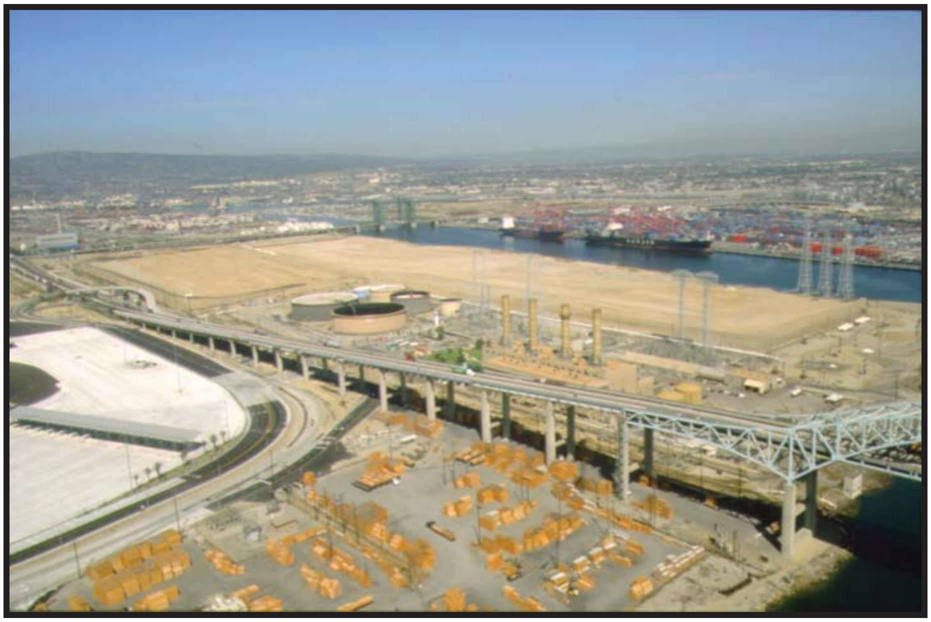
Appendix I

Draft Transmission Towers and Lines Relocation Options at the Port of Long Beach

Gerald Desmond Bridge Replacement Project



Transmission Towers & Lines Relocation Options at the Port of Long Beach

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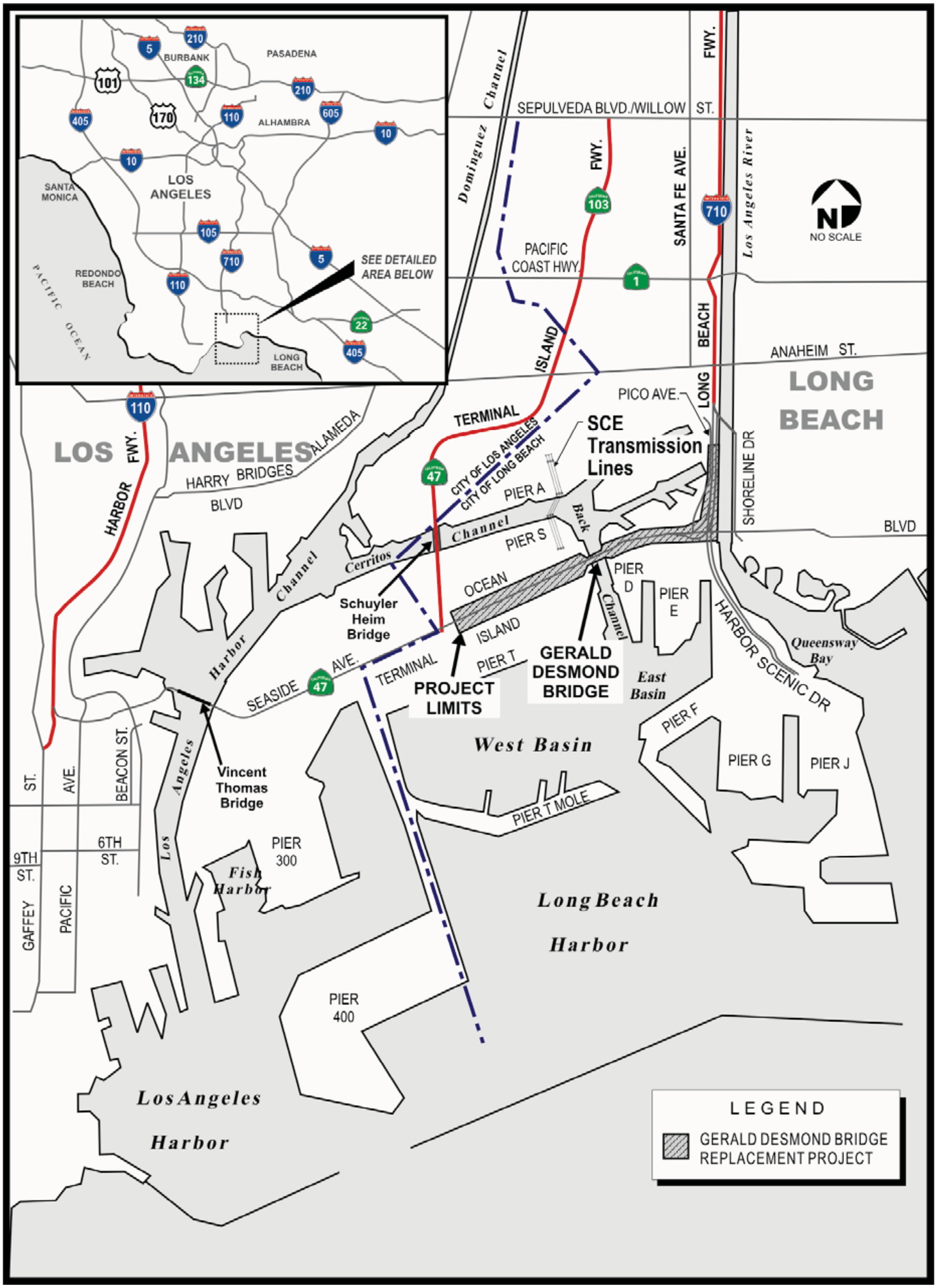
Introduction

