CHAPTER 3 – PROJECT DESCRIPTION

3.1 SCE Project Development Process

3.1.1 Initial Considerations

After a project need is established, SCE considers a range of possible technical alternatives that will fulfill the identified need. The preliminarily preferred project (based on technical feasibility and cost considerations) is then evaluated according to a broader range of factors, including environmental impacts and community concerns. As part of the environmental analysis prepared for the proposed Viejo System Project, a California Environmental Quality Act (CEQA) Initial Study checklist was prepared. This checklist is provided for reference purposes as Appendix A to this document. Further, SCE encourages communication regarding the proposed project with local communities, local business, government officials, and other interested parties early in the project planning process. The objective is to ensure that SCE understands and addresses, where possible, issues of public interest or potential concern regarding the proposed project. For the proposed Viejo System Project, SCE undertook several efforts to ensure that the public received information related to the proposed project and had an opportunity to ask project-related questions. These efforts are summarized in Appendix B to this document.

3.1.2 Substation Site Selection

SCE considered a number of potential locations for the proposed Viejo Substation. In 1993, SCE conducted a preliminary identification and evaluation of all parcels of land 15 to 20 acres in size located within two miles of the existing 220 kV corridor. Only sites within two miles were evaluated to minimize potential environmental impacts and cost factors related to construction of additional 220 kV transmission lines that would be required for the substation power source. Factors evaluated included demography, property ownership, estimated land value, engineering constraints, and environmental sensitivities. Based on the conclusions of this evaluation, SCE purchased the proposed Viejo Substation site. SCE purchased this site in anticipation of projected load growth.

Several potential alternative sites were identified on SCE-owned property located between Portola Hills and Foothill Ranch developments, and south of Whiting Ranch Wilderness Park. These alternative sites were removed from consideration due to environmental concerns.

Other potential sites were identified and evaluated in the area of the existing 220 kV corridor. All of these alternative sites are east of the proposed Viejo Substation site. Site alternatives are limited, because all parcels south of the proposed Viejo Substation site are fully developed and parcels north of the proposed site have been zoned for low density R-1 residential. Consequently, SCE would expect significant developer and public opposition to siting a substation north of the proposed substation site. In contrast, all of the parcels surrounding the proposed site are now developed industrial/light industrial uses.

Following is a summary of the alternative sites considered in 1993 and reevaluated in 2002:

Alternative Site 1 (Proposed)
This site is located on land owned by SCE and is adjacent to the existing 220 kV corridor in the City of Lake Forest. This site is bordered by vacant land (Viejo Conservation Bank) on the east, on the south by vacant land owned by Orange County, on the north by light industrial development and on the west by the SR 241 Foothill Transportation Corridor. The existing zoning is compatible with the proposed substation use. Use of this site for the substation would require the construction of approximately 3.1 miles of 66 kV subtransmission line within the existing 220 kV corridor. This site is located closer to the projected distribution load than the other alternative sites. This site is the preferred alternative for the location of the Viejo Substation.

Alternative Site 2
This site is located on private land on a large mesa approximately 100 feet above Silverado Canyon Road. To the south are equestrian centers, public elementary and middle schools, Tucker Wildlife Sanctuary and residential properties between Silverado Canyon and Modjeska Grade Roads. To the west is Limestone Canyon Regional Park and to the east is the Cleveland National Forest. To the north is existing residential development (Silverado Canyon), a church, recreational park and the Irvine Company's proposed Irvine Lake development.

This alternative site is now proposed for an RV park. Access to the site is from Santiago Canyon and Silverado Canyon Roads. The slope of potential access roads to these locations vary from 10% to 15% making it extremely difficult to build a road that would allow heavy equipment to access the site.

This alternative was not pursued due to difficulties with site access; the cost to purchase the site; the need to install site improvements and to acquire rights for and to construct approximately six miles of 66 kV subtransmission line.

Alternative Site 3
This site is owned by The Irvine Company and is zoned agricultural. It is located directly north of Alternative Site 2 on the north side of Silverado Canyon Road and across from a church. The 220 kV corridor crosses this property. The surrounding area is similar to Site 1 except there is an equestrian center and group of single-family homes adjacent to the easterly property line. Use of this site for the substation would require the construction of approximately six miles of 66 kV subtransmission line.

This alternative substation site was not pursued due to the sensitivity of surrounding land uses; the cost to purchase the site; the need to install site improvements and to acquire rights for and to construct approximately 6 miles of 66 kV subtransmission line.

Alternative Site 4
This site is north of Sites 1 and 2 approximately one mile north of Silverado Canyon Road. This site is adjacent to a private road known as Baker Canyon Road that is accessed from Black Star Canyon Road. This property is owned by The Irvine Company and used primarily for grazing. It is adjacent to residential properties and an RV campground. Use of this site for the substation would require the construction of approximately seven miles of 66 kV subtransmission line.

This alternative substation site was not pursued due to the sensitivity of surrounding land uses; the cost to purchase the site; the need to install site improvements and to acquire rights for and to construct seven miles of 66 kV subtransmission line.

3.1.3 Subtransmission Line Route Selection

Among the primary goals of the route selection process is the cost-effective minimization of environmental and community impacts. The basic strategies for accomplishing this goal include avoiding significant or potentially significant sensitivities whenever possible and minimizing impacts by locating new facilities in existing roads and electric facility corridors. Additionally, when no overriding environmental considerations dictate otherwise, the shortest line route alternative is selected to minimize project costs and potential impacts associated with construction of new towers or poles.

SCE avoids impacts to sensitive resources (i.e. riparian areas, endangered plants) by locating towers and poles outside these areas and spanning cable over the sensitive areas. Additionally, project impacts can be minimized by co-locating new facilities with existing facilities either by double circuiting (i.e., adding a second power line circuit to a single pole) or, overbuilding existing lines (i.e., placing lower voltage lines below the higher voltage power lines). Locating lines adjacent to roads or corridors or within electric facility corridors also minimizes the need to construct new access roads, thereby eliminating the major source of ground disturbance associated with power line construction, operation and maintenance.

