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Prepared for

PG&E

and the
State Water Resources Control Board
Nuclear Review Committee

Alternative Cooling Technologies or Modifications to the Existing Once-Through Cooling System for the Diablo Canyon Power Plant

Prepared by
Bechtel Power Corporation
Report No. 25762-000-30R-G01G-00010

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Independent Third-Party Final Technologies Assessment for the Alternative Cooling Technologies or Modifications to the Existing Once-Through Cooling System for Diablo Canyon Power Plant

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25762-000-30R-G01G-00010

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Sections 2 through 4.2 have been previously issued for review and are therefore omitted from this document.

4.3 Closed-Cycle Cooling Technology

The closed-cycle cooling technologies considered herein would replace only the non-safety-related portions of each unit's existing once-through cooling system. The portion of the existing system identified as "auxiliary saltwater cooling" would remain a once-through cooling system. The following five variants of the closed-cycle cooling technology were evaluated; two use dry cooling, two use wet cooling, and one uses a combination of wet/dry cooling:

- Passive draft dry/air cooling
- Mechanical (forced) draft dry/air cooling
- Wet natural draft cooling
- Wet mechanical (forced) draft cooling
- Hybrid wet/dry cooling

Each variant would significantly reduce the quantity of water withdrawn from the ocean.

Plant cooling water temperatures created by the closed-cycle cooling systems would be higher than the temperature provided by the existing once-through system. Cooling water temperatures created by closed-cycle systems are primarily governed by the ambient wet and dry bulb temperatures, the cooling tower surface (heat exchange area), and the air flow across the cooling tower cooling surface. Dry technologies follow dry-bulb temperatures, while wet technologies follow wet-bulb temperatures. Dry technology cooling water temperatures are higher than wet technology cooling water temperatures. The design temperatures used for DCPP are provided in Table 4.3-1.

Table 4.3-1. DCPP Design Ambient Temperatures

Parameter	Temperature (°F)
Design Wet Bulb Temperature	64.5
Design Dry Bulb Temperature	77.8
Site Maximum Wet Bulb Temperature	76.1
Site Maximum Dry Bulb Temperature	97.0
Site Minimum Wet Bulb Temperature	21.0
Site Minimum Dry Bulb Temperature	33.0

Warmer cooling water temperatures to the plant's condensers would decrease the associated turbine generator system's electrical power output. In addition, using mechanical (forced) draft fans in lieu of natural draft would increase the plant auxiliary (parasitical) electrical load, further reducing the facility's electrical output usable to consumers. An analysis was performed to estimate the effect on plant electrical generation due to the various cooling system options under consideration. Local weather and oceanographic data was used in the analysis. For simplicity, condenser and cooling tower performance is based on 100-percent duty for all operating points. For base load operation, this is a reasonable assumption, because duty over the range of ambient temperatures would only change by a few percentage points. Figure 4.3-1 provides a graphic representation of how the monthly average cooling water temperature varies annually for the existing once-through cooling system and the various closed cooling technologies being considered. Average temperatures vary within the range of 10°F to 40°F above the existing temperature, based on the technology and time of year. Figure 4.3-2 graphically indicates the corresponding average-month condenser backpressure associated with the cooling water temperatures.

