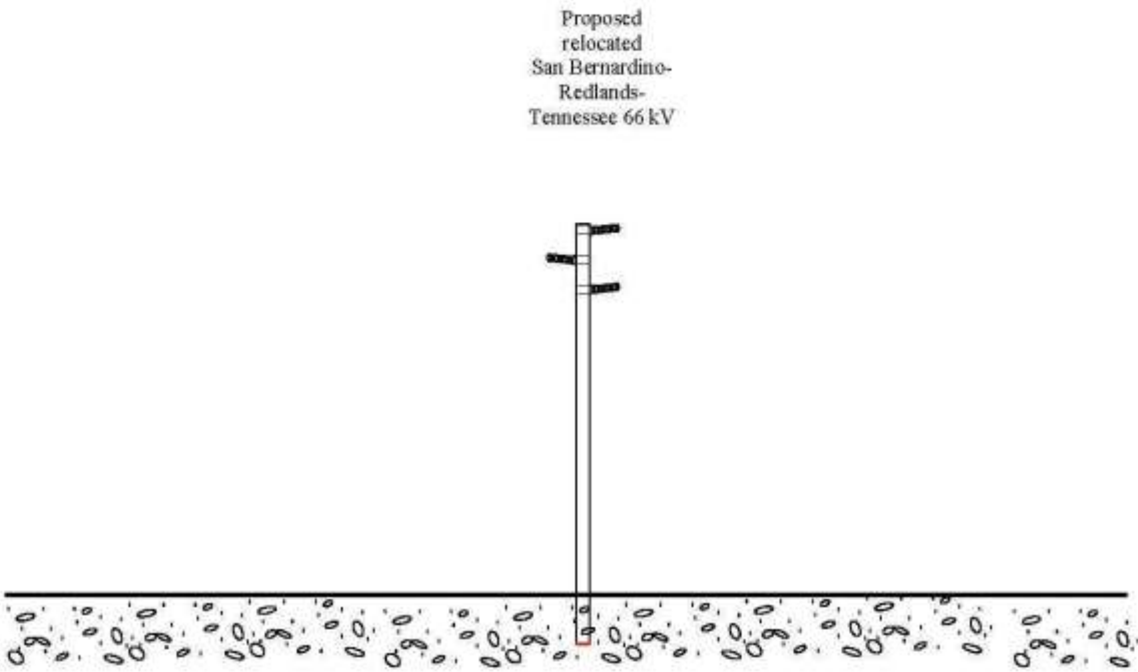
SB-R-TN Model 3 analyzes the typical design where the San Bernardino-Redlands-Tennessee 66 kV line is an overhead single circuit between the intersection of San Bernardino Avenue and Nevada Street in the City of Redlands to the intersection of Barton Road and Iowa Street in the City of Redlands, California. This section would utilize mostly LWS or wood structures. The proposed typical design for this section is shown in Figure 43. Typical 66 kV circuits have 25-foot wide easements. For EMF analysis, calculated field levels were evaluated 12.5 feet from the centerline of the structures, and the effects for any distribution located on the same structures were not considered. Presently, the Barbara Phelps Community Day School is located on the corner of Nevada Street and West Park Ave. The Loma Linda University Behavioral Medicine Center is located near this intersection. The buildings are more than 200 feet from the proposed relocated San Bernardino-Redlands-Tennessee 66 kV line. The proposed route for this section is adjacent to a school, residential, commercial/industrial, and agricultural areas.

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

1. Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria
2. Utilize subtransmission line construction that reduces the space between conductors compared with other designs
3. Locate subtransmission structures on the west side of the Nevada street away from school

Low-Cost Field Reduction Options: Low-cost field reduction option of using taller structures was considered near the school in this section.

Figure 44. Proposed 66 kV Structures Design – San Bernardino-Redlands-Tennessee 66 kV Relocation Model 3[122]



Magnetic Field Calculations: Figure 44 and Table 22 show the calculated magnetic field levels for the proposed design. These calculations were made using the proposed structure with a minimum height of 60 feet (above ground).

122 Figure is not to scale.

Figure 45. Calculated Magnetic Field Levels[123] for SB-R-TN Model 3 Proposed Relocation

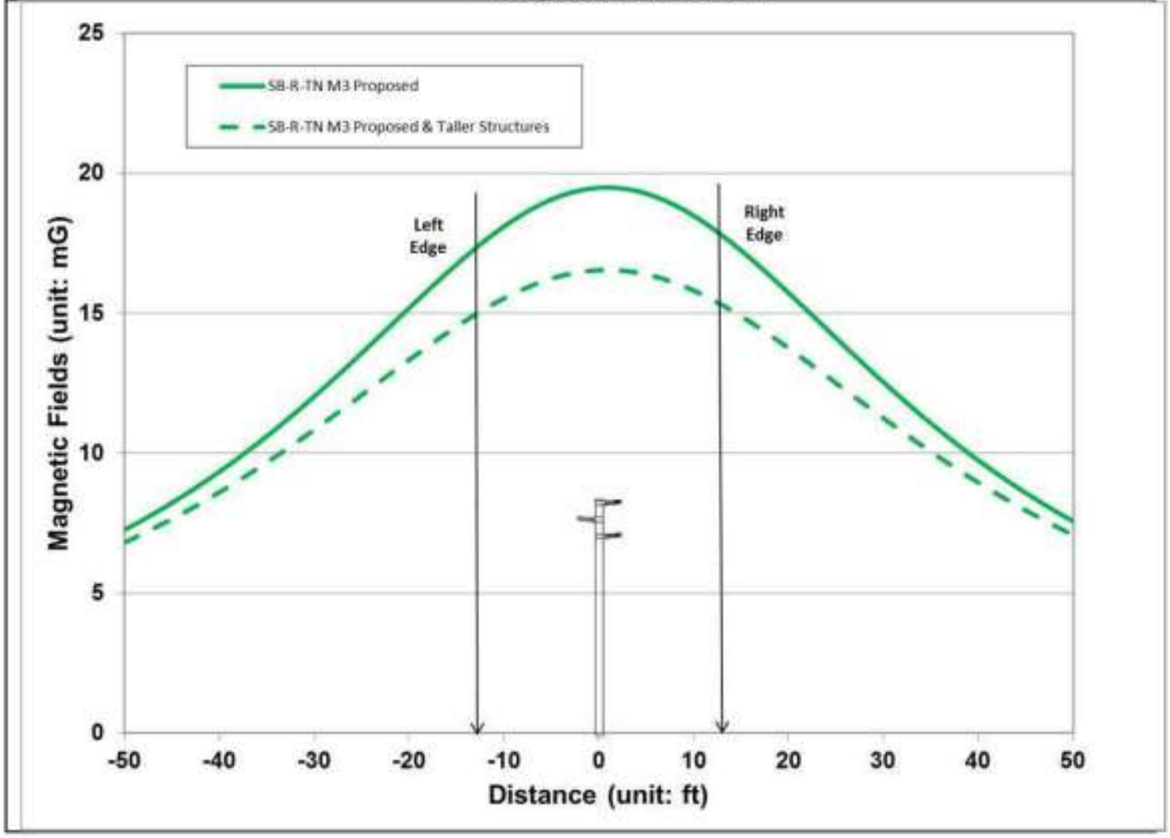


Table 23. Calculated Magnetic Field Levels[124] for SB-R-TN Model 3				
Design Options	12.5 Feet Left of Centerline of structures (mG)	% Reduction	12.5 Feet Right of Centerline of structures (mG)	% Reduction
Proposed	17.5	-	17.9	-
Proposed & Taller Structures	15.1	13.7	15.4	14.0

Recommendations for SB-R-TN Model 3: *Because the proposed design already includes no-cost field reduction measures including structural heights that met the SCE EMF preferred design criteria in the preliminary design, no low-cost field reduction measures such as utilizing taller structures are recommended. The low-cost measure of utilizing 10-foot taller structures would not achieve 15% or more field reduction and is not recommended.*

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

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

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

The Proposed Project substation work scope does not present significant opportunities to reduce EMF. There is no recommendation to reduce EMF for the substation scope of work.

Part 2: Proposed 220 kV Transmission Line Work

Segment 1 – From San Bernardino Substation to the San Bernardino Junction:

- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
- Arrange conductors of T/Ls for magnetic field reduction, maintain the following phase conductors the same arrangement or equivalent combination for the entire Segment 1:
    - San Bernardino-Vista 220 kV T/L: **B**-**C**-**A** (top to bottom)
    - Etiwanda-San Bernardino 220 kV T/L: **A**-**C**-**B** (top to bottom)
    - El Casco-San Bernardino 220 kV T/L: **B**-**A**-**C** (top to bottom)
    - Devers-San Bernardino 220 kV T/L: **C**-**A**-**B** (top to bottom)
- Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas

Segment 2 – From San Bernardino Junction to Vista Substation:

- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
- Arrange conductors of T/Ls for magnetic field reduction, maintain the following phase conductors the same arrangement or equivalent combination for the entire Segment 2:
    - Devers-Vista No.2 220 kV T/L: **B**-**C**-**A** (top to bottom)
    - Devers-Vista No.1 220 kV T/L: **A**-**C**-**B** (top to bottom)
- Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas

Segment 3 – From San Bernardino Substation to El Casco Substation:

- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
- Arrange conductors of T/Ls for magnetic field reduction, maintain the following phase conductors the same arrangement or equivalent combination for the entire Segment 3:
  - Devers-San Bernardino 220 kV T/L: **C-A-B** (top to bottom)
  - El Casco-San Bernardino 220 kV T/L: **B-A-C** (top to bottom)
  - Devers-Vista No.2 220 kV T/L: **B-C-A** (top to bottom)
  - Devers-Vista No.1 220 kV T/L: **A-C-B** (top to bottom)
- Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas

Segment 4 – From El Casco Substation to San Gorgonio Avenue in the City of Banning:

- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
- Arrange conductors of T/Ls for magnetic field reduction, maintain the following phase conductors the same arrangement or equivalent combination for the entire Segment 4:
  - Devers-San Bernardino 220 kV T/L: **C-A-B** (top to bottom)
  - Devers-El Casco 220 kV T/L: **B-A-C** (top to bottom)
  - Devers-Vista No.2 220 kV T/L: **B-C-A** (top to bottom)
  - Devers-Vista No.1 220 kV T/L: **A-C-B** (top to bottom)
- Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas

Segment 5 – From San Gorgonio Avenue in the City of Banning to the eastern limit of the Morongo Reservation at Rushmore Avenue:

- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
- Arrange conductors of T/Ls for magnetic field reduction, maintain the following phase conductors the same arrangement or equivalent combination for the entire Segment 5:
  - Devers-San Bernardino 220 kV T/L: **C-A-B** (top to bottom)
  - Devers-El Casco 220 kV T/L: **B-A-C** (top to bottom)

  - Devers-Vista No.2 220 kV T/L: **B-C-A** (top to bottom)
  - Devers-Vista No.1 220 kV T/L: **A-C-B** (top to bottom)

- Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas

Segment 6 – From the eastern limit of the Morongo Reservation at Rushmore Avenue to Devers Substation:

- Utilize double-circuit construction that reduces spacing between circuits as compared with single-circuit construction
- Arrange conductors of T/Ls for magnetic field reduction, maintain the following phase conductors the same arrangement or equivalent combination for the entire Segment 6:
  - Devers-San Bernardino 220 kV T/L: **C-A-B** (top to bottom)
  - Devers-El Casco 220 kV T/L: **B-A-C** (top to bottom)
  - Devers-Vista No.2 220 kV T/L: **B-C-A** (top to bottom)
  - Devers-Vista No.1 220 kV T/L: **A-C-B** (top to bottom)

- Utilize taller structure heights **or** increased conductor ground clearance where the proposed T/Ls run adjacent to populated areas

Part 3: Proposed 66 kV Subtransmission Line Work

San Bernardino-Redlands-Timoteo 66 kV Relocation:

Section 1 (SB-R-T M1): Parallel with existing Calectric-Homart-Mentone 115 kV subtransmission line on the same structure:

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

Section 2 (SB-R-T M2): Single circuit overhead San Bernardino-Redlands-Timoteo 66 kV subtransmission line:

- Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria

- Utilize subtransmission line construction that reduces the space between conductors compared with other designs

Section 3 (SB-R-T M3): Single circuit underground San Bernardino-Redlands-Timoteo 66 kV subtransmission line:

- Utilize underground subtransmission construction for crossing other transmission structures and other engineering reasons

San Bernardino-Redlands-Tennessee 66 kV Relocation:

Section 1 (SB-R-TN M1): Parallel with existing El Casco-Purewater-Vista 115 kV and San Bernardino-Highland 66 kV subtransmission lines on separate structures:

- Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria
- Utilize subtransmission line construction that reduces the space between conductors compared with other designs
- Arrange conductors of subtransmission lines for magnetic field reduction with the following arrangement or equivalent combination:
    - Existing El Casco-Purewater-Vista 115 kV: **A-C-B** (top to bottom, no change)
    - Existing San Bernardino-Highland 66 kV: **A-B-C** (top to bottom, no change)
    - Relocated San Bernardino-Redlands-Tennessee 66 kV: **C-A-B** (top to bottom)

Section 2 (SB-R-TN M2): Parallel with existing Calectric-Homart-Mentone 115 kV subtransmission line on the same structure:

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

Section 3 (SB-R-TN M3): Single circuit overhead San Bernardino-Redlands-Tennessee 66 kV Subtransmission line:

- Utilize subtransmission structure heights that meet or exceed SCE's preferred EMF design criteria
- Utilize subtransmission line construction that reduces the space between conductors compared with other designs

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 2019 FORECASTED LOADING CONDITIONS

Magnetic Field Model Assumptions:

SCE uses a computer program titled "MFields"[125] 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 transmission and subtransmission lines were modeled using forecasted peak loads (see Tables 23 and 24).
- All conductors were assumed to be straight and infinitely long.
- Average conductor heights account for line sag used in the calculation for the transmission and 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.