To avoid costs and project delays associated with securing new land rights, SCE generally prefers to construct new facilities within existing electric facility corridors. The next preferred option is to locate new facilities in franchise positions on dedicated streets and highways.

3.2 Regional Location and Project Area

The Viejo System Project study area is defined as the proposed substation site and a 3.1-mile segment of the existing 220 kV corridor located between the proposed substation site and the Chiquita Substation. The substation site is located in the Trabuco Canyon area of Orange County as shown in Figure 3-1 - Regional Vicinity Map.

The proposed substation site is located in the City of Lake Forest and within the Foothill Ranch Master Planned Community. The site is owned by SCE and is vacant. The adjacent 220 kV corridor is located in the Cities of Lake Forest and Mission Viejo. Figure 3-2 - Proposed Substation Site and 66 kV Subtransmission Line Route, shows the location of proposed substation site and the existing 220 kV corridor. The 12.5 acre substation site is located on Lot A, Tract No. 14951 approximately one-quarter mile north of El Toro Road, one mile east of Santa Margarita Parkway, and southeast of the SR 241 Foothill Transportation Corridor.

3.2.1 Existing 220 kV Transmission and 66 kV Subtransmission Line Infrastructure

The 220 kV corridor varies in width and is 220 feet wide at its narrowest width. The 220 kV corridor contains one double circuit 220 kV transmission line on the west and one double circuit

66 kV subtransmission line on the east. The 220 kV transmission lines are supported on one row of LSTs. The westerly circuit is the San Onofre-Serrano 220 kV transmission line. The easterly circuit is the Chino-San Onofre 220 kV transmission line. The existing 220 kV transmission line conductors are 1,590 kcmil, 45X7 Aluminum Conductor Steel Reinforced (ACSR) “Lapwing”. The 66 kV subtransmission lines are supported by one row of TSPs. The easterly circuit is the Chiquita-Limestone-O’Neil 66 kV line. The westerly circuit is the Chiquita-Limestone-Moulton 66 kV line. The existing 66 kV conductors are 954 kcmil, 37 strand All Aluminum Conductor (AAC) “Magnolia”.

Figure 3-3 - Existing Transmission and Subtransmission Line Configuration, shows the current LST and TSP structure locations within the study area.

Insert Figure 3-1, Regional Vicinity Map

Figure 3-1 Regional Vicinity Map

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Insert Figure 3-2, Proposed Substation Site and 66 kV Subtransmission Line Route

Figure 3-2 Proposed Substation Site and 66 kV Subtransmission Line Route

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Insert Figure 3-3,
Existing 220 kV Transmission/66 kV Subtransmission Line Configuration

Figure 3-3 Existing Transmission and Subtransmission Line Configuration

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3.3 Project Overview

3.3.1 Site Preparations

3.3.1.1 Grading:

The proposed Viejo Substation site was graded to a 2% slope in 1994 by the previous owner, Foothill Ranch Company. Since the initial grading, some vegetation has reestablished on-site. Storm water runoff has eroded the surface as deep as 6 inches in several locations leaving the graded surface uneven. A sinkhole has developed at the north end of the pad around a 24-inch diameter corrugated steel drainage pipe. The sinkhole area covers approximately 2,200 square feet and averages 3-feet deep.

Prior to substation construction, the entire 12.5-acre substation site would be stripped of vegetation and soil to a depth of 8 inches. The stripped material would be stored on site until it could be filtered and replaced as backfill. The bottom of the stripped pad would be scarified to a minimum depth of six (6) inches and brought to minimum moisture content per American Society of Testing Materials (ASTM) standards.

Screens would be used to remove all weeds, roots and grasses from the stripped soil. It is estimated that 70 percent of the stripped soil can be rendered useable as fill material. Of the approximately 13,000 cubic yards of soil to be removed from the pad, 9,000 cubic yards would be available to back fill the surface. All rocks encountered at the surface in excess of 6-inches would be removed from the site. The steel corrugated drainage pipe would be removed, plugged at the catch basin located at the north end of the site, and the resulting excavation backfilled. The sinkhole would be backfilled and compacted using approximately 240 cubic yards of fill material. The site would be restored to match the original grade except the slope would be reduced from 2 percent to 1.9 percent. This modification would reduce the amount of fill material required from 15,000 to 7,500 cubic yards. Assuming a 15 percent shrinkage allowance, caused by settling and drying of the material, fill requirements could be met using on-site material. The balance of fill material would be hauled off-site. Thus, the total volume of material that could be removed from the site would range between 4,000 and 5,500 cubic yards.

Following final site grading, a four (4) inch thick layer of untreated crushed rock would be placed within the walled substation area, except in designated driveways.

3.3.1.2 Drainage:

The hill on the neighboring property to the east of the proposed site is crossed by a system of concrete drainage swales and down drains designed to bring surface runoff to catch basins and into a below ground pipe system to the nearest street. However, overgrown vegetation restricts performance of the existing drainage system. Further, drainage system deficiencies cause soil and debris to be carried onto the proposed substation pad and down the access road.

During site preparation, all hillside drainage structures would be cleaned and repaired. A concrete curb and three-foot drainage swale would be placed along the full length of and to the outside of the east substation fence, adjacent to the neighboring hillside, in order to direct hillside runoff north, away from the substation pad into existing storm water drains.

The walled substation area would have a crushed rock surface that would allow surface storm water to sheet flow from the southerly end of the substation site to three existing concrete catch basins located at the northerly end of the graded pad, where it would be pumped and conveyed to the public storm water system through existing reinforced concrete pipes.

3.3.2 Proposed Viejo System Project Facilities

3.3.2.1 Viejo Substation Site Facilities

Equipment:
For Alternatives 1A, 1B, and 1C, SCE is proposing the same substation site facilities and work plan. All impacts and remediation associated with the proposed substation would be the same for each of the three 66 kV line route alternatives. For this reason the PEA will only include the substation discussion in this section 3.3.2.1 with the understanding that it is the same for Alternatives 1A, 1B, and 1C.