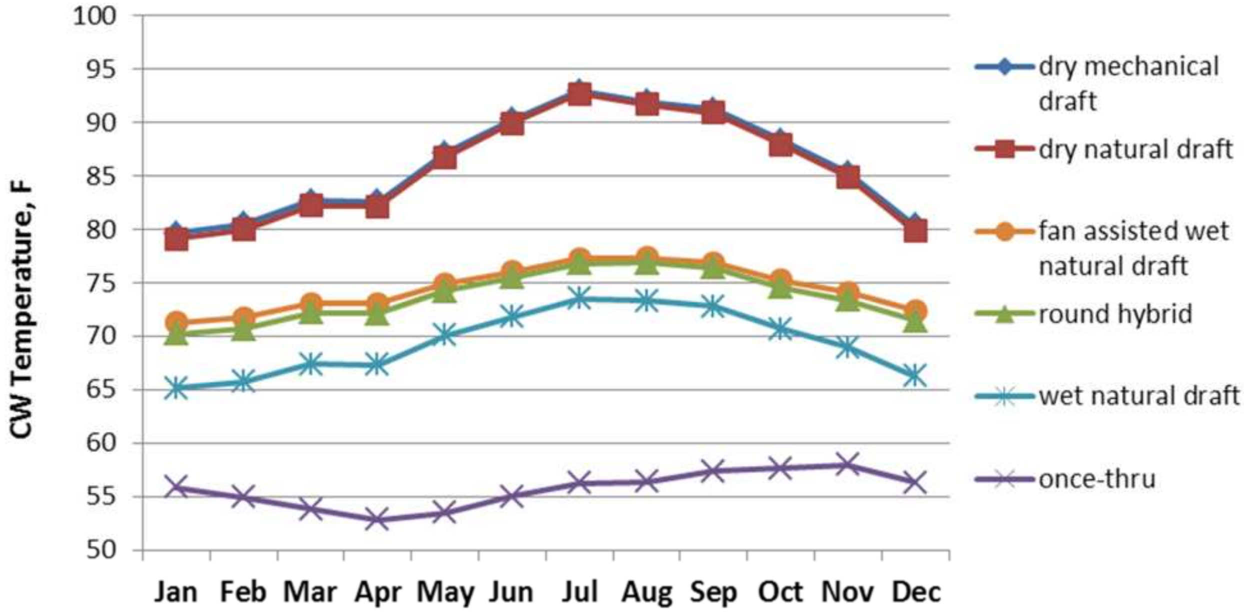

Figure 4.3-1. Average Circuating Water Temperature per Month

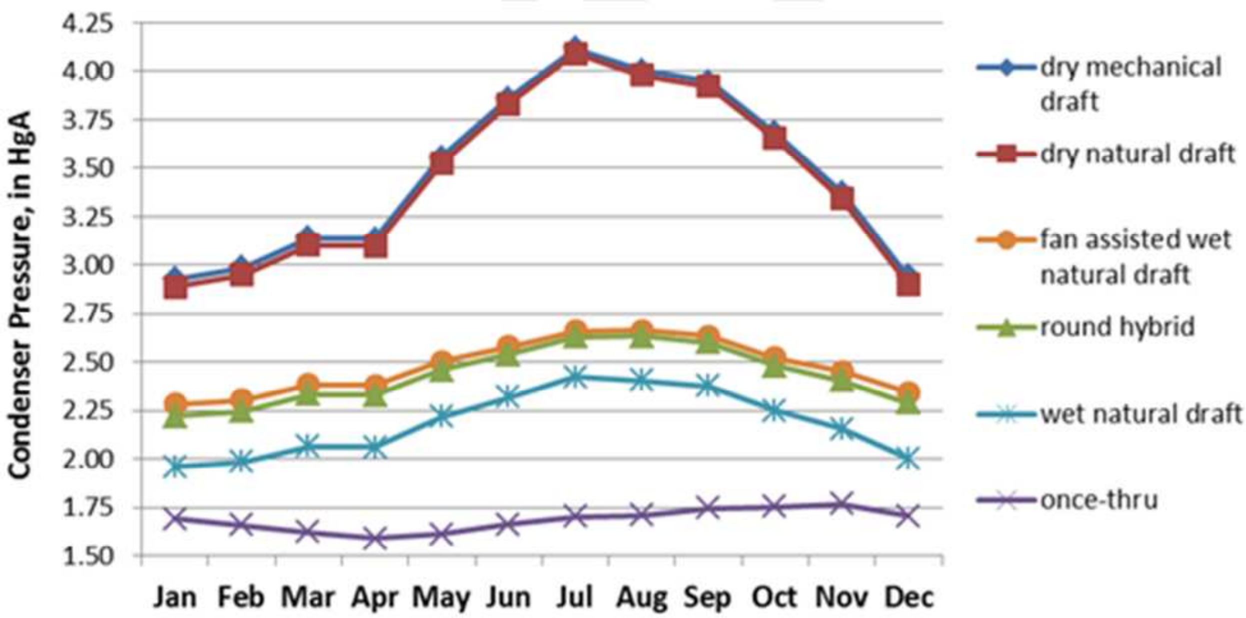

Figure 4.3-2. Average Condenser Backpressure per Month

As previously stated, increased condenser pressure results in reduced turbine output. In addition, the additional auxiliary loads of some of the cooling system options (fans, additional pumping power, etc.) also lead to a reduction in plant net output. Figure 4.3-3 shows estimated loss of generation by month for the different cooling options compared to the current once-through system. The average yearly lost generation (assuming 90% capacity factor) is shown in Table 4.3-2.

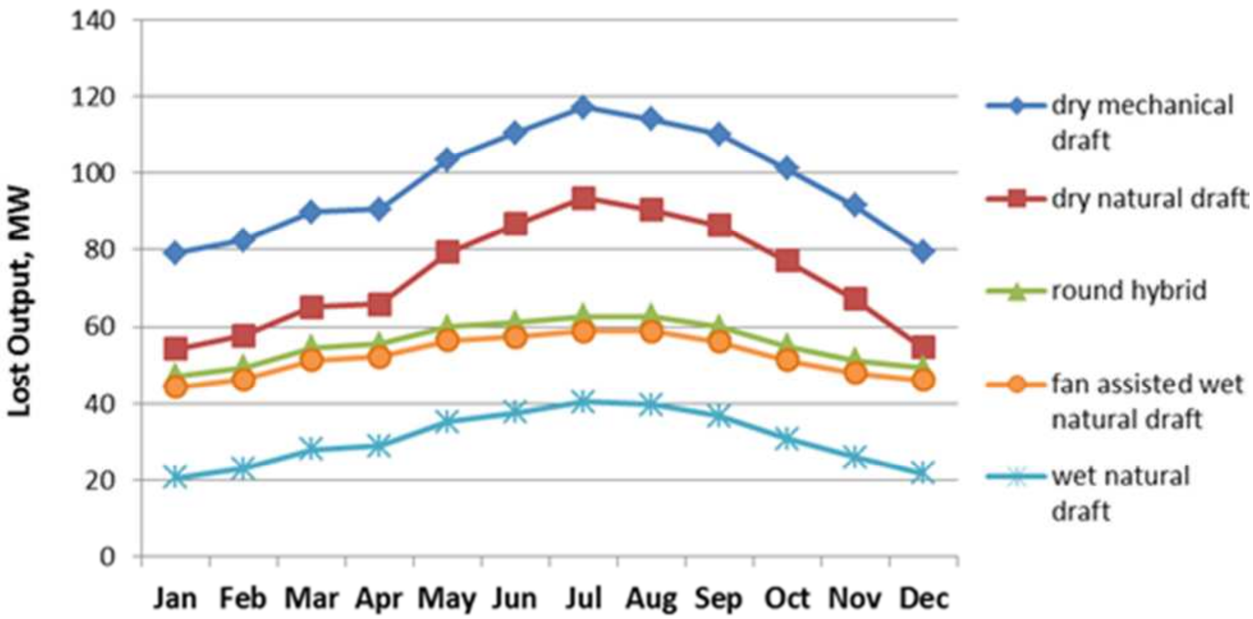

Figure 4.3-3. Average Lost Output per Month

Table 4.3-2. Average Yearly Lost Generation

Technology	Yearly Lost Generation MWh (per Unit)
Dry mechanical draft	769,514
Dry natural draft	578,031
Wet natural draft	242,684
Fan-assisted wet natural draft	412,184
Round hybrid	439,833

Selected major equipment suppliers (cooling towers, pumps, water treatment equipment, large valves, large piping, transformers, and offshore specialty contractors) were consulted to validate technical data and cost estimates included herein.

To avoid repeating information about similar features applicable to several technologies, the variant technologies within each category (dry and wet) are discussed together.

4.3.1 Dry/Air Cooling Systems—Overview

4.3.1.1 Mechanical Design

Dry/air cooling systems (passive draft and mechanical [forced] draft) are primarily used when water for more traditional solutions is not available or is cost prohibitive. The cold water temperatures achievable from dry/air cooling systems are the highest of the closed-cycle cooling technologies considered and thus have the highest impact on the electrical output that can be generated. In addition, the achievable “cold” water temperatures do not meet the cooling requirements of secondary components at DCPP that support plant operations and are currently cooled from the CWS. It was considered impractical to redesign these secondary systems, so one much-smaller independent once-though cooling system per unit would be included to support these secondary components. Two new saltwater cooling pumps per unit would be provided, located in the existing seawater intake structure, for the new once-through cooling system. The system would be capable of providing 10,200 gpm per unit. New piping would be routed from these pumps to interface with the existing supply piping to the service water heat exchangers and component cooler. Return flow would be through the existing plant outfall.