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

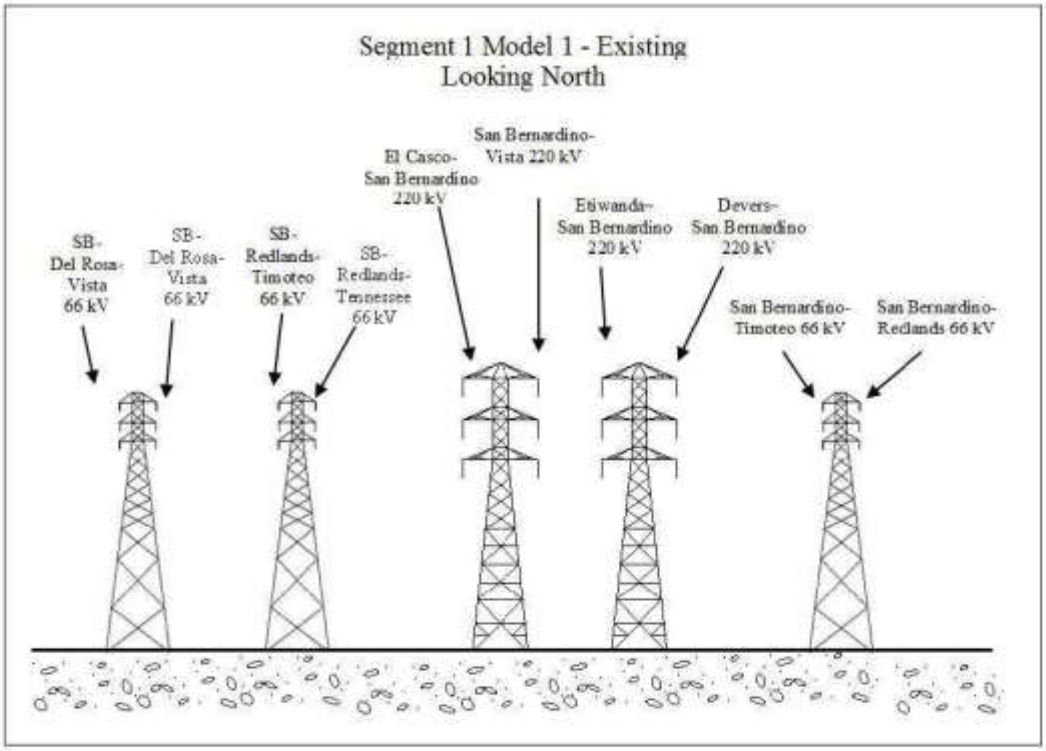
Table 24. Year 2019 Forecasted Loading Conditions for the Proposed Project (After Project Completion)		
Line Name	**Current (Amps)**	**Power Flow Direction**
El Casco-Purewater-Vista 115 kV (Segment 3)	273	El Casco to Purewater, open at Vista
El Casco-Purewater-Vista 115 kV (Segment 2)	0	Normally no current in this section
El Casco-San Bernardino 220 kV	943	El Casco to San Bernardino
San Bernardino-Vista 220 kV	1760	San Bernardino to Vista
Etiwanda-San Bernardino 220 kV	1182	San Bernardino to Etiwanda
Devers-San Bernardino 220 kV	1641	Devers to San Bernardino
Devers-Vista No.2 220 kV	1938	Devers to Vista
Devers-Vista No.1 220 kV	2149	Devers to Vista
Devers-El Casco 220 kV	1839	Devers to El Casco
Devers-Valley No.1 500 kV	1210	Devers to Valley
Devers-Valley No.2 500 kV	1210	Devers to Valley
San Bernardino-Del Rosa-Vista 66 kV	417	San Bernardino to other substations
San Bernardino-Cardiff-Unimed-Vista 66 kV	463	San Bernardino to other substations
San Bernardino-Redlands 66 kV	737	San Bernardino to Redlands
San Bernardino-Timoteo 66 kV	690	San Bernardino to Timoteo
El Casco-Purewater-Vista 115 kV (on San Bernardino Ave)	0	Normally no current in this section
Calectric-Homart-Mentone 115 kV (on San Bernardino Ave)	0	Normally no current in this section
San Bernardino-Highland 66 kV	791	San Bernardino to Highland
San Bernardino-Redlands-Timoteo 66 kV	614	San Bernardino to other substations
San Bernardino-Redlands-Tennessee 66 kV	697	San Bernardino to other substations
Moreno-Moval-Vista 115 kV	0	Normally carries no current in this section

Table 25. Year 2019 Forecast Loading Conditions without the Proposed Project		
Line Name	**Current (Amps)**	**Power Flow Direction**
El Casco-Purewater-Vista 115 kV (Segment 3)	273	El Casco to Purewater, open at Vista
El Casco-Purewater-Vista 115 kV (Segment 2)	0	Normally no current in this section
El Casco-San Bernardino 220 kV	333	El Casco to San Bernardino
San Bernardino-Vista 220 kV	956	San Bernardino to Vista
Etiwanda-San Bernardino 220 kV	750	San Bernardino to Etiwanda
Devers-San Bernardino 220 kV	750	Devers to San Bernardino
Devers-Vista No.2 220 kV	1163	Devers to Vista
Devers-Vista No.1 220 kV	998	Devers to Vista
Devers-El Casco 220 kV	1020	Devers to El Casco
Devers-Valley No.1 500 kV	1430	Devers to Valley
Devers-Valley No.2 500 kV	1430	Devers to Valley
San Bernardino-Del Rosa-Vista 66 kV	417	San Bernardino to other substations
San Bernardino-Cardiff-Unimed-Vista 66 kV	463	San Bernardino to other substations
San Bernardino-Redlands 66 kV	690	San Bernardino to Redlands
San Bernardino-Timoteo 66 kV	737	San Bernardino to Timoteo
El Casco-Purewater-Vista 115 kV (on San Bernardino Ave)	0	Normally no current in this section
Calectric-Homart-Mentone 115 kV (on San Bernardino Ave)	0	Normally no current in this section
San Bernardino-Highland 66 kV	791	San Bernardino to Highland
San Bernardino-Redlands-Timoteo 66 kV	614	San Bernardino to other substations
San Bernardino-Redlands-Tennessee 66 kV	697	San Bernardino to other substations
Moreno-Moval-Vista 115 kV	0	Normally carries no current in this section

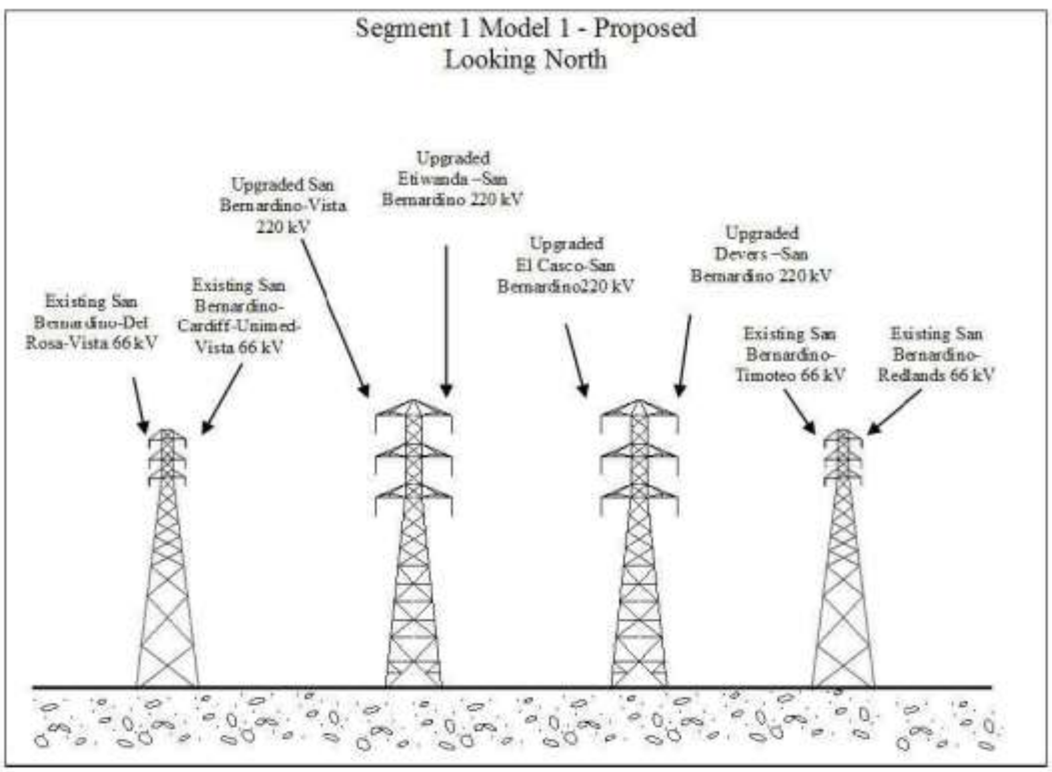
Notes:

1. Forecasted loading data is based upon scenarios representing load forecasts for 2019. The forecasting data is subject to change depending upon availability of generation, load increases, changes in load demand, and by many other factors.