The proposed substation would be an unmanned, automated, 560 MVA 220/66 kV and 66/12 kV low-profile substation. The substation site would contain two 220 kV source lines, two 280 MVA 220/66 kV transformers, five 66 kV subtransmission lines, two 28 MVA 66/12 kV transformers, two 28.8 MVAR 66 kV capacitor banks, two 4.8 MVAR 12 kV capacitor banks and four 12 kV distribution circuits. The 220 kV switchrack would be designed in a double-breaker configuration and the 66 kV switchrack would be designed in a breaker and a half configuration. The 12 kV switchrack would be of low profile design with an operating bus and a transfer bus with provision for a second operating bus.

Two mechanical and electrical equipment rooms would be constructed to house control and relay panels, batteries and battery chargers, telecommunication and associated equipment (see Figure 3-4, Proposed Viejo Substation Site Plan). Electrical equipment housed within the substation is summarized in Table 3-1, Substation Facility Summary. The Viejo Substation would also be equipped with SCE's Substation Automation System (SAS). The system would include one Human Machine Interface (HMI) cabinet and approximately six 19-inch switch-racks.

The 66/12 kV portion of the Viejo Substation would offload the existing Limestone Substation via four 12 kV distribution circuits. These circuits would be constructed underground in a westerly direction with circuit ties to the 12 kV distribution circuits out of Limestone Substation. The exact location and routing of these proposed circuits have yet to be determined, but will be underground within city streets. These circuits cannot be designed now because of the uncertainty of where the load will occur precisely.

Insert Figure 3-4, Proposed Viejo Substation Site Plan

**Figure 3-4	Proposed Viejo Substation Site Plan**

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Table 3-1 Substation Facility Summary

Equipment	Description
220 kV Switchrack	The proposed 220 kV, low-profile switchrack would consist of four positions. Two positions would be for lines and two for transformer banks. The 220 kV switchrack would be 45 feet high.
Transformers	Transformation would consist of two 280 MVA and two 28 MVA transformers. Each of the two 280 MVA transformers would be approximately 22 feet tall. Each 28 MVA transformer would be approximately 15 feet tall.
66 kV Switchrack	The 66 kV low-profile switchrack would consist of five bays. Five positions will be equipped for lines, two for the 220/66 kV transformer banks and one for the 66/12 kV transformer banks. The 66 kV switchrack would have high and low elevations of 39-feet and 29-feet.
Capacitor Banks	Two 28.8 MVAR, 66 kV capacitor banks with fused disconnects and a circuit breaker would be installed. Two 4.8 MVAR, 12 kV capacitor banks with fused disconnects and a vacuum switch would be installed. Each capacitor bank would be 14 feet high.
Mechanical-Electrical Equipment Room	Two Mechanical-Electrical Equipment Rooms (MEER) would contain control and relay panels, battery chargers, communication equipment, and local alarms. The larger MEER would be 45 feet wide, 65 feet long and 12 feet high. The smaller MEER would be 20 feet wide, 33 feet long and 10 feet high.

Lighting:
The proposed Viejo Substation would have both security and maintenance lighting. The security lights would be low intensity lights integrated into the landscape and architectural aspects of the station. The security lights would be photo sensor controlled. Normal security light operation would be from dusk until dawn.

Maintenance lighting would consist of high pressure sodium lights located in the switchracks, around the transformer banks, and in areas of the yard where maintenance activities may have to take place during night time hours. Maintenance lights would be controlled by a manual switch and would normally be in the off position.

Site Paving:
New driveways would be constructed to match the proposed site plan (see Figure 3-4, Proposed Viejo Substation Site Plan). All driveways would be paved between the substation and Definition Street with asphalt concrete over a compacted layer of aggregate base material placed on the sub-grade. The total area that would be paved is approximately 29,000 square feet.

Landscaping:
Landscaping around the proposed substation would be designed to filter views from residential areas located to the north and east of the proposed substation site. The landscaping plan would be prepared by a certified licensed landscape architect and would be consistent with the Orange County Environmental Management Agency Standards, adopted planned community

regulations, scenic corridor and Foothill Ranch Master Planned Community Specific Plan requirements. The landscape plan would include an eight-foot high, architect-designed block wall surrounding three sides of the proposed substation with security barbed wire mounted on the substation side of the wall. The side of the substation site facing the 220 kV corridor would have an eight-foot-high, chain link fence topped with barbed wire.

3.3.2.2 220 kV Transmission Line Minor Modifications

For Alternatives 1A, 1B and 1C, SCE will be proposing the same 220 kV scope and work plan. All impacts and remediation relating to the 220 kV transmission line modifications would be the same for each of the three 66 kV line alternatives. For this reason the PEA will only discuss the 220 kV transmission line modifications in this section 3.3.2.2 with the understanding that they are the same for Alternatives 1A, 1B and 1C.

To make the proposed Viejo System Project independent of the Santiago System, a separate 220 kV source line is needed. Under the proposed configuration, three new LSTs, ranging in height from 125 to 160 feet, would replace the existing LSTs M22-T4, M23-T2 and M23-T1. The new, stronger LSTs would be used to turn the Chino-San Onofre 220 kV transmission line (the easterly circuit in the 220 kV corridor) allowing it to loop through the Viejo Substation on new TSPs. The LSTs would also support a minor reconfiguration of the San Onofre-Serrano 220 kV transmission line (the westerly circuit in the 220 kV corridor) as required for rerouting conductor. After installation of the three new LSTs, the Chino-San Onofre 220 kV transmission line would be split and connected to the 220 kV Viejo Substation switchrack. The San Onofre-Serrano 220 kV transmission line would be reconfigured to allow the overhead transit of the Chino-San Onofre 220 kV transmission line into Viejo Substation. The reconfiguration includes transferring all three phases of one span of the vertically configured San Onofre-Serrano 220 kV conductor from the new LSTs into a horizontal configuration on new TSPs.

Approximately 0.3 circuit miles of overhead 220 kV transmission line would be relocated on and adjacent to the Viejo Substation site on 10 new TSPs. A typical LST structure is shown in Figure 3-5 – Typical 220 kV LST and TSP.