A dry/air cooling system needs small amounts of makeup water to replace water lost due to leakage. The system requires no blowdown, nor does it have any evaporative losses. Water would be required to periodically wash the outside of the dry heat exchangers to maintain their performance. The existing plant water system would be capable of providing the initial fill of water, wash water, and leakage makeup.

Cooling towers would be located northeast of the turbine building and east of the SLO-2 archeological site. The existing portion of the mountain at this location would be lowered to an elevation of 115 feet to accommodate the towers. The 115-foot elevation was selected because it matched the elevation where the cooling water piping crossed the SLO-2 archeological site and was the highest elevation that was determined to result in an acceptable pressure for the cooling water ducts within the turbine buildings. A new pumphouse would be furnished for each unit. The Unit 1 pumphouse would be located northeast of the turbine building and south of the SLO-2 archeological site. The Unit 2 pumphouse would be located west of the Unit 1 turbine building. Refer to General Arrangement 25762-110-P1K-WK-00011 and the general arrangements included below for each closed-cycle cooling technology variant.

A hydraulic analysis of the dry/air cooling variant was performed based on providing the design coolant flow to the CWS components using the proposed configuration to validate pipe sizes and to determine required system design pressures and pumping parameters. Four 25-percent-capacity CW pumps with common suction and discharge headers would be provided per unit. As shown on the general arrangement drawings, a combination of 12-foot-in-diameter FRP piping and 16-foot-by-16-foot concrete conduits per unit would be connected to modified condenser outlet concrete conduits and routed to the associated unit’s CW pumphouse. Similar piping and concrete conduits would be routed to/from all of the cooling towers along the north and west sides of the turbine building to connect the towers to the new pumphouses and existing condensers. Refer to General Arrangement 25762-110-P1K-WL-00011 and the general arrangements included below for each closed-cycle cooling technology variant. The routing and pipe/conduit sizes would be very similar for all variant technologies except in the local area of the towers.

Significant demolition/modification of the existing CW concrete conduits west of the turbine building would be required for each of the variant technologies. The extent of this demolition is shown on drawing 25762-110-P1K-WL-00013. The modifications necessary on the west side of the turbine building are shown in Figure 4.3-4.

A closed-cycle cooling system would require an increase in the overall design pressure of the CWS since the towers are located at the 115-foot elevation. The tube side of the main condensers would be modified to increase the tube-side pressure design from 25 psig to 50 psig. This pressure increase would account for the system losses and the increased hydrodynamic loading that result from the modified CWS arrangement.

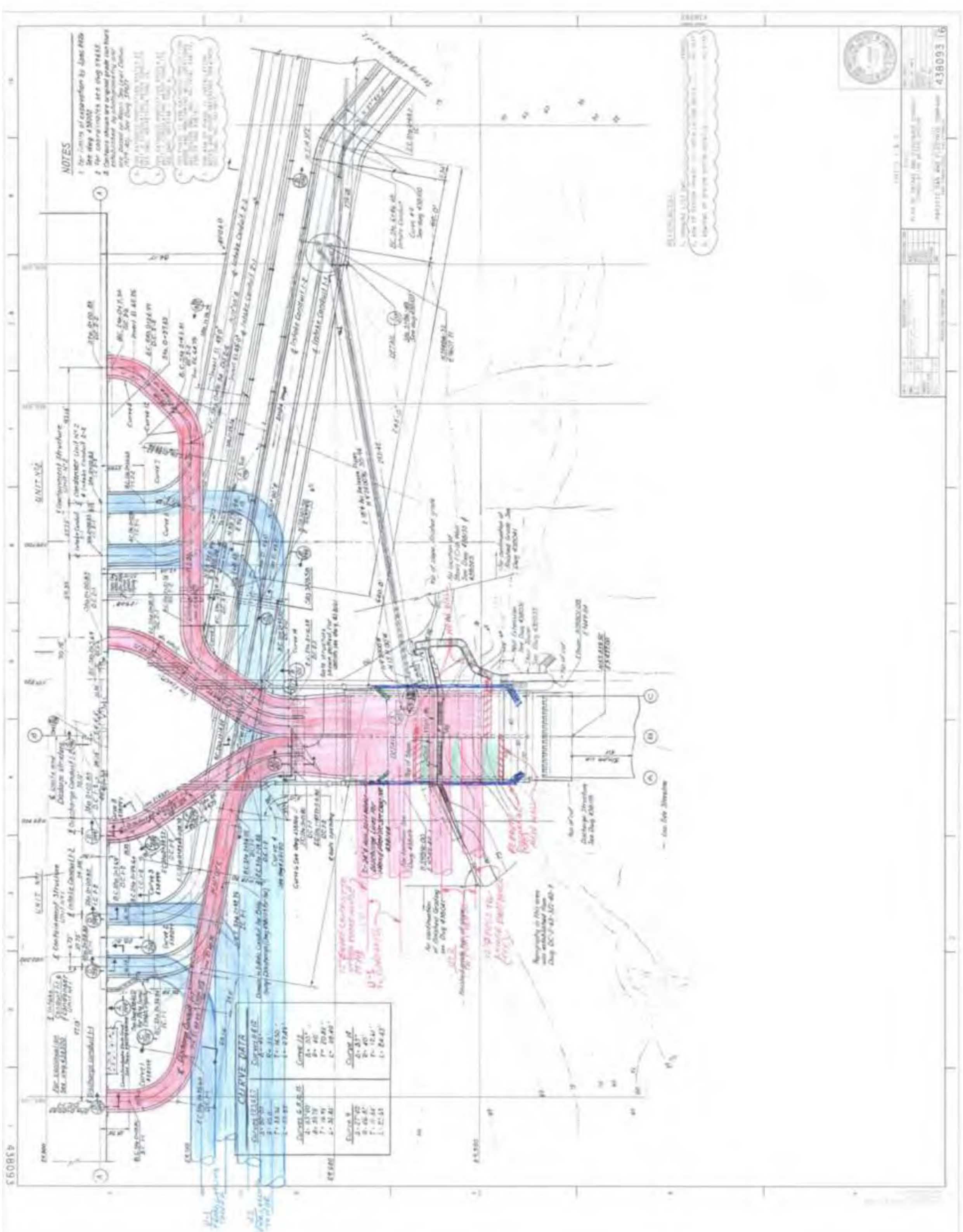

Figure 4.3-4. Circulating Water System

Access/maintenance roads would be provided. The existing fire loop would be extended to the cooling tower area. It has been assumed that the existing fire system can provided the required fire water flows and pressures required at the cooling tower area.