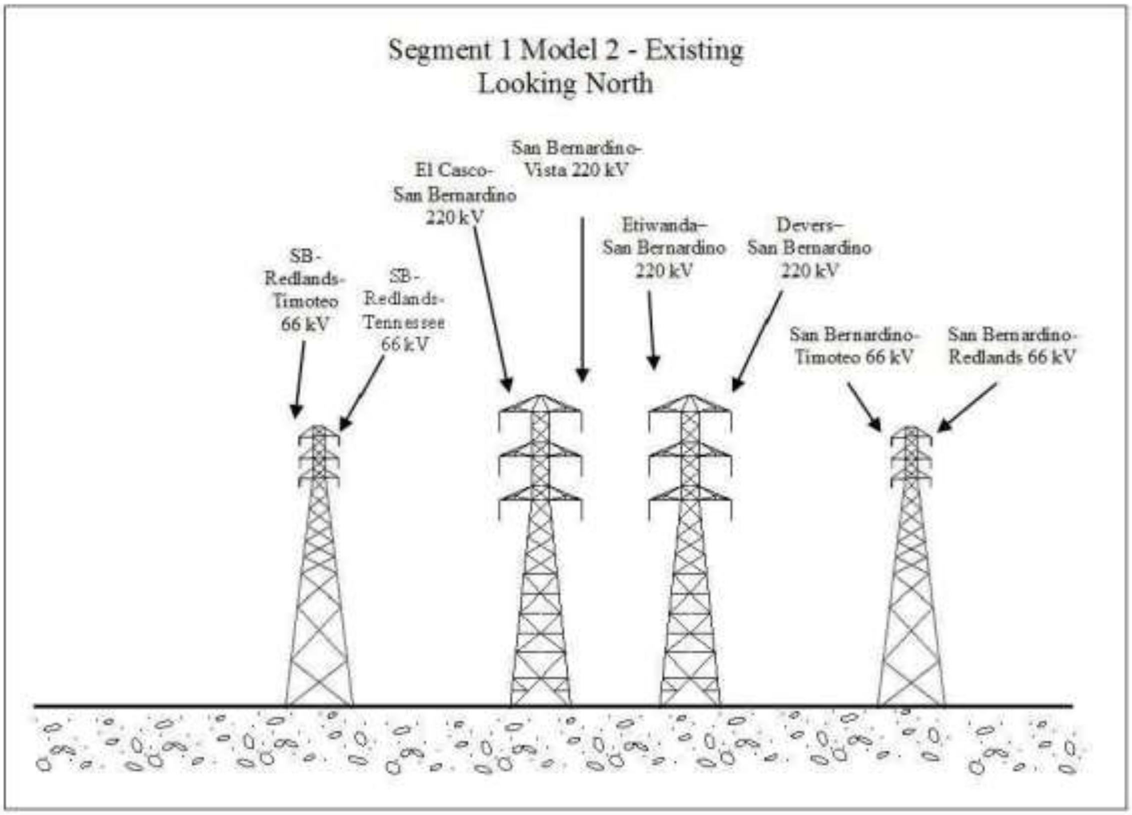
VIII. APPENDIX B: EXISTING AND PROPOSED TRANSMISSION CONFIGURATIONS

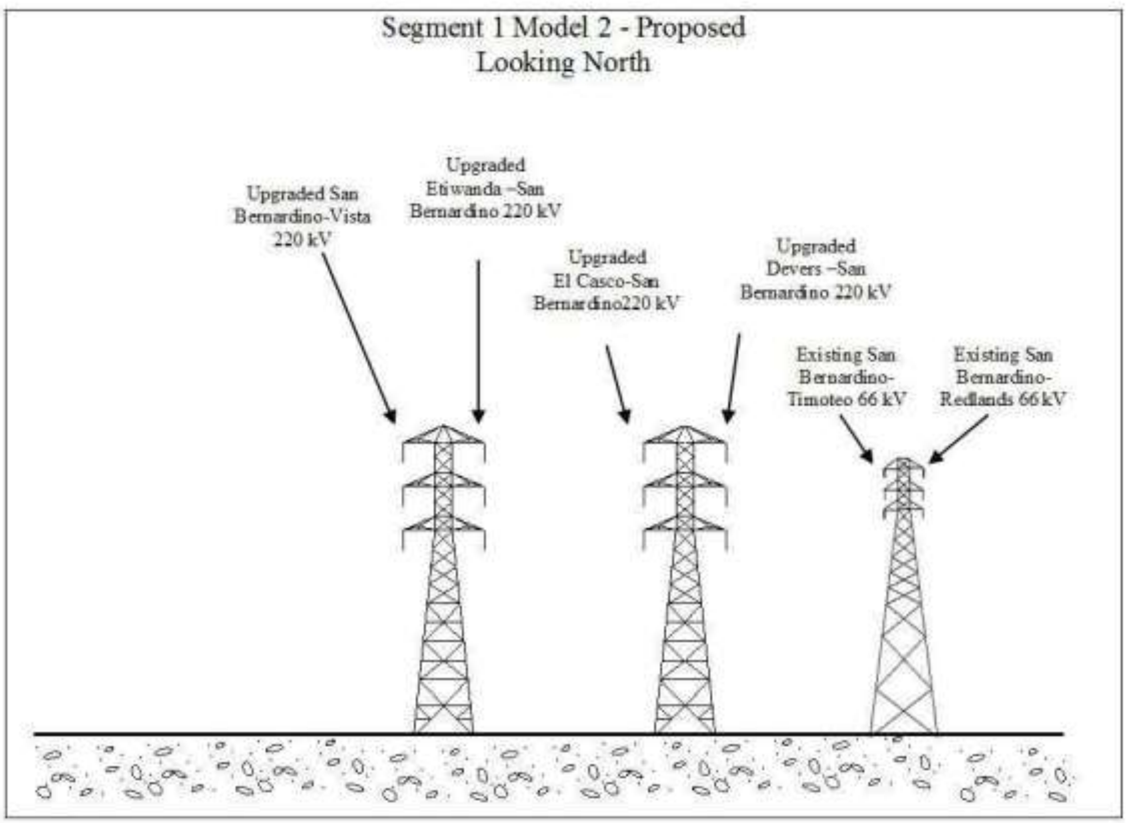


Segment 1 Model 1 - Existing
Looking North

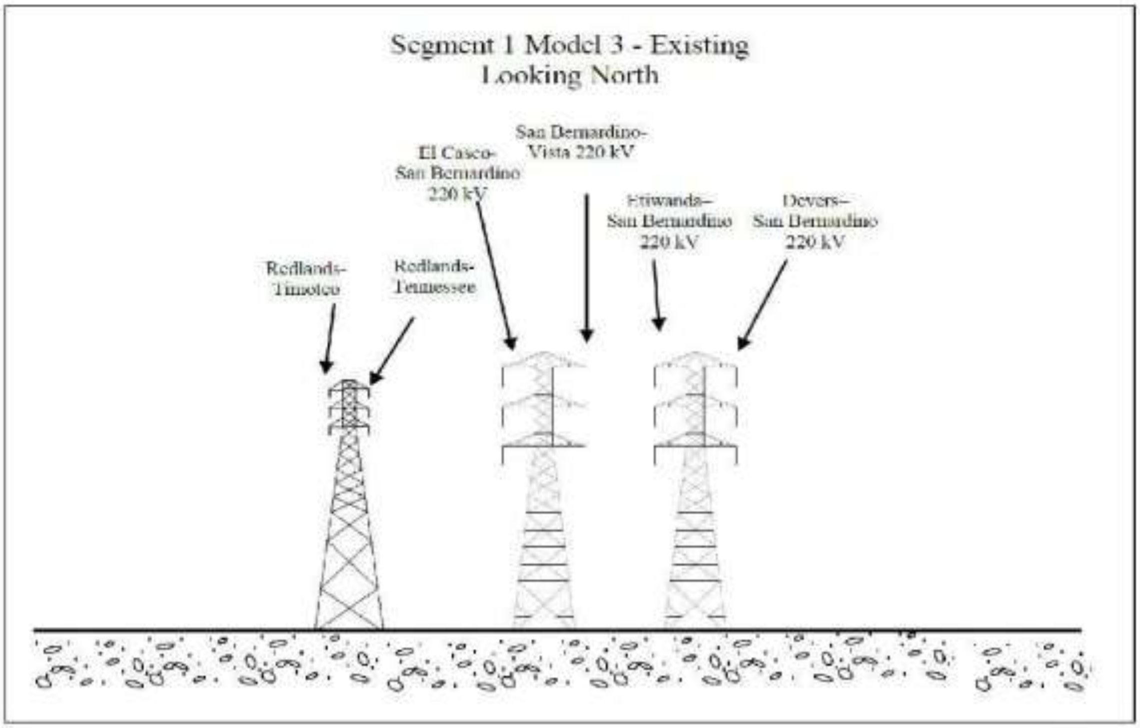


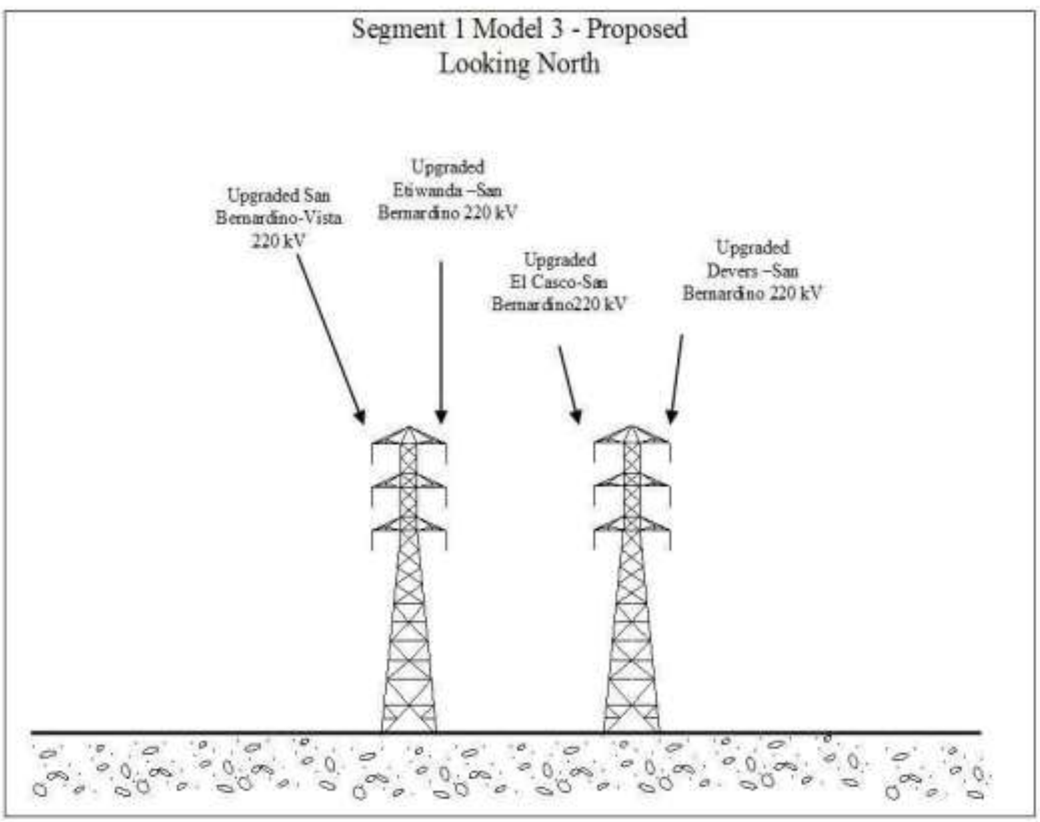
Segment 1 Model 1 - Proposed
Looking North

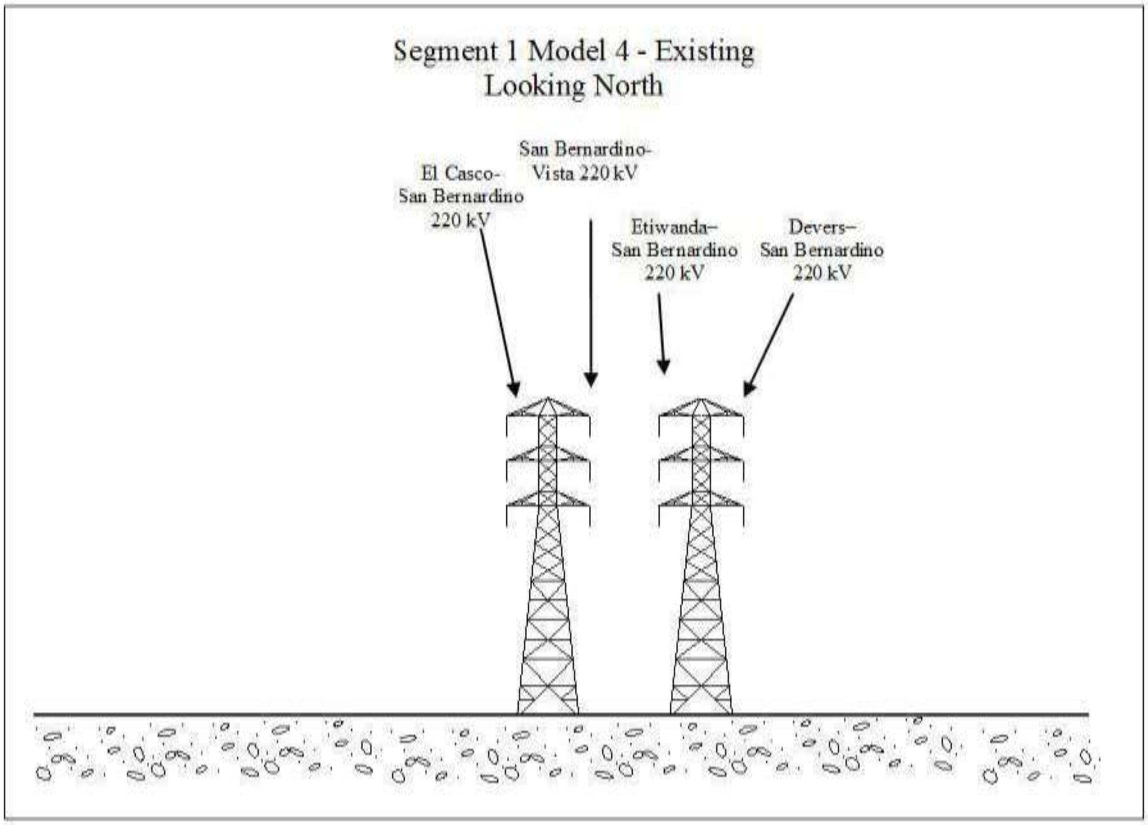

Segment 1 Model 2 - Existing
Looking North
SB-Redlands-Timoteo 66 kV
SB-Redlands-Tennessee 66 kV
El Casco-San Bernardino 220 kV
San Bernardino-Vista 220 kV
Etiwanda–San Bernardino 220 kV
Devers–San Bernardino 220 kV
San Bernardino-Timoteo 66 kV
San Bernardino-Redlands 66 kV