The Gerald Desmond Bridge is a steel tied-arch truss bridge that connects downtown Long Beach to Terminal Island (Figure 1), The North- and South-side Alignment Alternatives (Bridge Replacement Alternatives) for the proposed Gerald Desmond Bridge Replacement Project would provide a new bridge with 200 feet [ft] (61 meters [m]) of vertical clearance above mean high water level (MHWL) within the Back Channel that could accommodate the larger container vessels currently in service and planned for the future. However, the vertical clearance afforded by the existing transmission and power lines that cross the Cerritos Channel from Piers S and A is approximately 153 feet [ft] (46.6 meters [m]) above MHWL and would be a potential hazard to navigation. The resulting navigational hazard will require raising or otherwise relocating the transmission and power lines. The information presented in this document summarizes the analysis and different options considered for relocating the Southern California Edison (SCE) lines.

History

Southern California Edison's (SCE) high-voltage transmission and power lines cross the Cerritos Channel from Long Beach Generation (also referred to as the Long Beach Generating Station [LBGS]) to Pier A via three 200-foot high steel lattice power transmission towers constructed in 1912 and 1924. The towers were erected in order to carry the high tension lines from the plant to the Edison distribution system discussed below. The existing vertical clearance was based on the need to clear the masts of sailing ships. This clearance is now insufficient to accommodate the larger container vessels currently in service and planned for the future. The transmission towers were evaluated by Parsons for eligibility on the National Register of Historic Places (NRHP). The State Historic Preservation Officer (SHPO) concurred with Parson's findings that the transmission towers are eligible for listing on the NRHP (Parsons, 2003).

The SCE Long Beach Substation, located on Terminal Island, was built in the 1920s as a networking point for SCE facilities. Initially, SCE owned not only the switchgear station but also an adjacent tank farm and power plant. The power plant had multiple generators, and the output of these generators was transformed to supply both of the 66-kV power lines, which then supplied energy to the adjacent switchgear station, and to the 220-kV transmission lines. The 220-kV lines then transported energy to either of SCE's main distribution hubs, Hinson Substation or Lightipe Substation, both north of the Cerritos Channel. The Hinson Substation is located just south of Interstate 405 (I-405).The Lightipe Substation is located north of State Route 91 (SR-91) near Interstate I-710. SCE has divested ownership of the tank farm and the power plant. NRG Energy, Inc., has taken ownership of the power plant, and Pacific Pipeline System, LLC, has taken ownership of the tank farm.