The existing CW pump motors and pump internals (two per unit) would be decommissioned and removed as necessary. The existing shoreline intake structure would be modified to accommodate the two new saltwater cooling pumps per unit to supply cooling water to the service cooling water and condensate cooler heat exchangers.

4.3.1.2 Control System Design

The philosophy used to develop the control systems approach is similar for each dry technology variant. Control systems and equipment were estimated in accordance with P&I schematics, the mechanical equipment lists, and the equipment described in the mechanical section of this report. The cooling tower control systems and equipment were estimated based on preliminary information received from cooling tower suppliers. A distributed control system (DCS) would be provided to control and monitor equipment. DCS input/output (I/O) cabinets would be located in the existing electrical building at the intake area for the new saltwater pumps, the new Unit 1 and Unit 2 cooling tower electrical buildings located in the area of the cooling towers, the new CW pump electrical building, and the new main switchgear building. It is expected that an operator workstation (OWS) human-machine interface (HMI) would be provided in each cooling tower building and in the main control room. It is assumed that there is enough space in the existing intake area electrical building to accommodate the new DCS I/O cabinet(s). The DCS would have redundant processors and communications networks. Separate and independent DCS networks would be provided for each of the two units. Hardware for the DCS would include functionally and geographically distributed I/O cabinets, I/O modules (analog and digital), OWSs, and the connective computer hardware modules. One engineering workstation (EWS) HMI and the software needed to develop control logic and graphic displays would be provided for each unit. The EWS would have the capability to upload and download configuration information and logic display changes into the OWSs and processors. The DCS would annunciate, indicate, time stamp, and track the status of critical parameters. Alarm histories would be available on the alarm summary display screen. A color laser printer would be provided to print DCS graphic displays, logic configurations, log reports, and alarm summaries.

As part of these modifications, the controls associated with the plant's existing CW pumps would be decommissioned and removed. New CW pumps and valves would be installed at a new pumphouse to circulate the cooling water from the condenser outlet to the new cooling towers. Local instrumentation and control panels for existing CW pumps would be removed and decommissioned. This estimate includes the demolition costs for these panels and instrumentation. The estimate also includes necessary revisions to plant drawings and documents (such as logic diagrams, instrument installation details, instrument list, and instrument data sheets).

Custom-built DCS graphics would be provided to show overview and group or detailed information to assist the operator in any type of control action required. Other DCS features are:

- Annunciation would be predominantly in the main DCS. Major alarms and protections would be time tagged.
- Positive indications would be provided for plant status (e.g., run/stop, open/close), and these indications would be fed back to the DCS and indicated using an appropriate graphic display.
- Plant personnel would be able to modify and tune control loops, create or change displays, and make database changes without training in high-level programming languages.

The DCS network would have a redundant Ethernet data highway and Ethernet links to the medium voltage (MV) switchgear multifunction relays and to the existing plant computer system. Redundant DCS Ethernet switches and cabling would be provided for the connection between the DCS local/remote I/O cabinets and the DCS HMIs to permit data transfer. All DCS printers and HMIs, including the historian, would also be interconnected via Ethernet. All DCS communication cabling between plant buildings would be fiber optic. All DCS communication cabling within the same room would be Category V/VI copper.

The DCS would control each new MV switchgear main, tie, and load center feeder breakers. The status of each MV bus would be monitored from the DCS via data link to MV meters/relays.

4.3.1.3 Civil Design

With respect to the major civil/structural effort, the five alternative closed-cycle cooling technologies can be divided into two groups: wet (includes natural draft, mechanical [forced] draft, and hybrid variants) and dry (includes natural draft and mechanical [forced] draft variants). Preliminary civil designs were prepared to size major structures such as cooling tower foundations, new pumphouses and header boxes, storage pond, desalinations and water treatment plant foundations, and mountain excavation quantities.

The wet technology options have similar general arrangements, and all include a makeup water system (storage pond, desalination plant, water treatment plant, offsite reclaimed water system, and cooling tower water basin). The dry technology options do not include the makeup water system, but have general arrangements otherwise similar to those of the wet technology variants with respect to cooling towers, pumphouses, CW piping, and box conduits. The other major difference among the five alternative technologies lies in cooling tower foundation designs, shapes, and dimensions. The preliminary cooling tower foundations were sized based on the data provided by the cooling tower suppliers and in keeping with the historic information for similar projects previously designed by Bechtel.

It would be necessary to excavate the mountain to an elevation of 115 feet to provide the space needed to build the new cooling towers and, for the wet technologies, the makeup water storage pond. The number of cooling towers needed is technology specific. The location of the new cooling towers has been chosen carefully to provide the most economical solution and to preclude impact to the nearby archeological site. Tower locations are shown on the general arrangement drawings identified in the mechanical design sections. The preliminary drawings depicting excavation plans and sections were developed to determine the excavation quantities needed to accommodate the two-cooling-tower and four-cooling-tower general arrangement options (refer to drawings 25762-110-7200-00001, -00002, -00003, -00004, and -00005). The shape and elevation contours of the mountain terrain were traced from the topographic quadrangle maps available from the United States Geological Survey (USGS) official website. The preliminary cut and fill excavation quantities for the two-tower and four-tower general arrangements, with 7-percent haul ramps, were determined using InRoads design software and are as shown in Table 4.3-3.

Table 4.3-3. Mountain Excavation Quantities

General Arrangement	Earthwork Quantities (cubic yards)		
	Cut	Fill	Net
Two Cooling Towers	189,858,300	4,788	189,853,512
Four Cooling Towers	315,654,754	14,324	315,640,430

The excess excavated soil would be disposed of using the proposed haul roads to the potential spoil area sites located further north as shown on drawings 25762-110-CEK-7200-00001 and -00002.

Existing plant buildings 102, 518, 519, 520, 521, 527, and 528 (refer to DCPP Drawing 512297, sheet 1) would need to be demolished to provide space for the new pumphouses, CW pipes, and conduits. The estimate considers replacement costs for buildings 102 and 519.