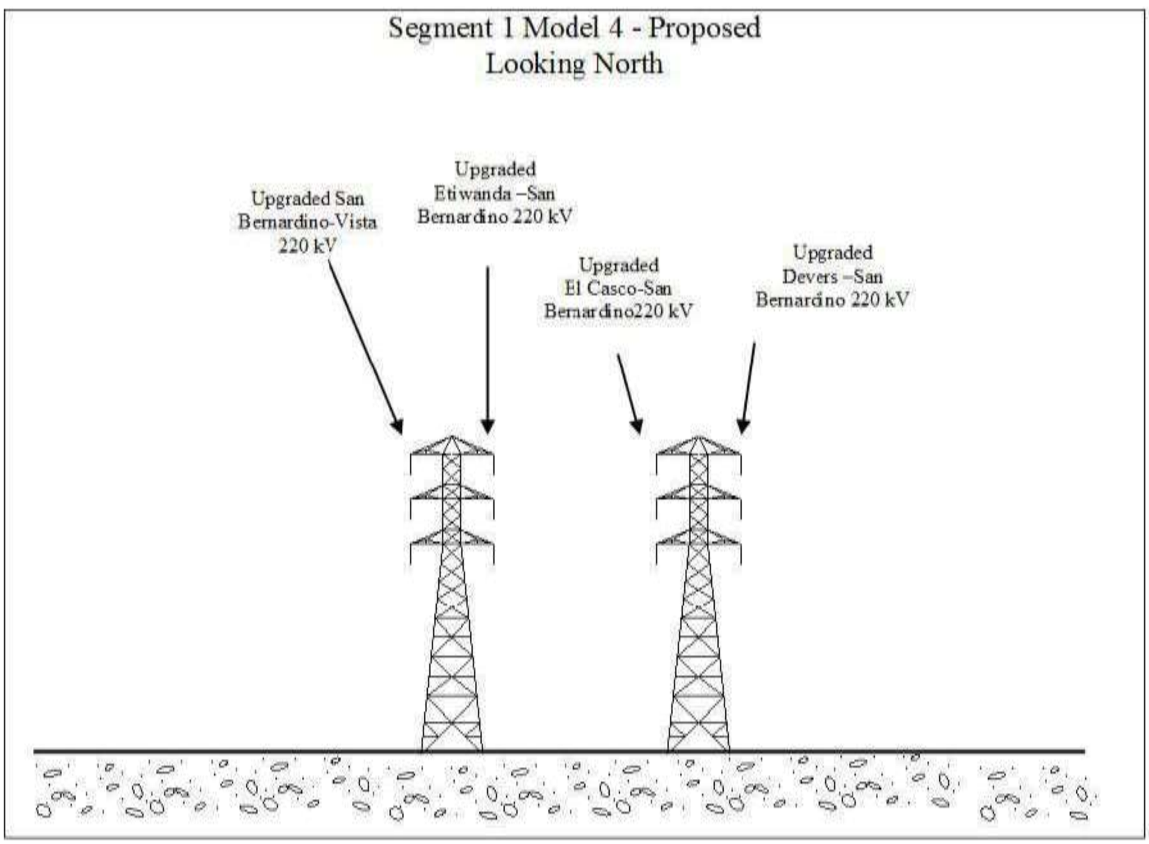

Segment 1 Model 2 - Proposed
Looking North
Upgraded San Bernardino-Vista 220 kV
Upgraded Etiwanda –San Bernardino 220 kV
Upgraded El Casco-San Bernardino220 kV
Upgraded Devers –San Bernardino 220 kV
Existing San Bernardino-Timoteo 66 kV
Existing San Bernardino-Redlands 66 kV

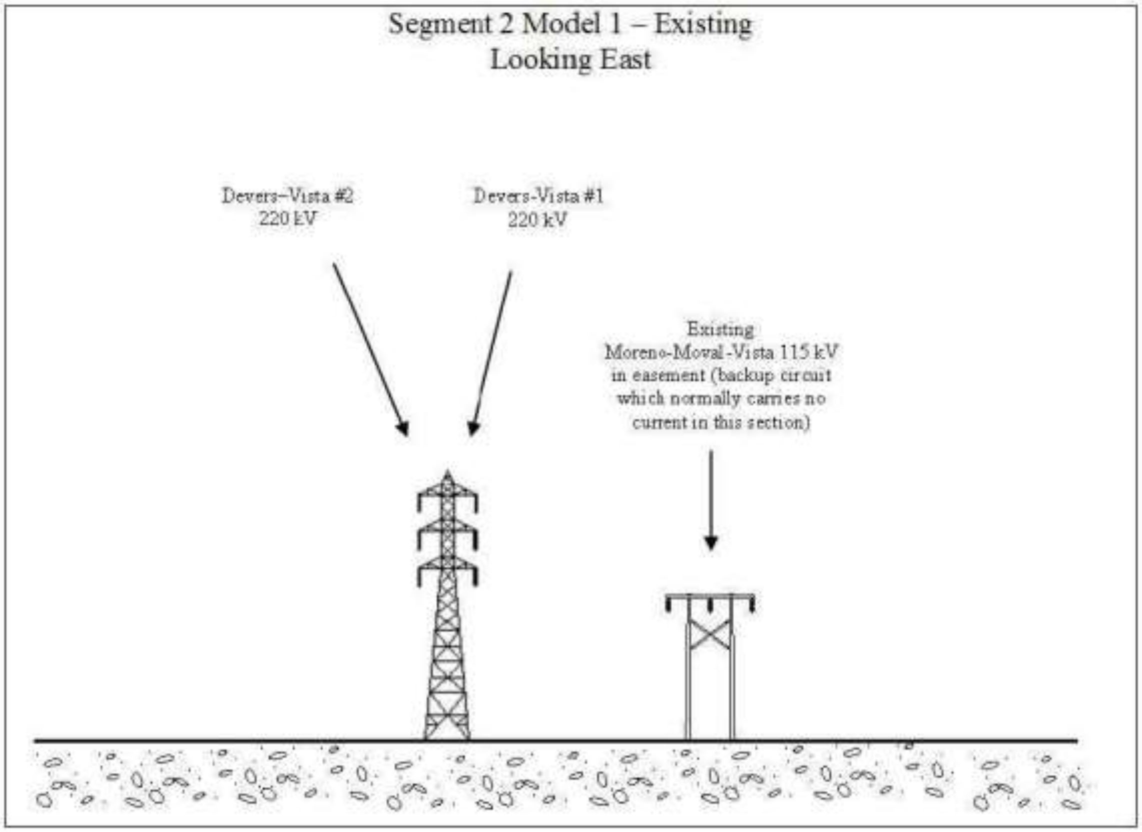
Attachment to Response of West of Devers Upgrade Project Data Request //3 PHS-4

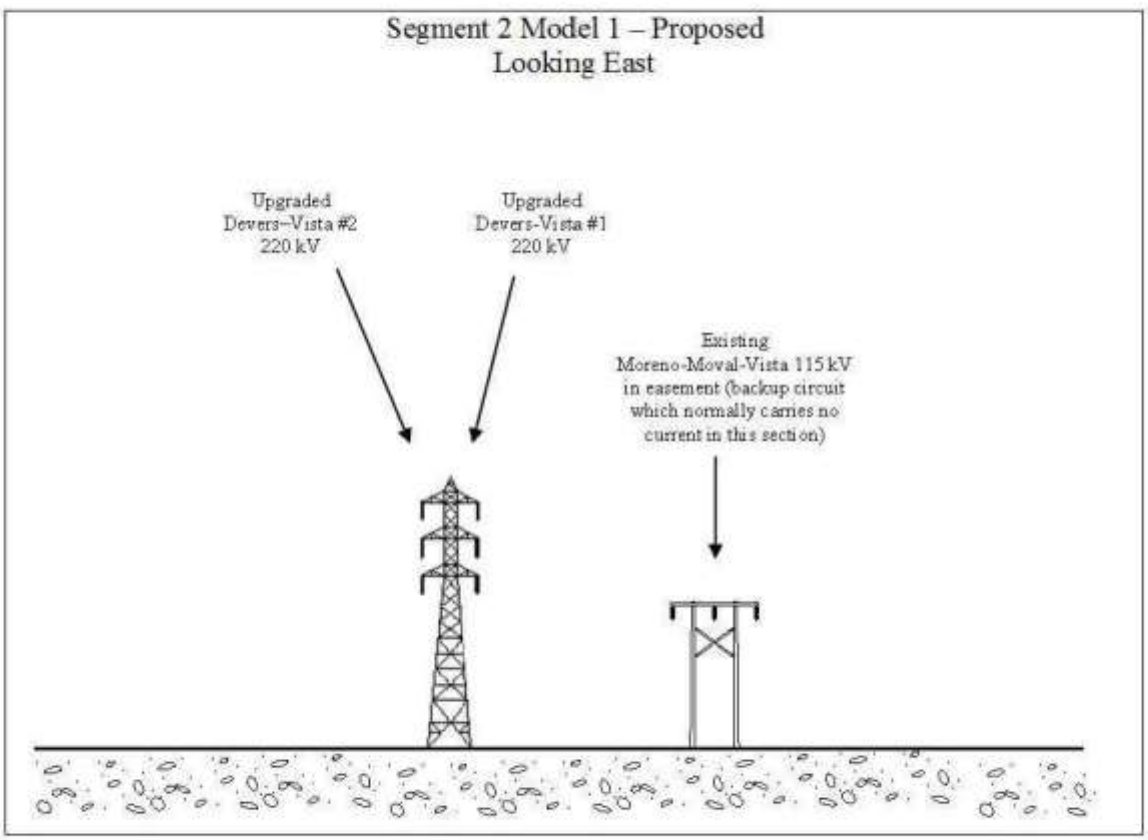




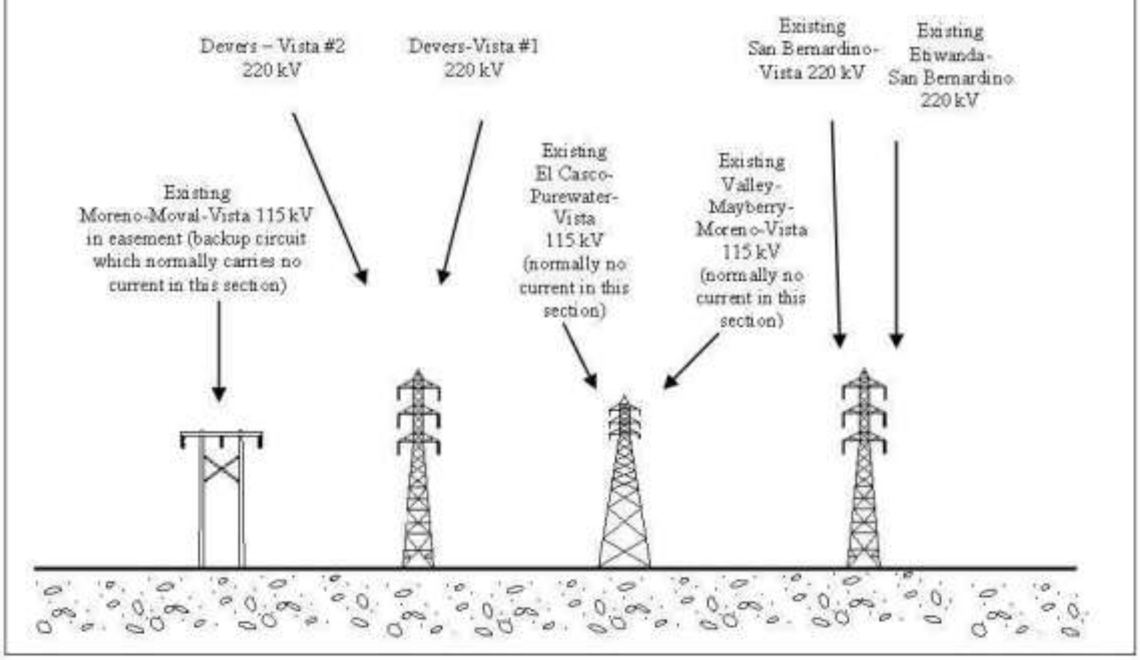

Segment 1 Model 4 - Existing
Looking North
San Bernardino-
Vista 220 kV
El Casco-
San Bernardino
220 kV
Etiwanda–
San Bernardino
220 kV
Devers–
San Bernardino
220 kV


Segment 1 Model 4 - Proposed
Looking North
Upgraded
Etiwanda –San
Bernardino 220 kV
Upgraded San
Bernardino-Vista
220 kV
Upgraded
El Casco-San
Bernardino220 kV
Upgraded
Devers –San
Bernardino 220 kV

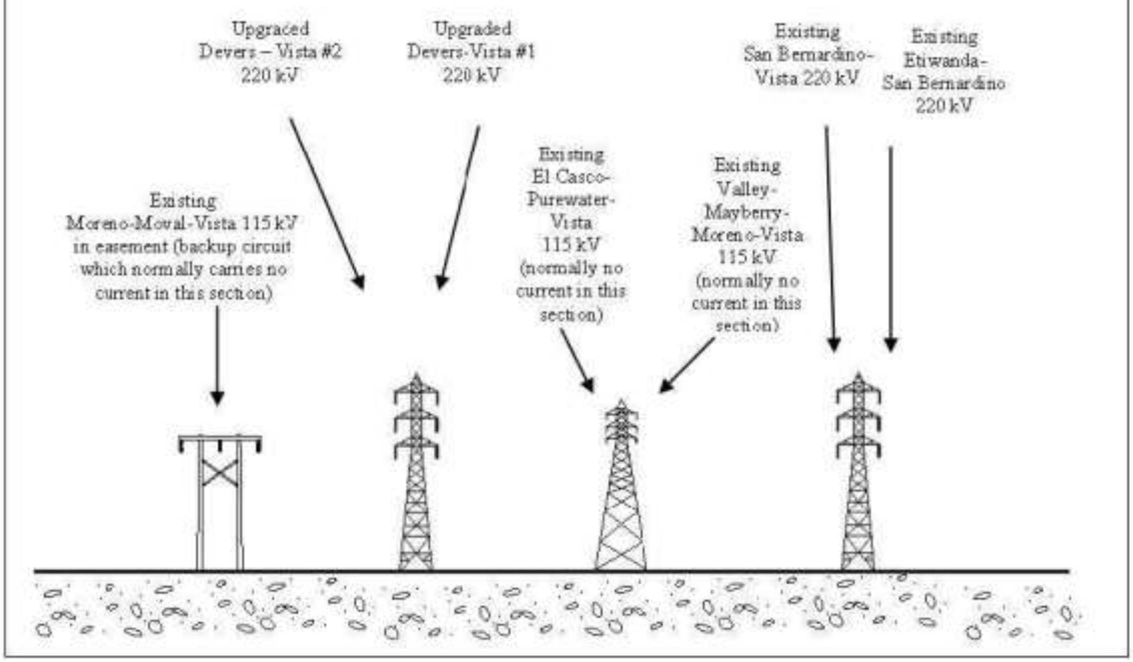

Segment 2 Model 1 – Existing
Looking East
Devers–Vista #2
220 kV
Devers-Vista #1
220 kV
Existing
Moreno-Moval-Vista 115 kV
in easement (backup circuit
which normally carries no
current in this section)