PASADENA
BURBANK
ALHAMBRA
LOS ANGELES
SANTA MONICA
REDONDO BEACH
PACIFIC OCEAN
LONG BEACH
SEE DETAILED AREA BELOW
SEPULVEDA BLVD./WILLOW ST.
PACIFIC COAST HWY.
ANAHEIM ST.
SANTA FE AVE.
LONG BEACH
FWY.
TERMINAL ISLAND FWY.
Dominguez Channel
Los Angeles River
NO SCALE
LONG BEACH
LOS ANGELES
HARBOR FWY.
HARRY BRIDGES BLVD
ALAMEDA
PICO AVE.
SHORELINE DR
BLVD
SCE Transmission Lines
CITY OF LOS ANGELES
CITY OF LONG BEACH
PIER A
PIER S
Back Channel
Cerritos Channel
Schuyler Heim Bridge
OCEAN
ISLAND
PIER D
PIER E
Channel
HARBOR SCENIC DR
Queensway Bay
GERALD DESMOND BRIDGE
PROJECT LIMITS
TERMINAL
PIER T
East Basin
SEASIDE AVE.
Harbor Channel
Vincent Thomas Bridge
West Basin
PIER F
PIER G
PIER J
PIER T MOLE
ST.
AVE.
BEACON ST.
Los Angeles
9TH ST.
6TH ST.
GAFFEY
PACIFIC
PIER 300
Fish Harbor
Long Beach Harbor
PIER 400
Los Angeles Harbor
LEGEND
GERALD DESMOND BRIDGE REPLACEMENT PROJECT

The power plant was taken out of service for lack of a power sale contract and decommissioned in 2005. In response to record electricity demand in summer 2006, regulators encouraged SCE to pursue power generation projects that could be available by summer 2007. In response to SCE's request for new generating capacity by independent operators, NRG Energy, Inc. submitted their application for a Harbor Development Permit to re-commission four of the seven gas turbine generators at the existing LBGS in November, 2006 for a peaking plant. A peaking power plant is a power plant that generally runs only when there is a high demand, known as peak demand, for electricity. This typically occurs in the afternoon, especially during the summer months when the air conditioning load is high. Construction began in April 2007 and the plant was operational by August 2007. The peaking plant is operating under a 10-year power purchase agreement with SCE

Existing Conditions

The SCE high-voltage transmission, power and distribution lines cross the Cerritos Channel from LBGS to Pier A. Transmission lines operate at or above 200 kV, power lines between 50 and 200 kV and distribution lines operate under 50-kV (PUC, 1994). The vertical clearance afforded by the these lines, approximately 153 ft (46.6 m) above the mean high water level (MHWL), is 3 ft (1-m) less than vertical clearance afforded by the Gerald Desmond Bridge. This existing vertical clearance currently limits the air draft of vessels transiting to Piers A and S. Pier A is located to the north of Cerritos Channel and Pier S is located on Terminal Island to the south of Cerritos Channel.

The proposed Bridge Replacement Alternatives would provide approximately 200 ft (61 m) of air draft to accommodate the larger container vessels currently in service and planned for the future. The SCE lines would be a potential hazard to navigation; therefore, it would be necessary to raise or otherwise relocate the SCE lines. This relocation would be done in accordance with the applicable laws and regulations governing power and transmission lines over navigable waters. It is important to note that the existing Gerald Desmond Bridge is one of the lowest bridges in any large commercial port in the world.

Currently, there are 12 sets of cables (7 circuits) on 3 sets of towers that cross the Cerritos Channel (see Figure 2).

The switchgear station, as originally constructed, functioned as a junction point for connecting multiple circuits from north of the Cerritos Channel with the multiple generation facilities at the power plant. It also provided three additional circuits to supply power requirements on Terminal Island. The multiple generator connections are no longer in service, and the remaining circuits are as follows:

Figure 2
Existing Electrical Placement

Supplying Terminal Island:

1. 66-kV Circuit to Dock Substation with connection to Fuel Substation
2. 66-kV Circuit to Dock Substation with connection to APL Substation
3. 66-kV Circuit to Dike Substation

Supplying the Main Land - Towers Crossing the Cerritos Channel:

1. 66-kV Bundled Circuit (two sets of cables) to Hinson Substation (main source near I-405 with connection to State Substation in North Long Beach
2. 66-kV Bundled Circuit to Seabright Substation (near Cesar Chavez Park)
3. 66-kV Bundled Circuit to Bowl Substation (in North Long Beach)
4. 66-kV Bundled Circuit to Pico Substation (branching off at Anaheim Street on the north boundary of the Harbor District)
5. 66-kV Bundled Circuit to Hinson Substation
6. 66-kV Circuit to Harbor Cogen Substation (north of Pier A) with connection to Hanjin (Pier A) Substation
7. 12.5-kV Circuit from Dike Substation on Terminal Island to Harbor Cogen Substation

Separate from the above power circuits, SCE has two transmission circuits with separate towers that were built to carry the 220-kV output of the power plant from Long Beach Substation to Hinson Substation and Lightipe Substation.