Two CW pumphouses would be required (one for each unit), and two each supply and return headers would be required for each pumphouse. Preliminary engineering has been performed to provide material and excavation quantities for the two pumphouses and headers. These quantities are in addition to the mountain excavation quantities noted above. Refer to the general arrangement drawings for each variant technology to see the configuration of the headers for that technology

The proposed closed-cycle CW piping consists of new concrete box conduits and FRP piping to get the water to and from the condenser. Inside the power block and nearby where space is restricted, concrete box conduits that can be designed to fit the restricted space would be used to carry the circulating water. For the rest of the CW pipe route toward the cooling towers, where adequate space is available, FRP pipes have been proposed in this estimate. FRP piping material was selected considering its advantages (such as hydraulic characteristics, resistance to biological attack, resistance to corrosion and a seawater environment, low maintenance, ease of handling and transportation, construction productivity, and long-term reliability) over other piping material like steel and concrete. Refer to Drawings 25762-110-P1K-WL-00010, -00011, -00020, -00030, -00031, -00040 and -00050 for CW piping/conduit layouts and to Section A-A on Drawings 25762-110-P1K-WL-00010, -00020, -00030, -00040 and -00050 for FRP pipe spacing requirements. Note that the stringent requirements for quality backfill around the FRP pipes require a larger space to accommodate the installation of the multiple FRP pipes needed to supply and return the cooling water to the main condensers.

The existing concrete intake and discharge conduits outside the turbine building were evaluated for the proposed CW pipe tie-ins based on the existing plant calculated design pressure and the design pressure determined for the new system configuration. Based on the tower evaluations, it was concluded that the existing conduits outside the turbine building would not be adequate for the new design pressure; therefore, they would be demolished and replaced with new concrete conduits to meet the new design pressure requirements. The excavation is planned for the space in front of the turbine building in order to demolish and remove the existing concrete conduits and provide space for the new pumphouse, valve pits, header boxes, and concrete box conduits. Refer to Drawing 25782-110-P1K-WL-00013 for the extent of the proposed demolition area. The conduits within the turbine were determined to be able to accept the new design pressure; however, their capability was one of the determining factors in selecting the tower basin elevation of 115 feet.

Each cooling tower option has specific requirements for electrical buildings to house the required electrical equipment and cable raceways. The preliminary foundation engineering for the buildings has been developed to determine excavation and concrete quantities.

New roads are planned to be 24 feet wide. The new access road layouts and lengths vary with each cooling tower option. Refer to the cooling tower and piping general arrangement drawings for the proposed road layouts.

The development plan for the plant site area is shown in Figure 4.3-5.

Draft Report Page-66 Figure 4.3-5 Site Development Plan (Plant Site Area)

PG&E Drawing 512297 Removed Prior to Forwarding Pending Further Security Related Review/Approval

The earthwork operations would affect an existing two-circuit 230 kV transmission line as well as one circuit of the 500 kV line, which are the main offsite power feeds to Units 1 and 2. In addition, more offsite power would be required to energize the proposed cooling tower equipment, so four additional circuits of 500 kV must also be factored into the design.

This transmission line rerouting would be divided into two categories: (1) ***reroute*** of the two-circuit 230 kv transmission line and the single-circuit 500 kV offsite feed and (2) installation of a ***new tap*** consisting of four 500 kV circuits to supply offsite power to the proposed cooling towers.

230 kV Line Relocation

The three existing 230 kV lines that bring in the main offsite power for DCPP and the 500 kV line that supplies power from DCPP Units 1 and 2 require rerouting. The maximum allowable outage time is 72 hours for the work that would be entailed. This requirement would demand a phased approach to completing the construction and re-energizing the lines in the allotted time. These three existing 230 kV double-circuit structures would need to be relocated to avoid anticipated earthwork operations that would be necessary to prepare a site for the proposed cooling towers. The relocated line would consist of four new towers, the first being just outside the 230 kV substation on the opposite side of Pecho Valley Road. The grading plan in this area would require special consideration because a small pad must be retained just outside the substation to accommodate the first structure. Other considerations that would be addressed in final design would require that the limits of work provide ample room (per the grading plan) to achieve the electrical clearances required by G.O. 95 and NESC (both horizontal and vertical).

The westernmost circuit of the existing 500 kV offsite power line would also be affected by the grading. The first structures beyond the substation would require relocation because they are located within the proposed graded area. Currently configured as three single-phase lattice towers, the proposed replacement structures would be monopoles, and their location would be adjacent to the other 500 kV circuits located to the east.

Figure 4.3-6 depicts how the existing 230 kV and 500 kV lines would be rerouted.

Figure 4.3-6. Existing 230 kV and 500 kV Power Line Rerouting

New 500 kV Line Tap

To energize the required equipment for the proposed cooling towers, four new 500 kV circuits would be brought in from a new expansion on the west side of the existing 500 kV substation (see Figure 4.3-7). Four circuits would leave the substation on the north side and traverse the site on single-circuit monopole dead-end structures. This work would be sequenced at the end of the earthwork operations because cooling tower earthwork must be completed prior to structure erection and stringing. The structures immediately outside the 500 kV substations are proposed to be 150 feet tall; this height provides clearance over the rerouted 230 kV lines. All other 500 kV tap structures are assumed to be 110-foot-tall monopoles. Foundations are currently proposed as caissons because these are usually quick to install using an excavator mounted Lo-Drill.

Figure 4.3-7. 500 kV Power Supply to the Cooling Towers

It is anticipated that construction would follow a sequence similar to the following:

- Perform grading in areas to which the existing lines would be relocated (existing lines still energized)
- Place foundations in the newly graded areas (existing lines still energized)
- Erect structures
  - 230 kV structures - erect lattice towers (existing lines still energized)
  - 500 kV structures – erect steel monopoles (existing lines de-energized due to proximity of construction)
- String conductor between dead-end towers (lines de-energized)
- After connections have been completed and checked off, re-energize lines

4.3.2 Passive Draft Dry/Air Cooling

4.3.2.1 General Design Considerations

P&I Schematic 25762-110-M6K-WL-00001 represents the piping arrangement for the CWS for the passive draft dry/air cooling arrangement as well as the piping arrangement for the new once-through saltwater cooling system. Two metal hyperbolic natural draft towers, approximately 590 feet in diameter by 590 feet high, would be required to support each unit, resulting in a total of four towers. The towers would provide a design “cold’ water temperature of 107.9°F. Refer to General Arrangement Drawings 25762-110-P1K-WL-00010, -00011 and -00012 for tower locations, pump locations, and pipe routings.

Four new volute-style CW pumps would be provided per unit, each capable of a design circulating water flow of 215,700 gpm. Two vertical turbine saltwater cooling pumps would be provided per unit, each capable of a design flow rate of 10,200 gpm.

Equipment List 25762-110-M0X-YA-00001 provides specific details about the new mechanical equipment that would be furnished, and Valve List 25762-110-M6X-YA-00001 lists the new major valves that would be furnished.