Segment 2 Model 1 – Proposed
Looking East
Upgraded
Devers–Vista #2
220 kV
Upgraded
Devers-Vista #1
220 kV
Existing
Moreno-Moval-Vista 115 kV
in easement (backup circuit
which normally carries no
current in this section)

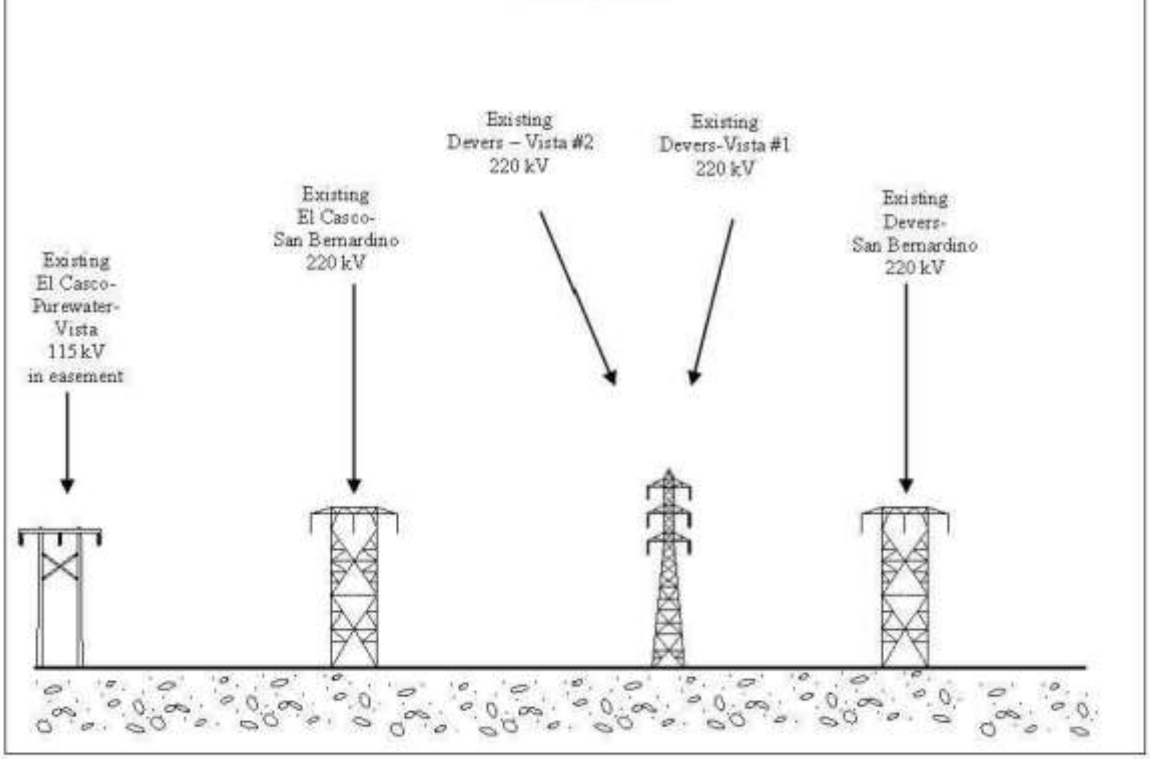
Segment 2 Model 2 – Existing
Looking East



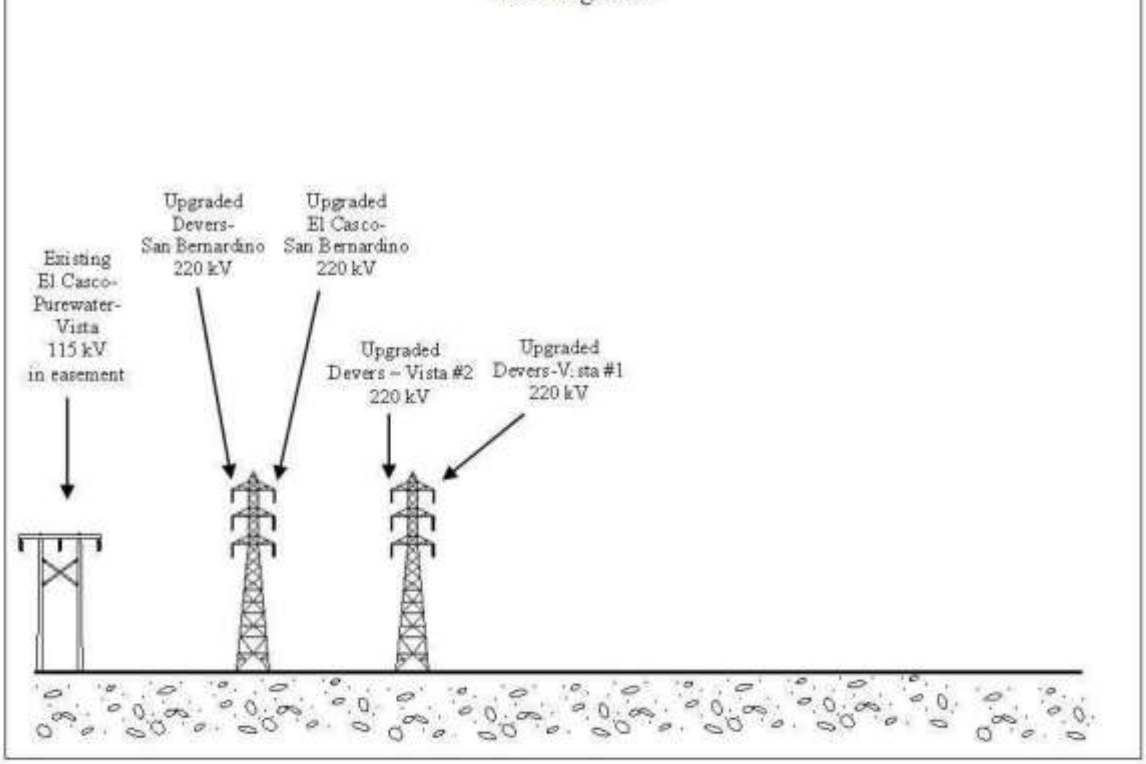
Segment 2 Model 2 – Proposed
Looking East