SCE has a CPUC approved master agreement with Sprint that permits the installation of a Sprint Wireless PCS site (“Sprint Project”) on SCE's existing transmission tower M23-T2 (SONGS-Serrano/Chino-SONGS 220kV). The Sprint Project is independent of the Viejo

Insert Figure 3-5, Typical 220 kV LST and Tubular Steel Pole

Figure 3-5 Typical 220 kV LST and Tubular Steel Pole

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System Project: However, the Sprint Project will be installed upon a LST that would be replaced as part of the proposed Viejo System Project.

The Sprint Project includes the placement of a 16'X16' fenced equipment area directly underneath M23-T2 SONGS-Serrano 220 kV tower. In addition, three sectors of 2-antenna arrays will be mounted at 43' (top of antenna) above grade (from "A" leg top of footing) and 7/8 inch diameter coaxial cable will extend from the base equipment area to each antenna array. Finally, a power line and a telecommunications line will be installed underground to the LST.

Sprint has been notified that SCE intends to relocate the LST within the next two years as part of the Viejo System Project and Sprint has opted to continue with the construction of the Sprint Project. If the proposed Viejo System Project is constructed, Sprint will need to relocate its project to another SCE facility or other third party property. Construction of the Sprint Project is scheduled to begin and be completed in the 3rd quarter of 2003.

Sprint will not be permitted to commence construction of the Sprint Project until Sprint demonstrates compliance with GO 159-A.

3.3.2.3 Construction of Additional Proposed 66 kV Subtransmission Line

Currently there are two 66 kV subtransmission lines, the Chiquita-Limestone-O'Neil and Chiquita-Limestone-Moulton, in the 220 kV corridor. Construction of a 66 kV subtransmission line between Viejo Substation and Chiquita Substation would be required to provide load relief to the Santiago System. Without the addition of this new line, the two existing 66 kV subtransmission lines that would connect the proposed Viejo Substation and the Chiquita Substation would exceed the conductor ratings under emergency conditions. Following construction of the new 66 kV subtransmission line and the cut-over of the existing 66 kV lines into the proposed Viejo Substation the following five 66 kV subtransmission circuits would be formed:

- Limestone-Viejo (created by the connection of the Chiquita-Limestone-O'Neil circuit into the substation);
- Limestone-Moulton-Viejo (created by the connection of the Chiquita-Limestone-Moulton circuit into the substation);
- Chiquita-Viejo No. 1 (created by the connection of the Chiquita-Limestone-Moulton circuit into the substation);
- Chiquita-O'Neil-Viejo (created by the connection of the Chiquita-Limestone-O'Neil circuit into the substation);
- Chiquita-Viejo No. 2 (new proposed 66 kV subtransmission circuit).

The following 66 kV subtransmission line alternatives were considered: an all-overhead configuration, a combined overhead and underground configuration and a complete underground installation. These alternatives are discussed below.

3.3.2.3.1 Alternative 1A - Proposed 66 kV Overhead Subtransmission Line

Scope: Construct Viejo-Chiquita 66 kV overhead subtransmission line within the 220 kV corridor.

Following construction of the Viejo Substation, the two 66 kV subtransmission lines in the existing 220 kV corridor would be rerouted and connected to the 66 kV switchrack within the substation on eight new double-circuit TSPs. The heights of these TSPs have not been determined, but would likely range from 75 to 90 feet. The diameters of the TSPs would range from 4 to 6.5 feet and the footing depths would be unlikely to exceed 25 feet.

In order to construct the proposed 66 kV circuit within the 220 kV corridor, it would be necessary to rebuild the existing double circuit 66 kV subtransmission lines (i.e., the Chiquita-Limestone-O'Neil and Chiquita-Limestone-Moulton lines). The twenty existing double-circuited TSPs would be removed and replaced with 13 four-circuit tubular steel H-Frame structures, ranging in height from 70 to 140 feet (see Figure 3-6 – Proposed Transmission/Subtransmission Line Configuration and H-Frame Locations and Figure 3-7 –Typical H-Frame Structure). These new structures would line up with the existing 220 kV transmission line LSTs structure for structure. The H-Frame design would require the replacement of the existing 66 kV conductor (ACC conductor) with a stronger conductor (ASCR conductor) because of the increased distance between the 66 kV H-frame structures. The centerline of the new H-Frame structures would be 20 feet closer to the existing 220 kV LST structures than the existing 66 kV TSPs.

3.3.2.3.2 Alternative 1B - 66 kV Overhead/Underground Subtransmission Line

Scope: Construct a portion of the Viejo-Chiquita 66 kV subtransmission line overhead within the 220 kV corridor and the remaining portion underground within city streets.

Insert Figure 3-6, Proposed Alternative 1A Transmission/subtransmission line configuration/ H-Frame Locations

Figure 3-6 Proposed Alternative 1A Transmission/subtransmission line configuration/ H-Frame Locations

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Insert Figure 3-7, Typical 66 kV H-frame structure

Figure 3-7 Typical 66 kV H-frame structure

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The Viejo-Chiquita 66 kV subtransmission line would be installed partially underground and partially overhead. The proposed route is shown in Figure 3-8 – Alternative 1B Overhead/ Underground Subtransmission Line.

The overhead segment of Alternative 1B would begin at the Viejo Substation and extend south for approximately one mile within the existing 220 kV corridor on six H-Frame structures. The overhead lines would dead end and be directed underground via a 75' TSP riser pole at Santa Margarita Parkway between Flamenco Park to the south and Pinecrest Park to the north. From this point the proposed Viejo-Chiquita 66 kV line would continue west underground within Santa Margarita Parkway and turn south within Marguerite Parkway to Olympiad Road. From Olympiad Road, the line would cross Alicia Parkway and be directed into the Chiquita Substation located on the southeast corner of Olympiad Road and Alicia Parkway. The proposed underground segment would require approximately 2.5 miles of trenching within city streets, installing ducts and pulling cable into the nine vaults required to complete the route from a Chiquita Substation pedestal riser to the 75' TSP riser on Santa Margarita Parkway and the existing 220 kV corridor.