4.3.2.2 Control System Design

The control system design approach for passive draft dry/air cooling is discussed in Section 4.3.1.2. The quantity of equipment required is adjusted to support the control needs of the given technology.

4.3.2.3 Civil Design

The civil design approach for passive draft dry/air cooling is discussed in Section 4.3.1.3. The quantities differ for each technology based on the size and spacing of the towers and the amount of support equipment required. The spacing and the equipment are shown on the general arrangement drawings referenced in each section. The tower foundation design for the dry natural draft tower is provided based on preliminary vendor input. Four circular steel cooling towers (two per unit) would be provided. The foundation design would consist of two concrete ring foundations, one to support the outside tower base and the other to support the tower throat (steel structure). For the cooling tower and piping general arrangement, refer to Drawing 25762-110- P1K-WL-00010.

4.3.2.4 Electrical Design

The electrical load for passive draft dry/air cooling is estimated to be approximately 32 MVA per unit. In each unit, two new three-winding, 40 MVA transformers would feed the auxiliary loads (new circulating water pumps). The existing 500 kV DCPP switchyard would be expanded by two additional bays (breaker-and-a-half scheme) to provide the four circuits for the transformers. Refer to single-line drawing 25762-110-E1K-0000-00001.

The four CW pumps would be fed from each of the secondary windings. The new electrical distribution voltage levels would be 12 kV (in line with the existing MV level at DCPP) for the large CW motors (11.5 kV), 480 V for the cooling tower/CW pumphouse auxiliary equipment, and 120 V ac for smaller loads. There would be dedicated 125 V dc batteries (along with an associated battery charger) for critical UPS loads and control power for distribution equipment. The batteries would be sized for 2-hour duration, and the charger would be sized to recharge the batteries in 8 hours.

New loads located in the existing plant intake area (e.g., the saltwater cooling pumps, two per unit) would be fed from the existing power distribution system. The existing power distribution system was evaluated and determined to have adequate spare capacity because the existing feed to the CW pumps (two at 13,000 hp per unit) would be decommissioned.

Based on the auxiliary system single-line design for the passive draft dry/air cooling system, the quantity and sizes of electrical equipment were estimated and used to develop the associated building sizes. Based on the number and sizes of conductors from the single-line drawing, the raceway system was designed and the quantities and sizes were estimated (trays/conduits within building, interconnecting duct banks). Supplier drawings showing the layout of the passive draft dry/air cooling towers were used to develop physical design quantity estimates. Seven electrical buildings would be provided: one for the main switchgear, one at each of the four towers, and one at each of the two CW pumphouses. Refer to Raceway Layout Drawing 25762-110-ERK-WL-00010.

Figures 4.3-8 and 4.3-9 depict the layouts of the electrical buildings for the passive draft dry/air cooling option.