Regulatory Compliance

This analysis would require compliance with Federal Aviation Administration (FAA) regulations, the Public Utilities Commission of the State of California (PUC) General Order 131-D, PUC General Order 128, the United States Army Corps of Engineers (USACE) regulations, the California Coastal Commission (CCC) regulations and, the United States Coast Guard (USCG). The preceding regulatory requirements are examples of some responsible agencies; compliance with other agencies and/or regulatory requirements may be necessary. These would be identified through the preferred option and during the design and permitting processes.

Per FAA regulations, all proposed construction and/or alteration of objects that may affect the navigable space are required to file a notice. Overhead transmission lines, as well as the height of supporting structures that are 200 ft (61 m) or greater, are required to file this notice with FAA (FAA, 2000a).

Also, FAA regulations require any obstruction to navigable space to have marking and lighting to reduce navigational hazards. This FAA standard was established using the criteria in Title 14, Part 77 of the *Code of Federal Regulations* (CFR) (FAA, 2000b).

PUC General Order 131-D requires that any new, upgraded, or relocated power lines or substations that are designed for immediate or eventual operation at any voltage between 50-kV and 200-kV require review under the California

Environmental Quality Act during the project planning phase and the relocation plan approval stage (PUC, 1994).

PUC General Order 128 sets uniform requirements for underground electrical supply and communication systems, the application of which will ensure adequate service and secure safety to all persons engaged in the construction, maintenance, operation, or use of underground systems and to the public in general (PUC, 1998).

The USACE is responsible for implementing Section 10 of the Rivers and Harbors Act of 1899. Section 10 of the Rivers and Harbors Act establishes permit requirements to prevent unauthorized obstruction or alteration of any navigable water of the United States. A Section 10 permit for modification of the SCE lines crossing Cerritos Channel will be obtained through coordination with the USACE as applicable (USACE, 2008a).

As part of the requirements of the CCC, the 1999 Port Master Plan establishes regulatory compliance with the Coastal Zone Management Act (CZMA). Specifically, the Port designates land uses and water uses where known throughout the Port area (Port, 1999).

The USCG monitors compliance with the Maritime Transportation and Security Act of 2002, which requires U.S. port facilities to establish and implement detailed security plans and procedures (Port, 2006). The Prevention Department of the USCG focuses on gaining compliance with regulatory standards, and design and maintenance of waterway systems to prevent incidents.

Options to Relocate and/or Raise Transmission Towers and Lines

Analysis of four relocation options for raising and/or relocating the SCE lines crossing the Cerritos Channel, as well as the advantages and disadvantages of each option, both from a project and operational standpoint are summarized below.

Option 1

Option 1 would relocate all lines (12.5-, 66- and 220-kV lines) from over the Cerritos Channel to beneath the Cerritos Channel. Figure 3 shows the proposed configuration for Option 1.

Pros

Relocating all of the lines under the Cerritos Channel would free up air space for ships to traverse the channel, thereby, reducing navigational hazards. Reducing navigational hazards along the Cerritos Channel would prevent service interruption to ships utilizing the Back Channel. The existing towers would be left in place and would not require additional coordination with the State Historic Preservation Officer (SHPO). The SHPO has concurred that by leaving the existing towers in place the project would not have an adverse affect on the eligible NRHP resource and therefore would not affect the project schedule.

Cons

Relocating the lines under the Cerritos Channel would require specialized protective steel poles. The lead time for manufacturing these custom-made steel poles and specialized cables would require a minimum of 1-year.

While underground facilities are not as susceptible to wind and debris-blown damage, they are more susceptible to water intrusion and local flood damage, which can make repairs more time consuming and costly. Damage and corrosion of underground electrical systems often show up days or even months later, causing additional outages and inconvenience to customers (FPL, 2006). Additionally, all SCE lines produce heat; therefore, they have a limit on the amount of power that they can carry to prevent overheating. Underground lines cannot dissipate heat as well as overhead lines. Factors, such as the type of soil, surrounding soil conditions, adjacent underground utilities, and the depth of installation, all affect the ability of the wire to dissipate heat (ATC, 2006)

The estimated cost of placing the 12.5-kV distribution line and 66-kV power lines below the Cerritos Channel is approximately $12 million (Port, 2005). Placing lines underground can be 5 to 15 times more costly than an overhead transmission line (FPL, 2006). Additionally it is assumed that to effectively dissipate the heat, placing the 220-kV transmissions lines beneath the channel may require the lines to be divided into multiple lines, further increasing the cost to relocate the lines beneath the Cerritos channel.