3.3.2.3.3 Alternative 1C - 66 kV Underground Subtransmission Line

Scope: Construct Viejo-Chiquita 66 kV underground subtransmission line within city streets.

Under this alternative, the proposed 66 kV subtransmission line would be constructed entirely underground. The proposed route is shown in Figure 3-9 – Alternative 1C Underground Subtransmission Line.

The route would begin at the Viejo Substation site, travel underground within the substation site access road to the intersection of Definition and Icon street, and then travel within Definition to Glenn Ranch Road. At Glenn Ranch Road the line would turn and travel southwest within Glenn Ranch Road, then southwest within Portola Parkway under SR 241 Foothill Transportation Corridor and south on Santa Margarita Parkway (i.e., Portola Road) to Marguerite Parkway. The line would then turn and travel south within Marguerite Parkway to Olympiad Road, cross Alicia Parkway and turn into Chiquita Substation located on the southeast corner of Olympiad Road and Alicia Parkway. Construction would require approximately 4.4 miles of trenching within city streets, installing ducts, and crossing the bridge at El Toro Road and Portola/Santa Margarita Parkway via preinstalled cells or attach to the underside of the bridge over Aliso Creek. This alternative would require fifteen vaults to complete the route from a Chiquita Substation pedestal riser to the proposed Viejo Substation.

Insert Figure 3-8, Alternative 1B Overhead/ Underground Subtransmission Line

Figure 3-8 Alternative 1B Overhead/Underground Subtransmission Line

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Insert Figure 3-9, Alternative 1C Underground Subtransmission Line

Figure 3-9 Alternative 1C Underground Subtransmission Line

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3.3.2.4 *Proposed Improvements at Chiquita Substation*

The following changes would be required at Chiquita Substation to accommodate the construction of the new Viejo–Chiquita 66 kV line. There are two open 66 kV bays in the Chiquita 66 kV switch rack: bay 1 and bay 9. One of these bays would be equipped as a line position to accommodate termination of the new line. The new installation would include one 66 kV circuit breaker, three 66 kV disconnect switches, and a 15-foot steel takeoff structure. Electrical interconnections would be made using jumpers fabricated from conductors of appropriate size and type. The proposed Chiquita Substation site plan is shown as Figure 3-10 – Chiquita Substation Site Plan.

3.3.2.5 *Telecommunication Improvements*

SCE is proposing to install two fiber optic cables to provide a ground return path for lightening protection and to provide a means of communication for voice, data, and relay protection. One Optical Ground Wire (OPGW) would be installed between the proposed Viejo Substation and the existing Chiquita Substation on the proposed 66 kV subtransmission H-Frame structures. Approximately 4.4 miles of fiber optic cable would be installed between the proposed Viejo Substation and the Irvine Operation Center (IOC) in existing underground vaults and conduits from SCE's IOC to Portola Parkway and new underground vaults and conduits from Portola Parkway to the proposed Viejo Substation site (see Figure 3-11 – Proposed Telecommunications Line Route). The addition of this fiber optic cable would allow the Viejo Substation to be monitored and controlled by an existing power management system located at SCE's Ellis Substation in the City of Huntington Beach.

Insert Figure 3-10, Chiquita Substation Site Plan

Figure 3-10 Chiquita Substation Site Plan

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Insert Figure 3-11, Proposed Telecommunications Line Route

Figure 3-11 Proposed Telecommunications Line Route

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3.3.3 Proposed Viejo System Project Construction

3.3.3.1 Viejo Substation Construction and Schedule

Construction of the proposed Viejo Substation is scheduled to begin 1 February 2004. The substation site would be re-graded to final contour. Construction of the perimeter fences, foundations, and below-ground facilities (e.g., ground-grid, conduit, etc.) would then be completed followed by installation of the above-ground structures and the electrical equipment. All material for the proposed substation, including the transformers, would be delivered by truck. Material would be staged along the west perimeter fence during construction. The majority of the truck traffic would use major streets and would be scheduled for off-peak traffic hours. However, some truck traffic would utilize dirt access roads and small access streets. Concrete truck deliveries might need to be made during peak hours when footing work is being performed. The transformers would be delivered by heavy transport vehicles and off-loaded on site by large cranes with support trucks. A traffic control service would be used for transformer delivery. All construction debris would be placed in appropriate onsite containers and periodically disposed in accordance with all applicable regulations.

The proposed substation components would be installed by April 15, 2005. The scheduled operating date for the proposed Viejo Substation is June 1, 2005. Approximately two months would be required to energize and test substation components once construction has been completed. The anticipated construction schedule is summarized in Table 3-2 – Proposed Construction Schedule.

Table 3-2 Proposed Substation Construction Schedule

	Start Date	Completion Date
Grading	02-02-04	04-01-04
Civil Construction	04-02-04	08-02-04
Electrical Construction	09-01-04	04-15-05

Labor Force Requirements

Construction would be performed by SCE construction crews and/or by contractors. Anticipated construction personnel and equipment are summarized in Table 3-3 – Construction Personnel and Equipment Summary.

Table 3-3 Construction Personnel and Equipment Summary

(Most probable fuel combinations are also listed)

Construction Element	Number of Personnel	Equipment Requirements	
Grading Crew	4	1 – 980 Loader (Diesel) 1 – Grader (Diesel) 1 – Compactor (Unleaded)	2-3 Water Trucks (Unleaded) 1-2 Survey Trucks (Unleaded) 1 – Soils test crew truck (Unleaded)
Survey Crew	2	2 – Survey trucks	
Civil	15	1 – Office Trailer (Electric/Propane) 4 – Crew Trucks (Gas/Diesel) 2 – Dump Truck (Diesel) 1 – 5-Ton Truck (Diesel) 1- Ditch Digger	1 – Driller (Diesel) 1 – Crane (Diesel) 2 – Tractors (Diesel) 1 – Forklift (Diesel)
Electrical	15	1 – Office Trailer (same trailer as civil) 1 – 5-Ton Truck (Diesel) 2 – Crew Cab Trucks (Gas/Diesel) 4 – Carryall Vehicles (Gas/Diesel) 2 – 150 ton Cranes (Diesel)	1 – Lift Truck (Gas/Diesel/Propane) 4 – Pickup Trucks (Gas/Diesel) 1 – Forklift (Diesel) 4 – Manlifts (Diesel) 2 – Support Trucks (Gas/Diesel) 2 – Crane Trucks (Diesel)
Transformer Installation Crew	5	2 – Carryall Vehicles (Gas/Diesel) 2 – Crew Trucks (Gas/Diesel) 1 - Crane (Diesel)	1 – Forklift (Diesel) 1 – Processing Trailer (Electric) 1– Low-boy Hauler (Diesel)
Test Crew	2	1 – Test Truck	