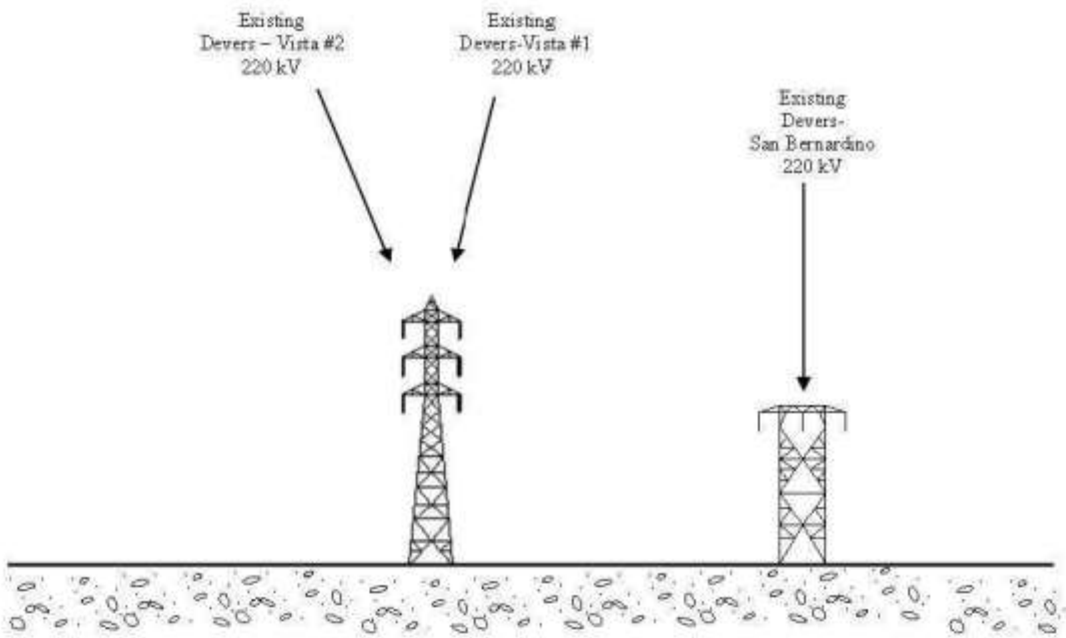
Segment 3 – Existing
Looking East



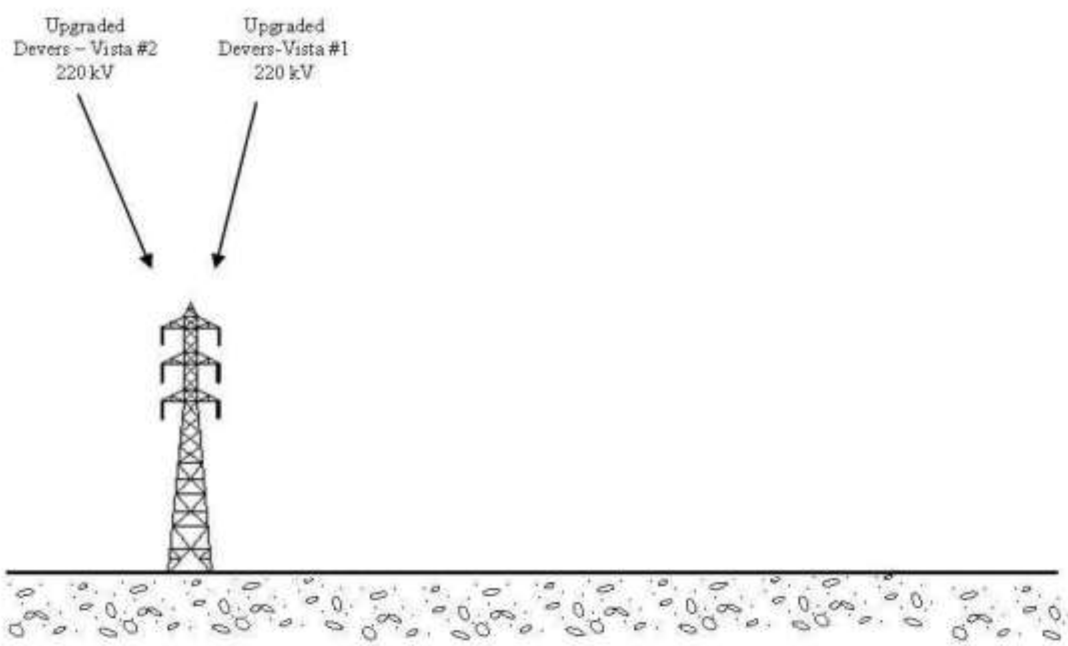
Segment 3 – Proposed
Looking East

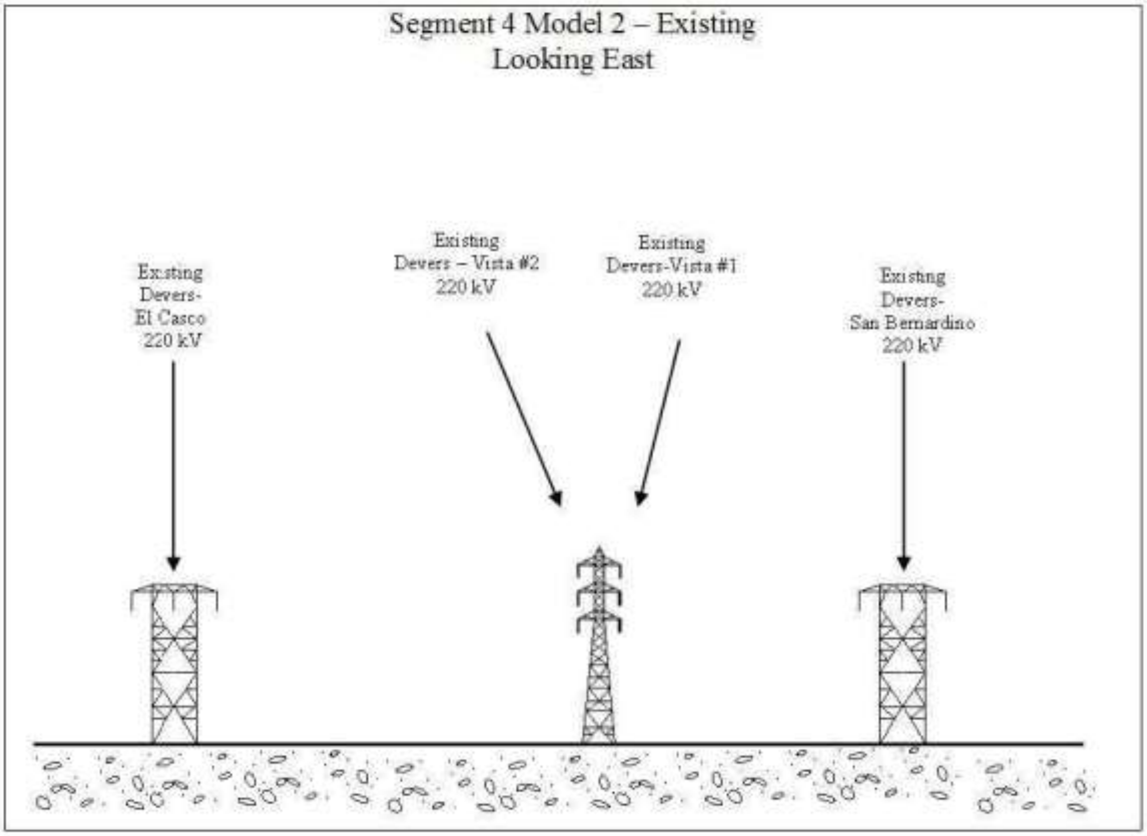


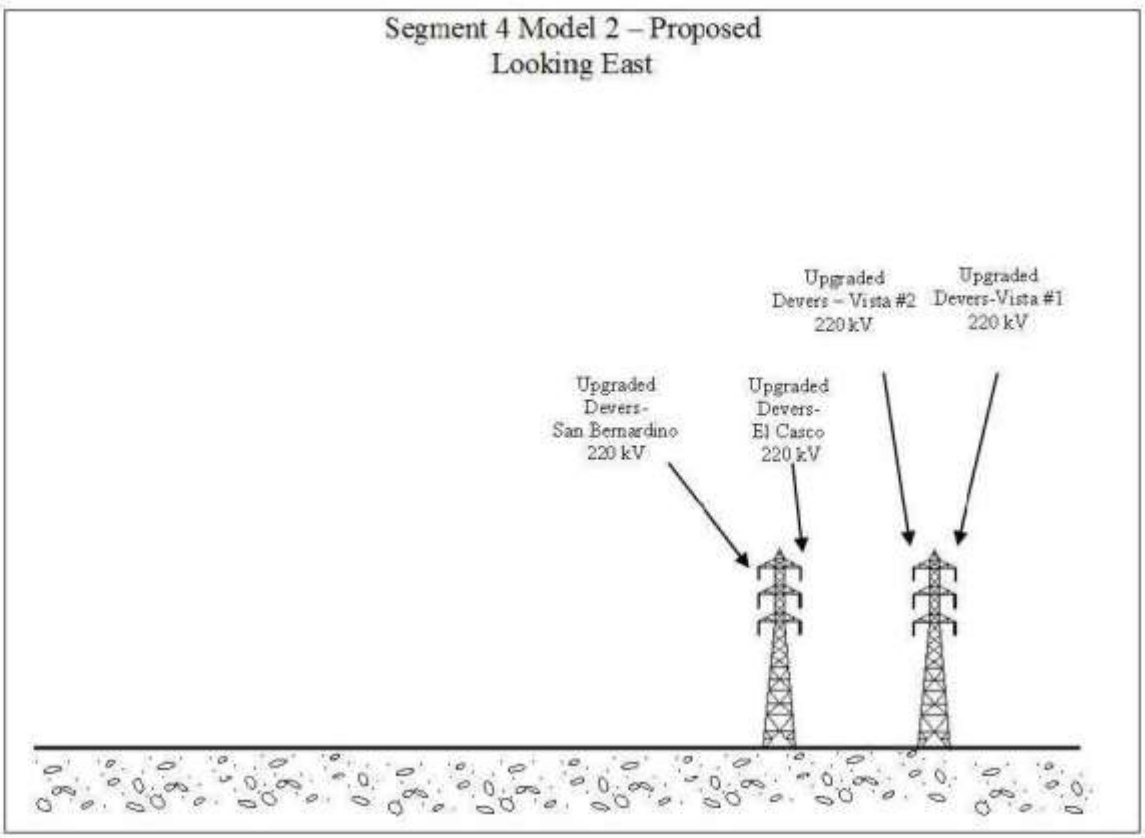
Segment 4 Model 1– Existing
Looking East

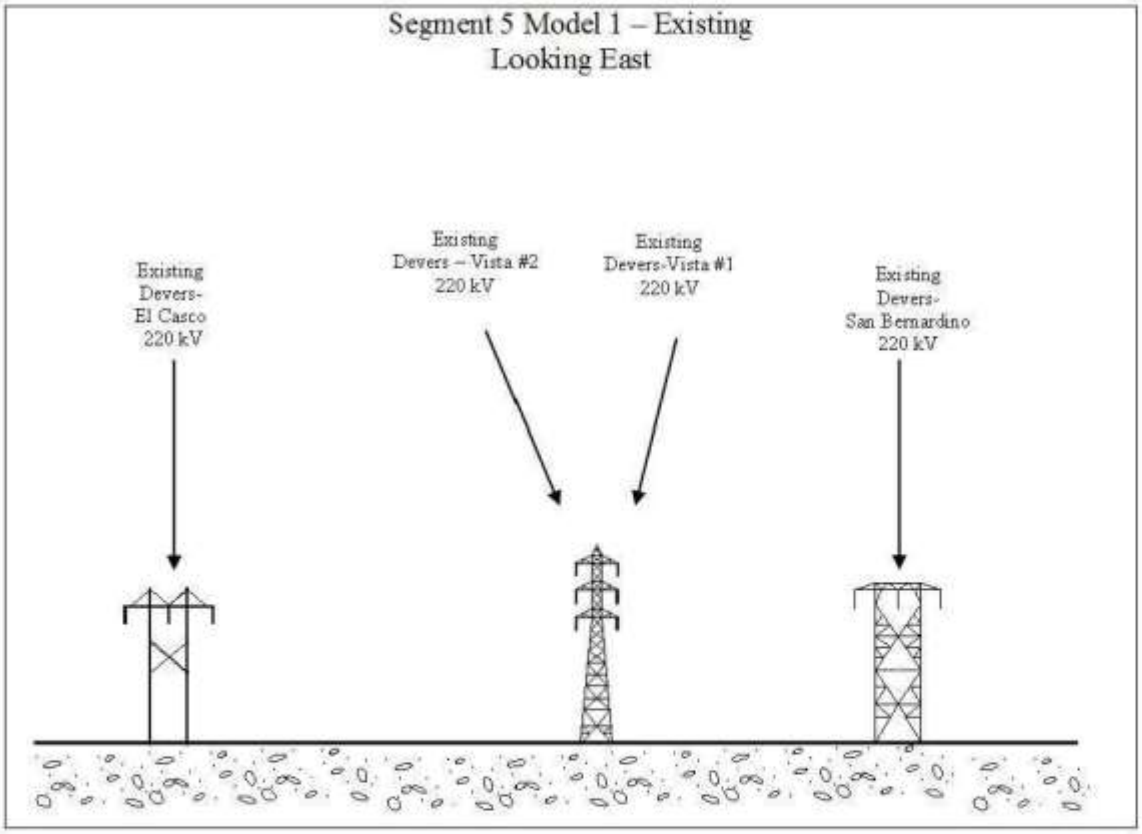


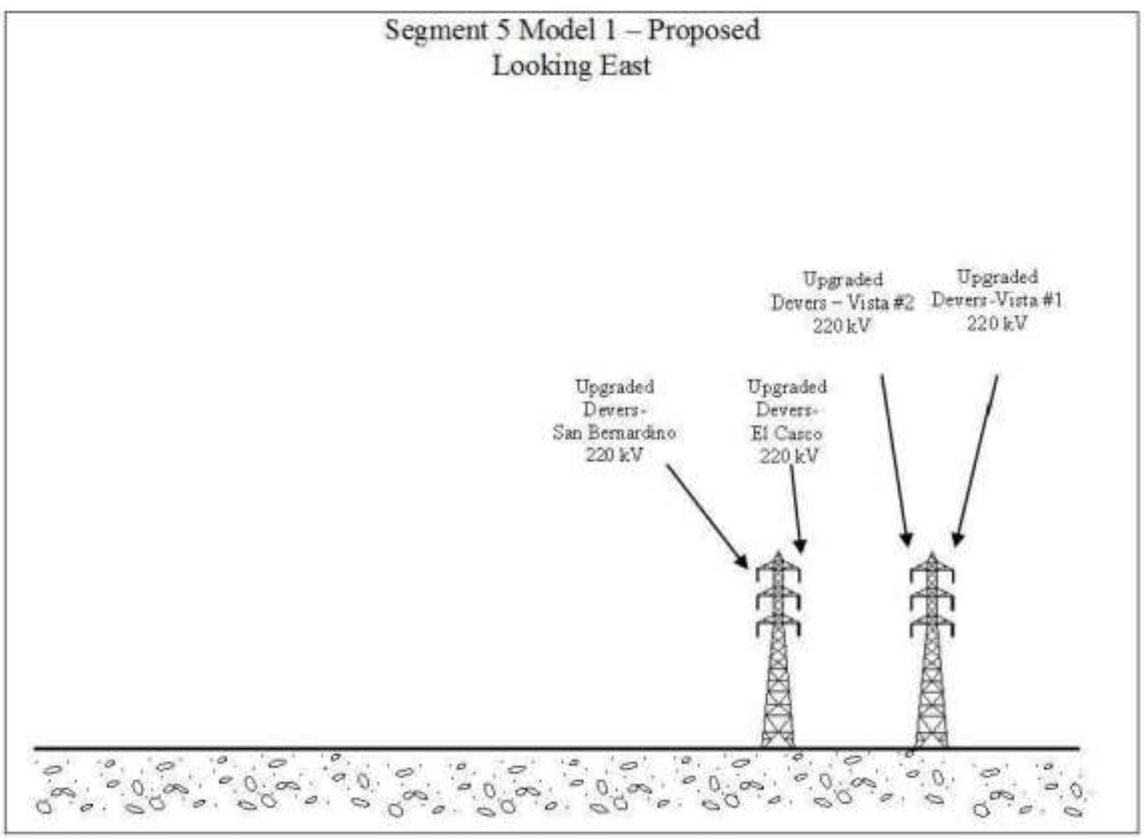
Segment 4 Model 1– Proposed
Looking East