Further Analysis

Further analysis to determine approximately how many miles of transmission cables would be required to reroute the lines under the Cerritos Channel. This would determine the approximate cost, and would be done during the preliminary design stage of the project.

Option 1

Figure 3
Under the Cerritos Channel

Option 2

Option 2 would raise the existing towers to accommodate a 200-ft (61-m) vertical clearance for all lines (12.5-, 66- and 220-kV lines). Figure 4 shows the proposed configuration for Option 2.

Pros

Raising the existing towers would enable taller ships to traverse the Cerritos Channel. Reducing navigational hazards along the Cerritos Channel would prevent service interruption to ships utilizing the Back Channel.

Cons

The original design of the tower foundations may not be adequate to support the additional height and weight of steel required to raise the towers. Additionally, the existing transmission towers on Piers S and A, were determined to be eligible for listing in the NRHP. Raising these towers would require modification of the NRHP eligible resource and necessitate further coordination and concurrence from the SHPO. This effort would require additional time to be added to the project schedule.

Further Analysis

A cost-benefit analysis would be required to determine the overall cost of raising the existing towers. Additionally, further analysis is required to determine the height of the new towers to accommodate a 200-ft (61-m) vertical clearance above the MHWL. This would be done during the preliminary design stage.

Option 2

Figure 4
Raise Existing Towers

Option 3

Option 3 would construct new towers adjacent to the existing towers on Piers S and A to accommodate a 200-ft (61-m) clearance. Subsequent to construction of the new towers, all SCE lines (12.5-, 66- and 220-kV lines) would be relocated to the new towers. Figure 5 shows the proposed configuration for Option 3.

Pros

Relocating the lines to the new towers at a higher elevation would enable taller ships to traverse the Cerritos Channel. Reducing navigational hazards along the Cerritos Channel would prevent service interruption to ships utilizing the Back Channel. The existing towers would be left in place. Building the new towers adjacent to the existing towers would not require additional coordination with the SHPO. The SHPO has concurred that by leaving the existing towers in place the project would not have an adverse affect on the eligible NRHP resource and therefore would not affect the project schedule.

Cons

The construction of the new towers on Piers S and A would require coordination with the tenants at these respective piers. Depending if there are parallel construction activities by these tenants, this may affect the schedule for the construction of the new towers.

Further Analysis

A cost-benefit analysis would be needed to determine the overall cost of constructing new towers. Similar to Option 2, further analysis is needed to determine the height of the new towers to accommodate a 200-ft (61-m) vertical clearance above the MHWL. This would be done during the preliminary design stage.

Option 3

Figure 5
New Towers

Option 4

Option 4 would remove all lines from over the Cerritos Channel via the towers on Pier S and on Pier A, up to just north of the Pier A Substation. New lines would then be routed overhead along the western Harbor Department boundary and across the Cerritos Channel to Terminal Island adjacent to the proposed Schuyler Heim Bridge. The 66- and 12.5-kV lines would then be connected to the Dock Substation and the 220-kV line would be routed across Pier S to the LBGS. Figure 6 shows the proposed configuration for Option 4.

Pros

Relocating the lines adjacent to the Schuler Heim Bridge would enable taller ships to traverse the Cerritos Channel. Reducing navigational hazards along the Cerritos Channel would prevent service interruption to ships utilizing the Back Channel. The existing towers would be left in place and would not require additional coordination with the SHPO. The SHPO has concurred that by leaving the existing towers in place the project would not have an adverse affect on the eligible NRHP resource and therefore would not affect the project schedule.

Cons

Option 4 will require acquisition of additional right-of-way that may impact the facilities located outside of the Harbor Department boundary south of Anaheim Street. Additionally, relocating the lines via the Schuyler Heim Bridge requires coordination with the Alameda Corridor Transportation Authority (ACTA) and the California Department of Transportation (Caltrans). Since the Schuyler Heim Bridge is proposed to be replaced, integrating the steel pole adjacent to the new project would be necessary to facilitate the construction process.

Further Analysis

A cost-benefit analysis would be needed to determine the overall cost of rerouting the lines and right-of-way requirements.

Conclusions/Recommendations

Based on the above analysis, Option 3 is recommended for further study and coordination with SCE. Option 3 is likely the most economical, feasible and, with the exception of the new towers, utilizes existing SCE power infrastructure and right-of-way while eliminating the navigational hazard for ships traversing the Cerritos Channel.

Option 4

Figure 6
Via Schuyler Heim Bridge

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