3.3.3.2 220 kV Transmission Modification Construction Methods

Construction of the proposed project would require minor modifications to the existing 220 kV transmission lines located in the 220 kV corridor. These modifications are described below.

Three new LSTs would be constructed between LST M22-T4 and M23-T2 and 10 new TSPs would be installed to loop the Chino-San Onofre 220 kV transmission line through the proposed Viejo Substation. Construction is scheduled to begin in February 2004, and is projected to be complete by 1 June 2005 (see Table 3-4 Proposed Transmission Construction Schedule). SCE intends to use conventional construction methods to make the 220 kV transmission line modifications. First access roads, assembly areas, and lay-down areas for equipment and material would be prepared. Next, footings would be installed, towers would be erected, and conductor would be strung.

Table 3-4 Proposed Transmission Construction Schedule

	Start Date	Completion Date
Preliminary Work	09-26-03	04-01-04
Engineering and Design	04-02-04	05-13-04
Material Order and Delivery	05-14-04	10-28-04
Caltrans Permit	05-14-04	08-05-04
Construction	10-29-04	4-15-05

SCE proposes to grade existing roadways within the 220 kV corridor and access to the 220 kV corridor from the El Toro Road (S18) entrance, the Definition and Icon entrance, and the Definition entrance. These roadway improvements would accommodate multi-ton construction equipment including, but not limited to, multi-axle cranes, cement trucks, boom trucks, wire stringing reel stand 5th wheel type trucks, tensioner trucks, sagging cats, and shipping 5th wheel type semi-trucks. All roadway improvements would be made in accordance with SCE specifications contained in the *Construction Standards for ROW Access, Maintenance, and Removal*, and any applicable CalTrans requirements.

Grading and Excavation: Excavations would be required for LST and TSP bases, crane pads, material lay-down and assembly areas, and stub roads. The nature and extent of excavations depends on the specific construction techniques employed. In general, two separate crane pads would be required for each LST site. One crane pad would also be required for each of two clusters of three TSPs needed for construction of the 220 kV transmission line bypass reconfiguration of the San Onofre-Serrano 220 kV circuit. Additionally, one crane pad would be required for each of the four remaining TSPs, for a total of twelve cranes sites. The center of each crane pad would be located no further than 50’ from the center of the LST or TSP base, either ahead on line, back on line, or laterally. The area around each LST would be cleared to allow access for foundation construction. The approximate area impacted for each LST would be a minimum of 50’ by 50’. Where possible, excavations for crane pads and assembly areas would be confined to previously disturbed areas.

A 16’ wide by 200’ long new stub road may be required for the replacement of LST M22-T4. This stub road would provide access to a crane pad from an existing access road. Construction of 16-foot wide stub roads from existing access roads may be required to access two of the four 220 kV TSPs required to relocate the Chino-San Onofre 220 kV transmission line. Final engineering and survey work would determine the exact lengths and locations of these stub roads, but each would have a maximum length of 50’.

Although much of the work within the 220 kV corridor is anticipated to be staged from an existing access road, site grading would be required to provide access and work areas for multi-axle heavy equipment utilized for footing construction, tower and pole erection, tower demolition, and conductor stringing operations. Standard machinery such as bulldozers and backhoes would be used as needed to clear lay down areas.

One footing would be required for each TSP, and four footings would be required for each LST. A total of 22 footings would be required for construction of the TSPs and LSTs adjacent to the substation site as part of the proposed 220 kV transmission line modifications. Footing work would include auger or drill rig truck excavation of footing positions, crane operations to place rebar cages in footing holes, and dual axle concrete trucks to pour concrete.

LST and TSP Construction and Conductor Installation: For the LST and TSP erection process, semi-type haul trucks would deliver project materials to the crane pad and assembly areas. Cranes and boom trucks positioned along existing and new stub roads or within excavated crane areas would aid in moving and assembling materials. Ground crews would erect TSPs on all 10 completed footings. Ground crews would partially erect LSTs to a safe height below the energized conductor along the 220 kV corridor at each of the 3 LST erection sites. Ground crews would also complete assembly of the top sections of the LSTs within the crane pad and assembly areas in preparation for final installation.

Following completion of the TSP installations, conductor stringing operations would begin for the TSP to TSP spans of the San Onofre-Serrano 220 kV circuit bypass reconfiguration and the TSP to TSP and TSP to substation rack portions of the San Onofre-Chino 220 kV circuit. Tensioner trucks, puller trucks, and wire reel stand rigs would be positioned along new and existing stub and 220 kV corridor roads directly adjacent to the new TSPs, under the intended conductor path, or ahead and back on line as required to install the new conductor.

In coordination with scheduled 220 kV transmission line electrical outages, a crane would hoist the assembled upper LST sections on top of the erected lower LST sections for final assembly. At completion of LST erection, existing conductors would be dead-ended into the new LSTs and hung in temporary suspension insulators on the old LSTs. During these operations, tensioner trucks, puller trucks, and wire reel stand rigs would be positioned along new and existing stub roads to safely dead end and clip existing conductor to new and old TSPs. Prior to the release of these outages, or during a subsequent outage, cut-in of the final conductor spans would be completed. Depending on the construction status of Viejo Substation, the final 220 kV rack configuration may either be connected to line risers in the substation rack or terminated in a bypass configuration. If a bypass were required as a result of delays in substation construction, final termination of substation jumper loops would take place later, during a scheduled outage, in order to create the San Onofre-Viejo and Viejo-Chino 220 kV circuits.