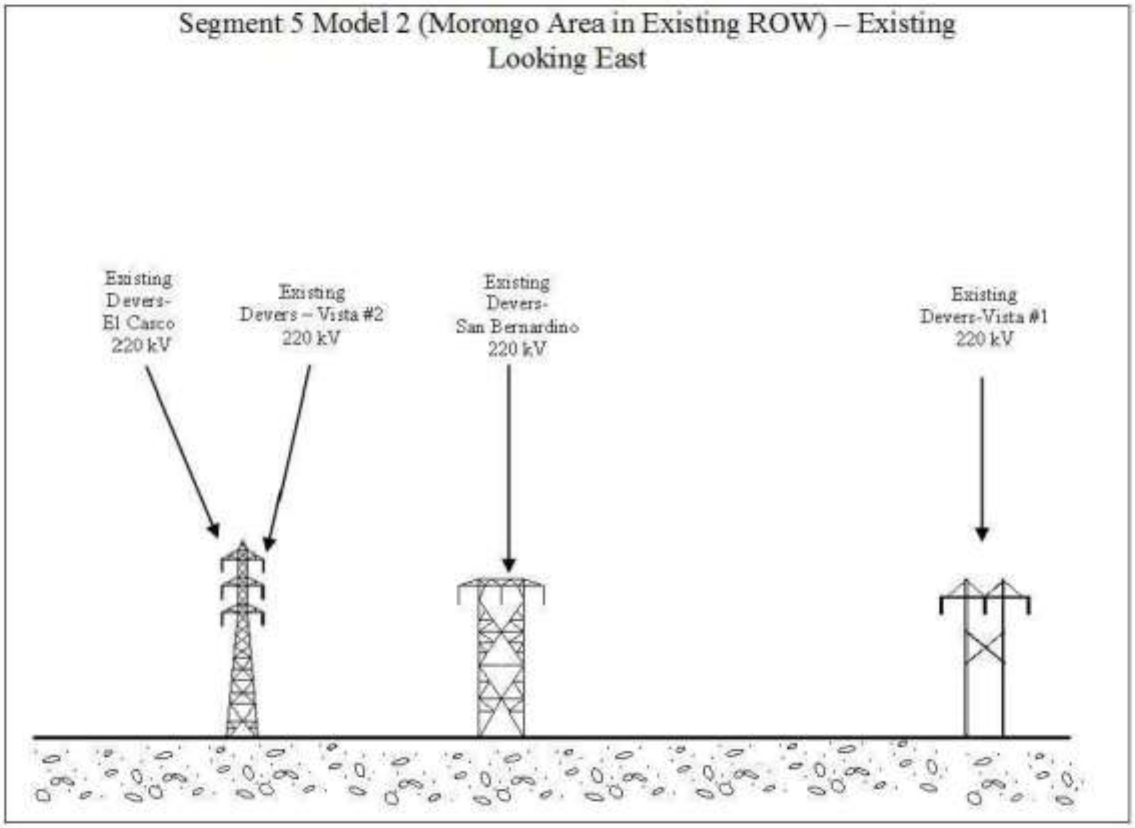


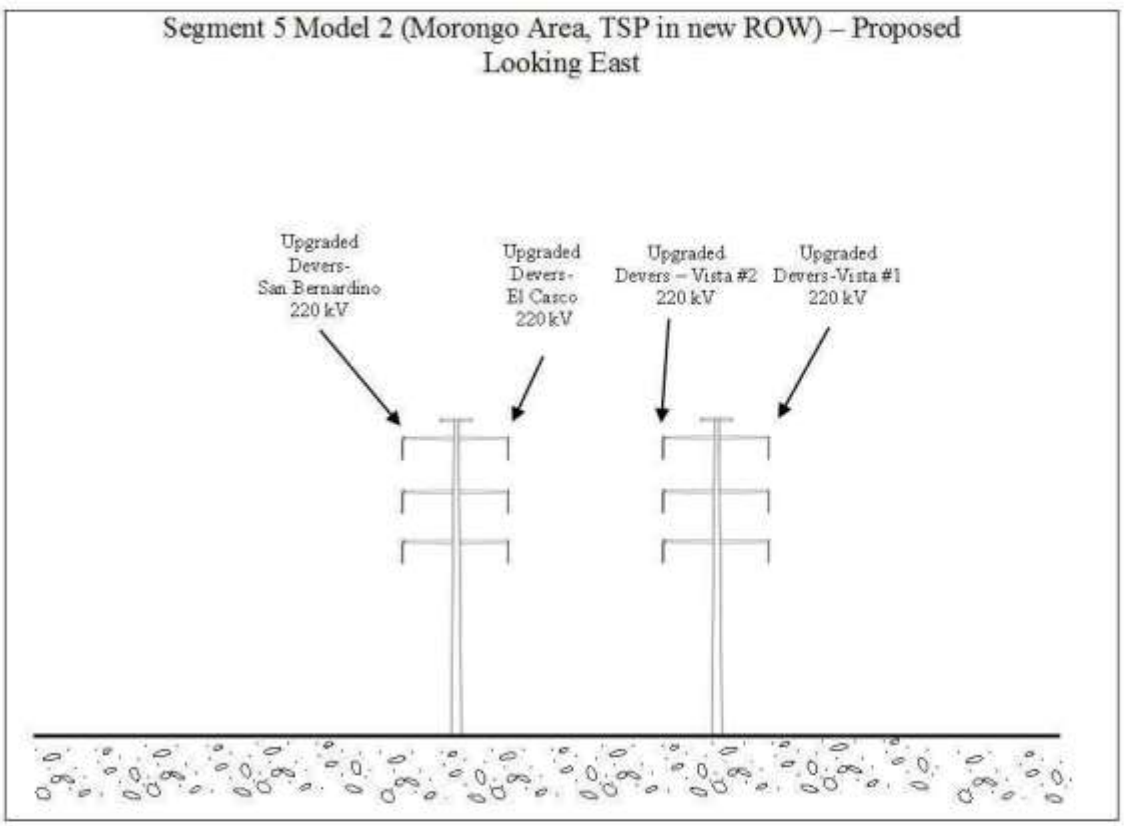

Segment 4 Model 2 – Existing
Looking East
Existing
Devers-
El Casco
220 kV
Existing
Devers – Vista #2
220 kV
Existing
Devers-Vista #1
220 kV
Existing
Devers-
San Bernardino
220 kV


Segment 4 Model 2 – Proposed
Looking East
Upgraded
Devers – Vista #2
220 kV
Upgraded
Devers-Vista #1
220 kV
Upgraded
Devers-
San Bernardino
220 kV
Upgraded
Devers-
El Casco
220 kV

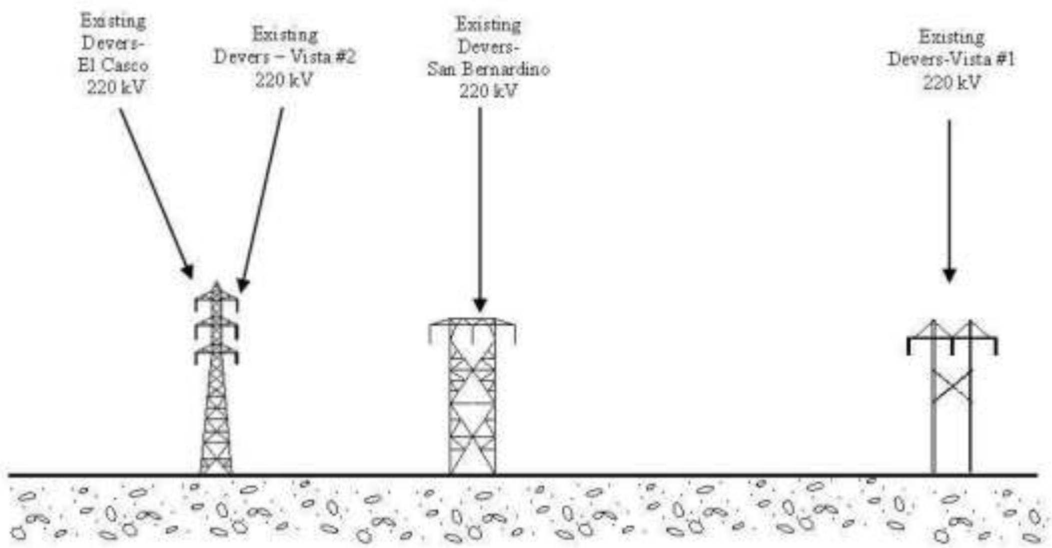

Segment 5 Model 1 – Existing
Looking East
Existing Devers-El Casco 220 kV
Existing Devers – Vista #2 220 kV
Existing Devers-Vista #1 220 kV
Existing Devers-San Bernardino 220 kV


Segment 5 Model 1 – Proposed
Looking East
Upgraded Devers – Vista #2 220 kV
Upgraded Devers-Vista #1 220 kV
Upgraded Devers-San Bernardino 220 kV
Upgraded Devers-El Casco 220 kV

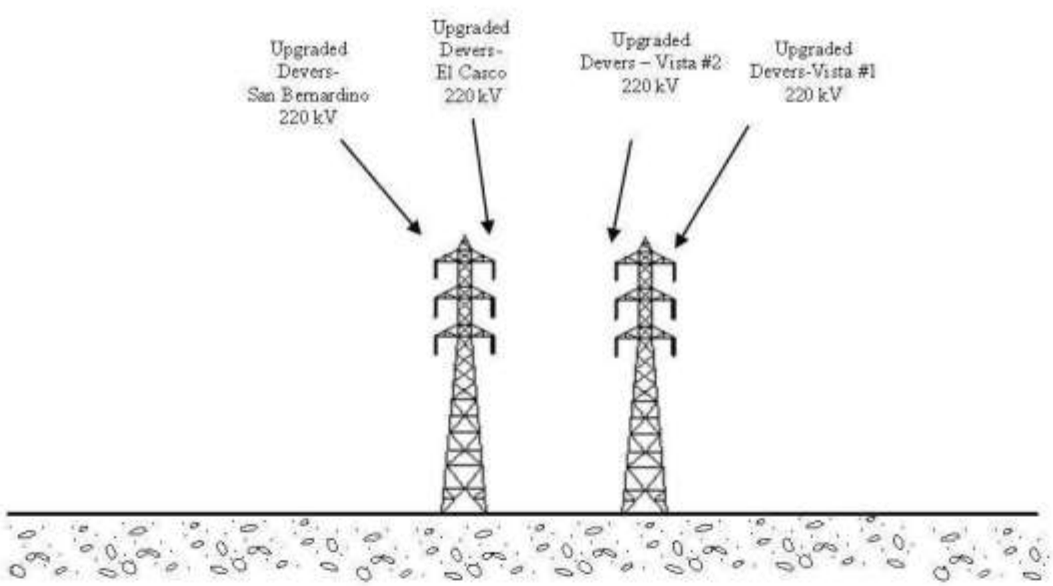

Segment 5 Model 2 (Morongo Area in Existing ROW) – Existing
Looking East
Existing Devers-El Casco 220 kV
Existing Devers – Vista #2 220 kV
Existing Devers-San Bernardino 220 kV
Existing Devers-Vista #1 220 kV

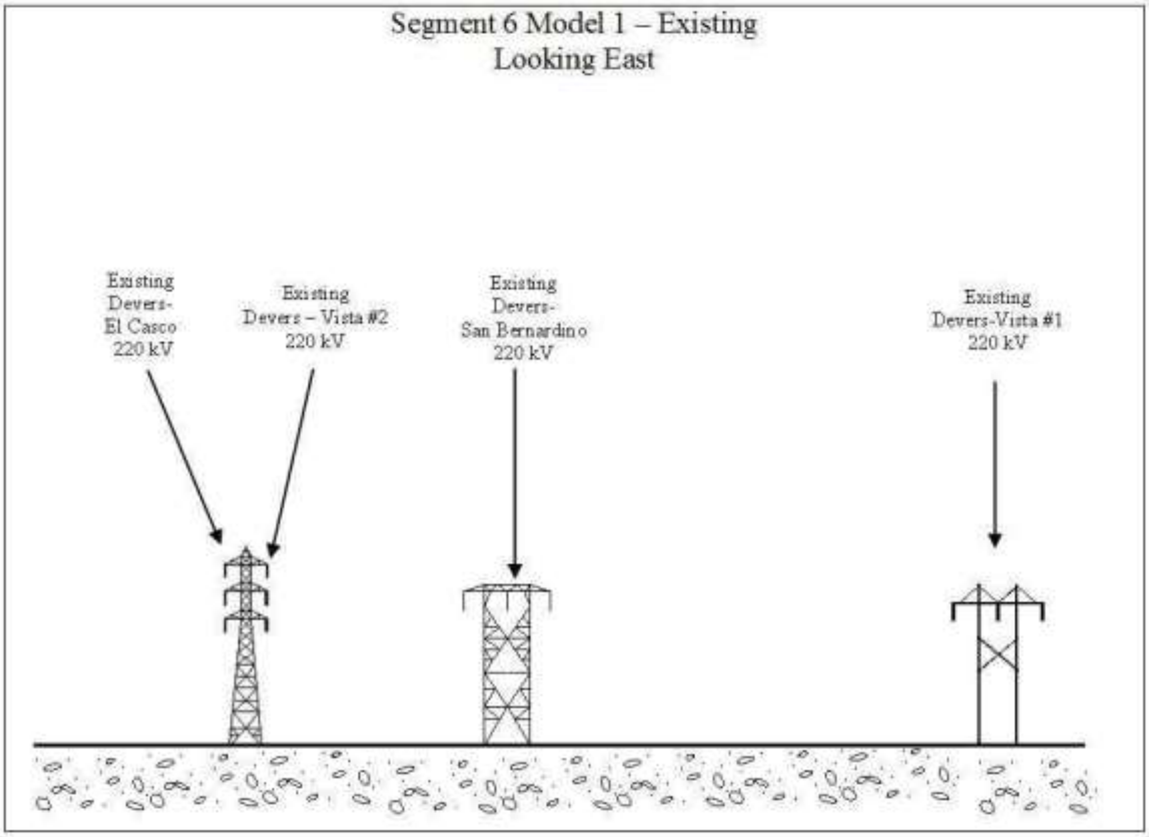

Segment 5 Model 2 (Morongo Area, TSP in new ROW) – Proposed
Looking East
Upgraded Devers-San Bernardino 220 kV
Upgraded Devers-El Casco 220kV
Upgraded Devers – Vista #2 220 kV
Upgraded Devers-Vista #1 220 kV