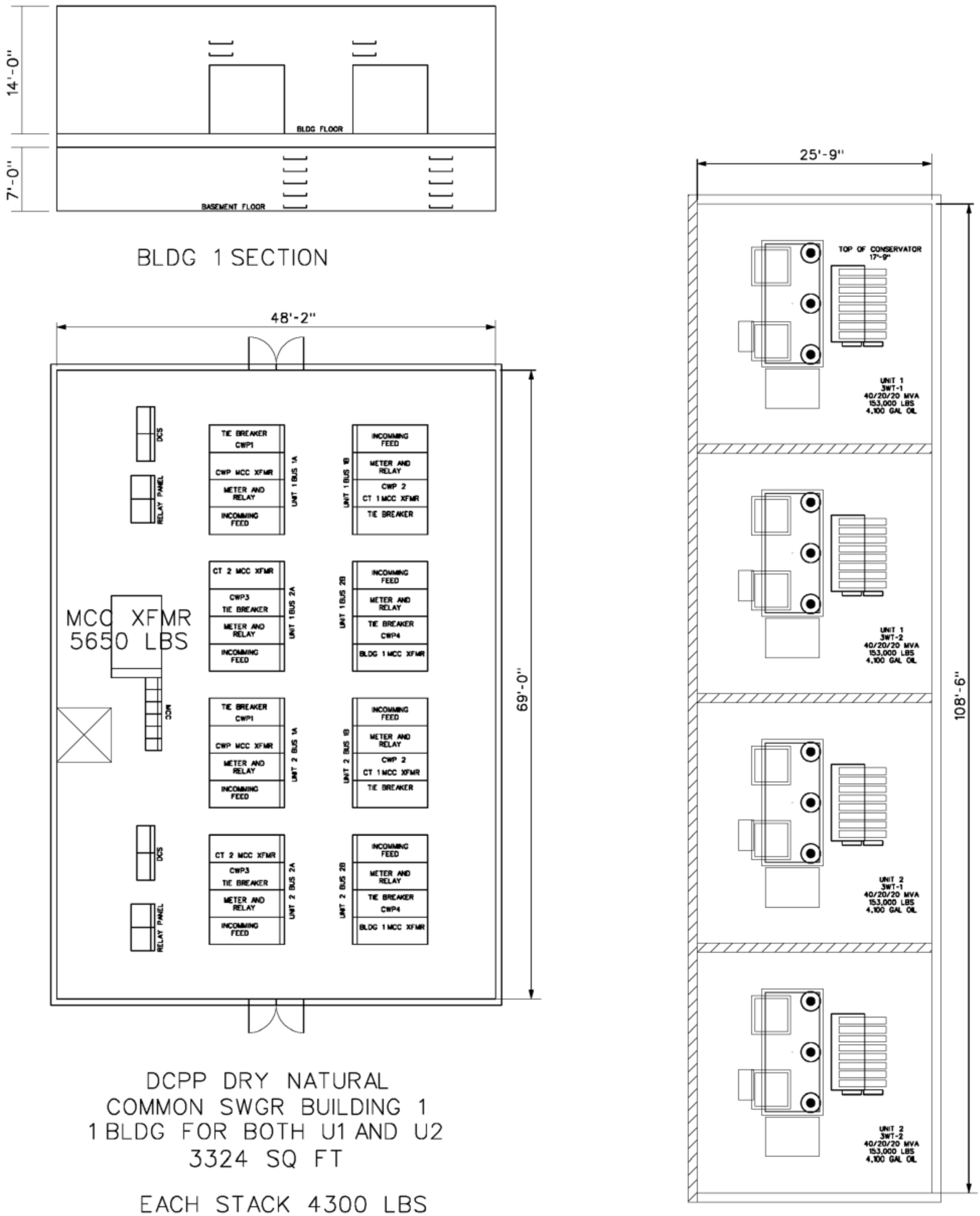

Figure 4.3-8. Passive Draft Dry/Air Cooling—Main Switchgear Electrical Building

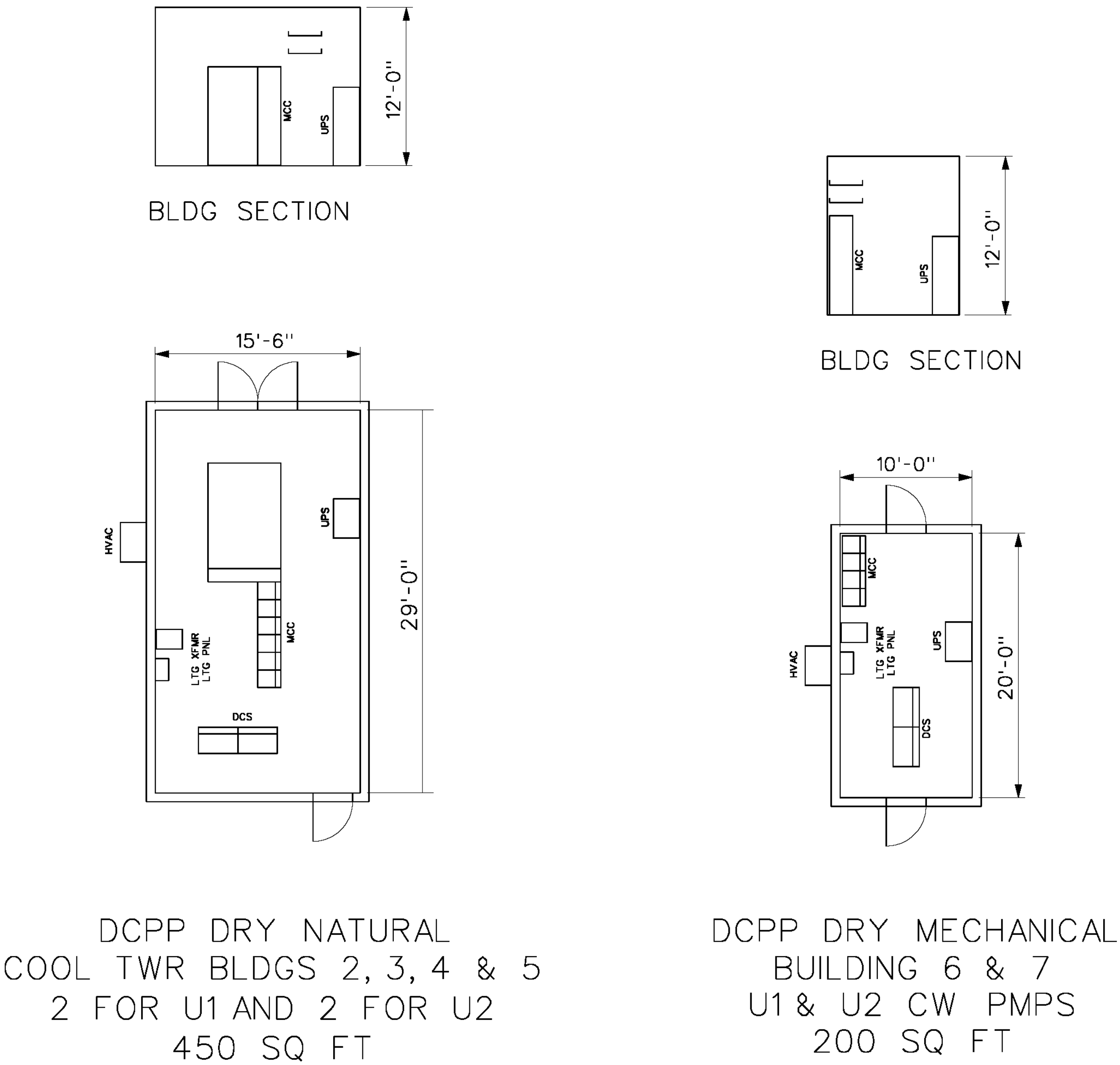

Figure 4.3-9. Passive Draft Dry/Air Cooling—Cooling Tower and Pumphouse Electrical Buildings

Quantity estimates were determined for the following items: tray, duct bank conduit, grounding, lighting, MV cable, nonsegregated phase bus duct, communication equipment, aboveground conduit length per circuit, and average circuit length.

4.3.3 Mechanical (Forced) Draft Dry/Air Cooling

4.3.3.1 Mechanical Design

P&I Schematic 25762-110-M6K-WL-00002 represents the CWS piping arrangement for the mechanical (forced) draft dry/air cooling arrangement as well as the piping arrangement for the new once-through saltwater cooling system. Two rectangular mechanical (forced) draft towers, each approximately 1,200 feet long, 100 feet wide, and 100 feet high, would be required to support each unit, resulting in a total of four towers. Each tower would have 60 fans. Each fan would be driven by a 250 hp motor to provide the required air flow through the tower. The towers would provide a design cold water temperature of 107.9°F. Refer to General Arrangement Drawings 25762-110-P1K-WL-00020, -00011, -00012, and -00013 for tower locations, pump locations, and pipe routings.

Four new volute-style CW pumps would be provided per unit, each capable of a design circulating water flow of 215,700 gpm. Two vertical turbine saltwater cooling pumps would be provided per unit, each capable of a design flow rate of 10,200 gpm, to supply cooling water to the service cooling water and condensate cooler heat exchangers.

Equipment List 25762-110-M0X-YA-00002 provides additional details about that would equipment be furnished, and Valve List 25762-110-M6X-YA-00002 lists the new major valves that would be furnished.

Performance, except for the additional electrical consumption, would be identical to that of the passive draft dry/air cooling towers, and the piping would be the same except in the immediate vicinity of the towers.

4.3.3.2 Control System Design

The control system design approach for mechanical (forced) draft dry/air cooling is discussed in Section 4.3.1.2. The quantity of equipment required is adjusted to support the control needs of the given technology.

4.3.3.3 Civil Design

The method used to develop quantities for the variant technologies is discussed in section 4.3.1.3. The quantities differ for each technology based on the size and spacing of the towers and the amount of support equipment required. The spacing and the equipment are shown on the general arrangement drawings referenced in each section.