3.3.3.3 Alternative 1A - 66 kV Subtransmission Line Construction Methods

Clearing and Grading: As part of the preliminary construction process, SCE would improve existing or construct new access roads, as necessary, to reach the proposed H-Frame construction sites. Stub roads, where needed, would be no more than 16-feet wide. SCE would first clear and grade an area approximately 50 x 50 feet for construction of the footings.

Facility Construction: During construction of the proposed 66 kV circuit, it would be necessary to rebuild the existing double circuit 66 kV subtransmission line (e.g., the Chiquita-Limestone-O'Neil and Chiquita-Limestone-Moulton lines). The 20 existing double circuit TSPs would be removed and replaced by 13 four-circuit tubular steel H-Frame structures resulting in 7 fewer 66 kV structures (see Figure 3-7 –Typical H-Frame Structure and Figure 3-6 – Proposed Transmission/Subtransmission Line Configuration and H-Frame Locations). These new structures would line up with the existing 220 kV transmission line LSTs structure for structure. The centerline of the new H-frame structures would be 20 feet closer to the existing 220 kV LST structures than the existing 66 kV TSPs. Removal of the existing TSPs would consist of loosening the footing bolts and dismantling of the structures. A jackhammer may be required should the bolts be encapsulated in cement. A crane would be used to place the old TSPs on a flat bed truck for transportation. The removed TSPs would either be reused or sent for recycling. The existing concrete footings would be removed by jackhammer to a depth of approximately two feet and backfilled to the preexisting grade.

Foundations for the westerly support structure of the H-Frame structures would be constructed first. The westerly pole of the H-Frame structure would be installed with the westerly cross arms. New 954 kcmil, ACSR 45X7 (Rail) conductor would be installed on the westerly side of the new structures for the replacement of the existing Chiquita-Limestone-Moulton 66 kV circuit.

After installation of the new Chiquita-Limestone-Moulton 66 kV conductor, SCE would obtain an outage on the existing Chiquita-Limestone-Moulton 66 kV circuit and cut the line over to the new 954 kcmil, ACSR 45X7 conductors. Next the Chiquita-Limestone-O'Neil line would be removed from service. SCE would then dismantle the existing double-circuited line by removing the 954 kcmil, AAC (Magnolia) conductors and the double-circuited TSPs.

SCE would install foundations for the easterly leg of the H-Frame structures and 8 TSPs required to connect the 66 kV subtransmission lines to the Viejo Substation 66 kV switchrack. The easterly pole of the H-Frame structures and all cross arms would be installed. Once the TSPs and H-Frame structures were installed, the replacement Chiquita-Limestone-O'Neil 66 kV circuit and the new proposed Viejo-Chiquita No. 2 66 kV circuit would be installed using 954 kcmil ACSR conductor and energized.

Alternative 1A involves minimal street work with the exception of the standard wire stringing safe guards such as guard poles set at Los Alisos Boulevard and El Toro Road. The Foothill Transportation Corridor crossing would require guard poles, anchors and a safety net that would span the width of the Foothill Transportation Corridor for the wire-stringing job. This last action would require a Caltrans encroachment permit. With these safeguards in place, the disruption to traffic in these areas would be minimal.

A total of six suspension structures and seven dead end structures would be required for construction of the new H-Frame structures. The estimated shaft lengths range from a minimum of 70 feet to a maximum of 140 feet. Foundation diameters would range from 5'-6" to 8'-6" in diameter. Foundation depths would range from 14 to 31 feet.

3.3.3.4 Alternative 1B - 66 kV Subtransmission Line Construction Methods

The proposed 66 kV overhead segment from Viejo Substation to Santa Margarita Parkway and the 220 kV corridor would require approximately 1.1 mile of 954 SAC conductor, six new H-frame structures and one riser pole. Construction methods for the overhead portion would be the same as those described for Alternative 1A. Approximately 2.5 miles of subtransmission line would be placed underground within local streets. Constructing the proposed 66 kV underground subtransmission line segment would require techniques different than those described for the proposed action. Project specific engineering designs have not been prepared for this alternative. Consequently, the following description is based on the assumed route and general subtransmission undergrounding methods.

Riser Pole Construction:
The riser pole is the point at which overhead lines are converted to underground lines. The overhead wires terminate and connect to underground cables at the riser pole. The underground cables are then routed down from the pole cross arms through plastic conduits, which transition the cables underground. One riser pole would be constructed within the existing 220 kV corridor near its intersection with Santa Margarita Parkway and one would be constructed outside the Chiquita Substation.

Digging and Trenching: A 19-inch wide and 6-foot deep trench would be required to place the conduits underground. After the pavement is cut and hauled away, trenching would be performed with a backhoe and other machinery specifically designed for this purpose. Spoils would be placed alongside the trench and used for backfill. As with all SCE underground construction, Underground Service Alert (USA) will be contacted in the prescribed amount of time to ensure minimal impact to other utilities.

Vault Installation: Vaults are below grade (i.e., below the surface) concrete enclosures where the conduit segments terminate. The vaults are constructed specifically for use in roadways and can accommodate vehicle loads without damage. Vaults house equipment and splices for underground circuits. Because there is a practical limit to the length of cable supplied on a reel, vaults are located where necessary to allow splicing of the cable ends together.

Duct Bank Installation: Conduits are positioned in a specific configuration and held in the trench by a frame (duct bank). After placement, the duct bank is encased in approximately 3-feet of concrete. Typical duct banks used for 66 kV construction are able to accommodate six cables.

The concrete encasement provides protection from accidental dig-ins and improved heat conduction. The duct banks commonly used for 66 kV installation have a rectangular cross-section of 19 x 23 inches.

Backfill Placement: Once the concrete has cured, spoils are used to backfill the trench and return the excavation to original grade. If installation is under a paved roadway, the paved area that was cut for the cable installation is repaved to match the existing roadway.