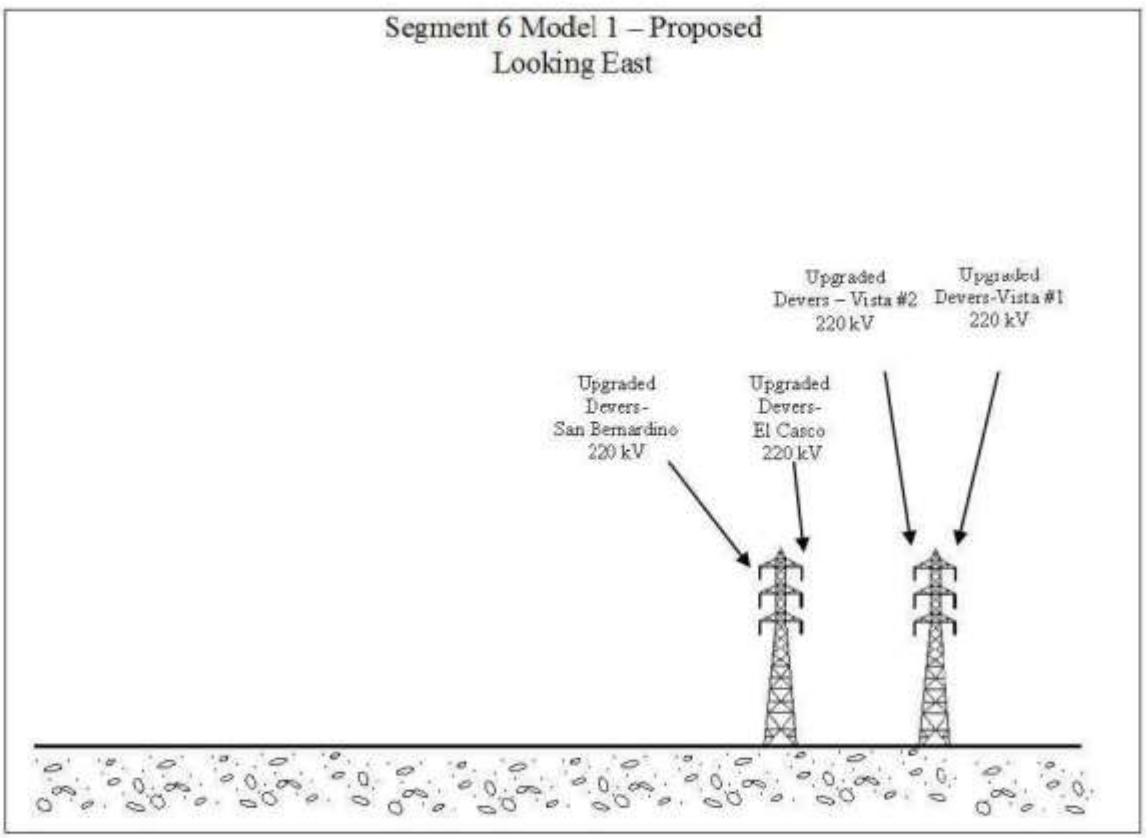
Segment 5 Model 3 (Morongo Area in Existing ROW) – Existing
Looking East



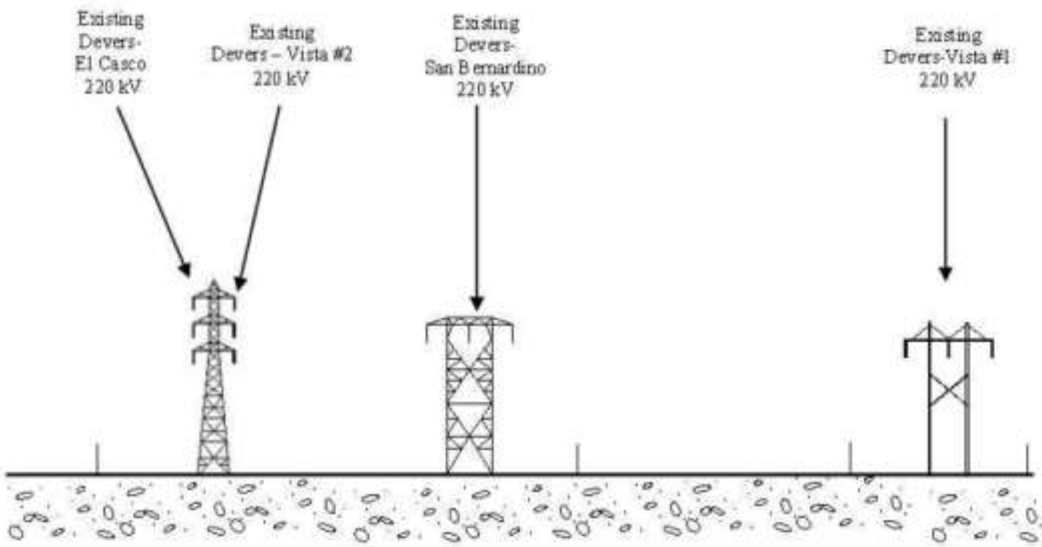
Segment 5 Model 3 (Morongo Area, LST in Existing ROW) – Proposed
Looking East



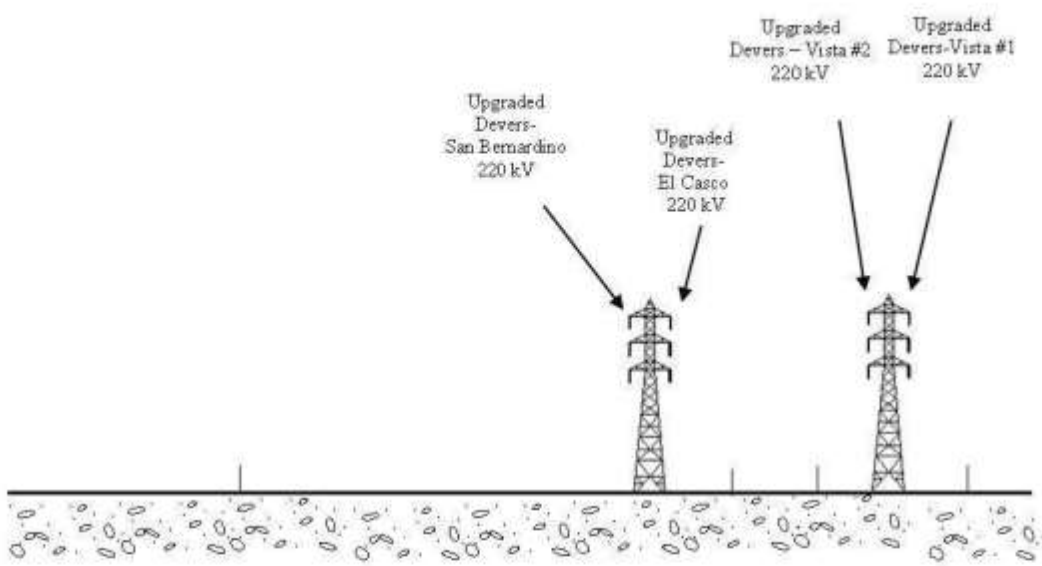

Segment 6 Model 1 – Existing
Looking East
Existing Devers-El Casco 220 kV
Existing Devers – Vista #2 220 kV
Existing Devers-San Bernardino 220 kV
Existing Devers-Vista #1 220 kV

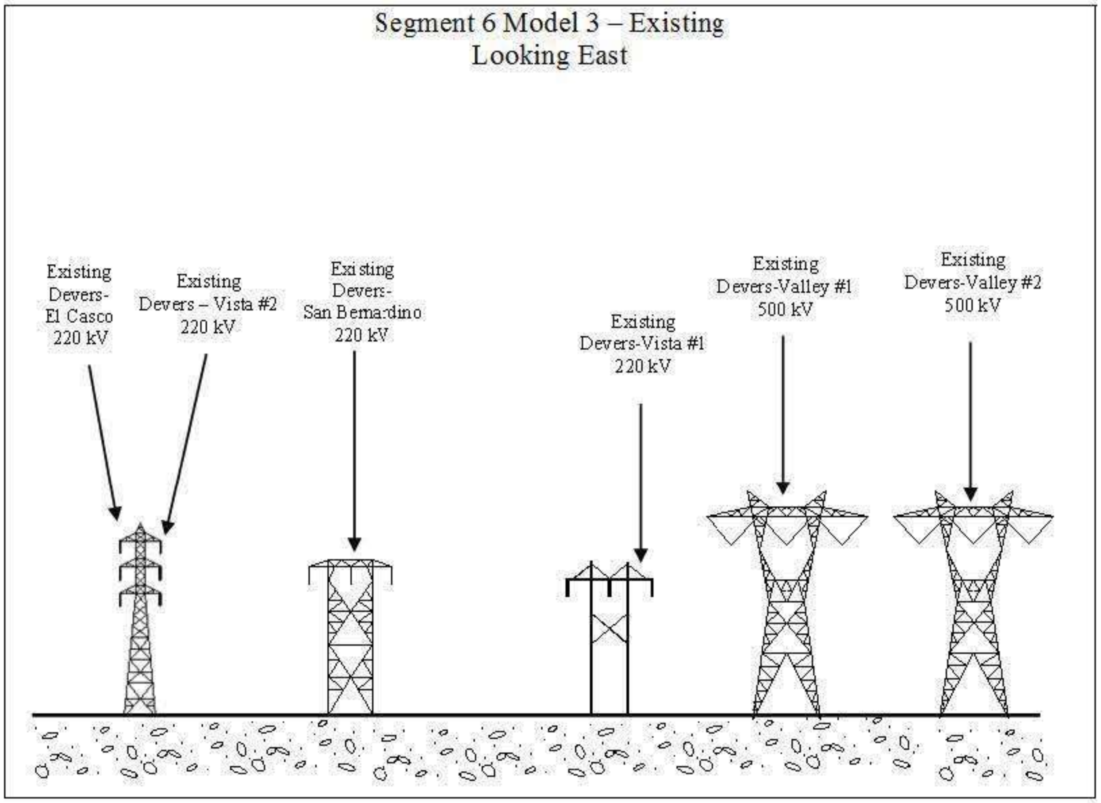

Segment 6 Model 1 – Proposed
Looking East
Upgraded Devers – Vista #2 220 kV
Upgraded Devers-Vista #1 220 kV
Upgraded Devers-San Bernardino 220 kV
Upgraded Devers-El Casco 220 kV

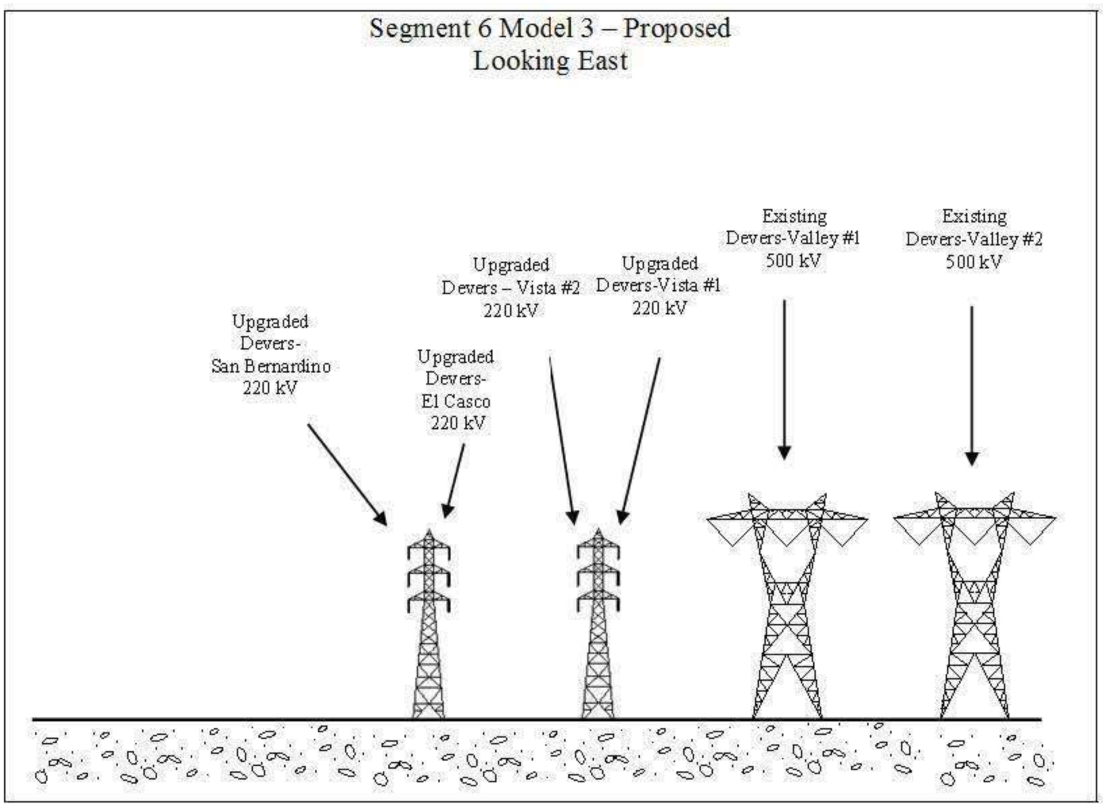
Segment 6 Model 2 – Existing
Looking East



Segment 6 Model 2 – Proposed
Looking East




Segment 6 Model 3 – Existing
Looking East
Existing
Devers-
El Casco
220 kV
Existing
Devers – Vista #2
220 kV
Existing
Devers-
San Bernardino
220 kV
Existing
Devers-Vista #1
220 kV
Existing
Devers-Valley #1
500 kV
Existing
Devers-Valley #2
500 kV


Segment 6 Model 3 – Proposed
Looking East
Upgraded
Devers-
San Bernardino
220 kV
Upgraded
Devers-
El Casco
220 kV
Upgraded
Devers – Vista #2
220 kV
Upgraded
Devers-Vista #1
220 kV
Existing
Devers-Valley #1
500 kV
Existing
Devers-Valley #2
500 kV