Cable Pulling: After the conduit and the riser poles have been constructed, the cable is installed. Starting at one end, cable is pulled from the first vault up through the riser pole. Cable is then pulled through to the next vault, and so on, until the last length of cable has been pulled through the last riser pole. Once installed, the cable is ready to be spliced, terminated, tested, and energized. For Alternative 1B would require the installation of two cables per phase, resulting in the use of all six available conduits.

Cut-over: The final step in the process involves energizing the new cable. To accomplish this, the circuit is temporarily taken out of service. Once the line is out of service, crews can safely connect the existing overhead lines to the new underground cables at the riser pole. When this job is finished, the line is returned to service, and energy would flow through the underground conductors.

The time allotted for the completion of the underground substructure would be approximately 143 days. This duration does not take into account potential problems such as unmarked underground facilities or limited work schedule on public streets. Traffic control would be used during all public street work in accordance with work safety measures and traffic control plans in the *Work Area Protection and Traffic Control Manual* (California Joint Utility Traffic Control Committee 1996). The installation of the cable portion would take approximately 118 days.

The overhead portion of Alternative 1B could be completed in approximately 48 days barring any unforeseen problems. The overhead portion would require minimal street work with the exception of the standard wire stringing safe guards such as guard poles set at Los Alisos Boulevard and El Toro Road. The Foothill Transportation Corridor crossing would require guard poles, anchors and a safety net that would span the width of the Foothill Transportation Corridor for the wire-stringing job. This last action would require a Caltrans encroachment permit. With these safeguards in place, the disruption to traffic would be minimal.

The type of equipment used for installing the underground portion of Alternative 1B is shown in Table 3-5. The type of equipment that would be use for installing the overhead portion of Alternative 1B is shown in Table 3-6.

Table 3-5 Equipment Used for Underground Construction

Vehicle Type	Fuel
Ditch witch/trenching tractor	Diesel
Material Truck	Gas
Dump Truck	Diesel
Backhoe	Diesel
Well Drilling Rig	Diesel
Cement Truck	Diesel
Crew Pickup	Gas
Asphalt Paver	Diesel
Crew Vehicles	Gas
Cable Pulling Machine	Diesel
Tractor/Trailer	Diesel
U.G. Power Line Construction Vans	Gas
U.G. Cable Dolly	N/A
Paving Roller	Diesel

Table 3-6 Equipment Used for Overhead Construction

Vehicle Type	Fuel
Hydraulic Crane 120 to 180 ton	Diesel
Material Truck	Gas
Manlift	Diesel
Well Drilling Rig	Diesel
Cement Truck	Diesel
Crew Pickup	Gas
Power Line Construction Derrick trucks	Diesel
Three Reel Rope Dolly	Diesel
Three Reel Wire Dolly	Diesel
Tractor\Trailer	Diesel

3.3.3.5 Alternative 1C - 66 kV Subtransmission Line Construction Methods

Construction of Alternative 1C would consist of approximately 4.4 miles of trenching within city streets, installing ducts and pulling cables into the 15 vaults that would be required to complete the route from a Chiquita Substation pedestal riser to the proposed Viejo Substation. Construction methods would be the same as those described for the underground segment of Alternative 1B. As with all SCE underground construction, Underground Service Alert (USA) will be contacted in the prescribed amount of time to ensure minimal impact to other utilities. The time allotted for the completion of the underground substructure would be approximately 249 days barring any unforeseen problems (i.e. unmarked underground facilities, and/or limited work schedule on public streets). Traffic control would be used during all public street work in accordance with work safety measures and traffic control plans in the *Work Area Protection and Traffic Control Manual* (California Joint Utility Traffic Control Committee 1996). The text in this manual conforms to guidelines established by the federal and state Departments of Transportation. The installation and completion of the cable portion would take approximately 187 days.

Equipment used would be same as described in Table 3-5, Equipment Used for Underground Construction.

3.4 Alternatives Considered But Not Advanced

3.4.1 No Project Alternative

Under the No Project alternative, the proposed Viejo System Project would not be constructed. As indicated, demand forecast studies show that the existing Santiago Substation 220/66 kV transformers will become overloaded by the year 2005. Overloaded transformers are susceptible to damage, which could lead to service outages. Without the additional transformer capacity provided by the proposed Viejo System project, the provision of reliable electrical service to SCE customers in South Orange County could be compromised. Consequently, the No Project alternative is not a viable alternative.

3.4.2 Underground 66 kV Subtransmission Line in the 220 kV Corridor

SCE evaluated the feasibility of installing the proposed Viejo-Chiquita 66 kV line underground within the existing 220 kV corridor. It would be impossible to install the number of vaults required to hold the cable in place as indicated in the Transmission Underground Standards Manual. The pulling equipment would not be able to pull the cable without breaking the pulling cable, the underground cable, or ripping the ducts out of the ground due to a combination of rough terrain and the fact that the weight of the underground cable would exceed the limits of the pulling equipment. Other major potential issues would be the number of access roads required to reach the vaults, water drainage, erosion issues, and available space to install the substructures without undermining some of the existing pole footings. Because of these issues, undergrounding the 66 kV subtransmission line in the existing 220 kV corridor is not a viable alternative.

3.4.3 Santiago Substation Upgrade - Alternative 2

As noted in Chapter 2, an upgrade of the Santiago Substation would require the addition of 560 MVA of new transformer capacity and construction of additional 66 kV subtransmission lines to deliver the power. Considerable cost and effort would be necessary to reconfigure Santiago Substation into three distinct sections. Each section would independently serve a portion of the existing load. Based on this reconfiguration and the evaluation of the existing subtransmission line network, approximately 26 circuit miles of new subtransmission lines would have to be constructed for this alternative.

Increasing capacity at Santiago Substation would address the need for additional transformer capacity; however, it would not contribute to increased reliability within the system. Additionally, construction of approximately 26 miles of new 66 kV subtransmission lines would potentially have a greater environmental impact than construction of the proposed subtransmission line improvements. Finally, as discussed in Chapter 2, construction of Alternative 2 would delay, but not eliminate the need for the Viejo System Project.