The tower foundation designs for the mechanical (forced) draft dry/air tower are based on preliminary vendor input. Four rectangular, steel-framed cooling towers (two per unit) are proposed. Foundations would be a grid of multiple spread-footing foundations of two different sizes. For the cooling tower and piping general arrangement, refer to Drawing 25762-110-P1K-WL-00020.

4.3.3.4 Electrical Design

The electrical load for mechanical (forced) draft dry/air cooling is estimated to be approximately 61 MVA per unit. In each unit, two new three-winding, 70 MVA transformers would feed the auxiliary loads (cooling tower fans, CW pumps, etc.). The existing 500 kV DCPP switchyard would be expanded by two additional bays (breaker-and-a-half scheme) to provide the four circuits for the transformers. Refer to Single-Line Drawing 25762-110-E1K-0000-00002.

The four CW pumps would be fed from each of the secondary windings. The new electrical distribution voltage levels would be 12 kV (in line with the existing MV level at DCPP) for the large CW motors (11.5 kV), 480 V for the cooling tower fans and other cooling tower/CW pumphouse auxiliary equipment, and 120 V ac for smaller loads. There would be dedicated 125 V dc batteries (along with an associated battery charger) for critical UPS loads and control power for distribution equipment. The batteries would be sized for 2-hour duration, and the charger would be sized to recharge the batteries in 8 hours.

New loads located in the existing plant intake area (e.g., the saltwater cooling pumps, two per unit) would be fed from the existing power distribution system. The existing power distribution system was evaluated and determined to have adequate spare capacity because the existing feed to the CW pumps (two at 13,000 hp per unit) would be decommissioned.

Based on the auxiliary system single-line design for the mechanical (forced) draft dry/air cooling system, the quantity and sizes of electrical equipment were estimated and used to develop the building sizes. Based on the number and sizes of conductors from the single-line drawing, the raceway system was designed and the quantities and sizes were estimated (trays/conduits within building, interconnecting duct banks). Supplier vendor drawings showing the layout of the dry mechanical cooling tower were used to develop physical design quantity estimates. Seven electrical buildings would be provided: one for the main switchgear, one at each of the four towers, and one at each of the two CW pumphouses. Refer to Raceway Layout Drawing 25762-110-ERK-WL-00020.

Quantity estimates were determined for the following items: tray, duct bank conduit, grounding, lighting, MV cable, nonsegregated phase bus duct, communication equipment, aboveground conduit length per circuit, and average circuit length.

Figures 4.3-10 and 4.3-11 depict the layouts of the electrical buildings for the mechanical (forced) draft dry/air cooling option.

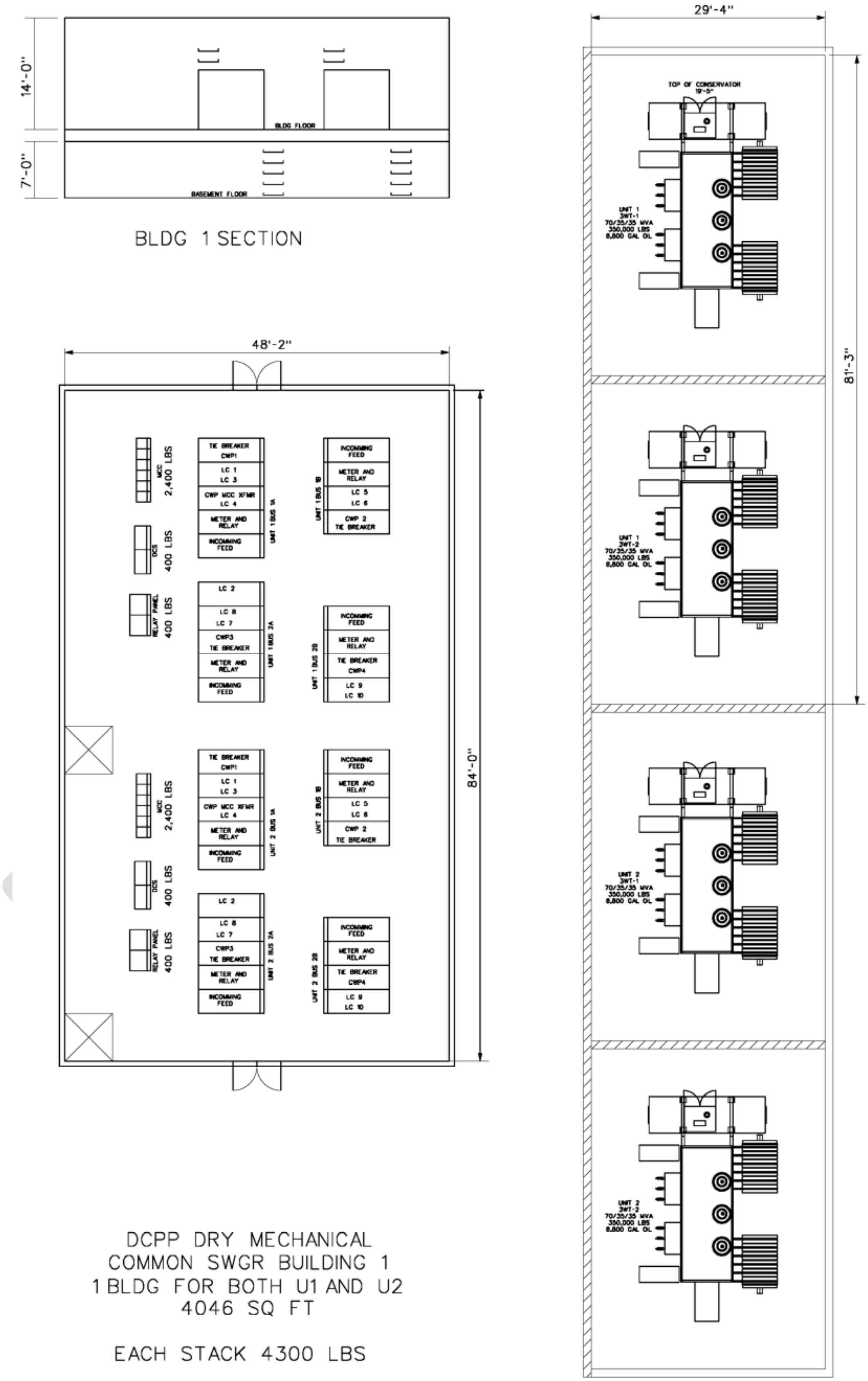

Figure 4.3-10. Mechanical (Forced) Draft Dry/Air Cooling—Main Switchgear Electrical Building

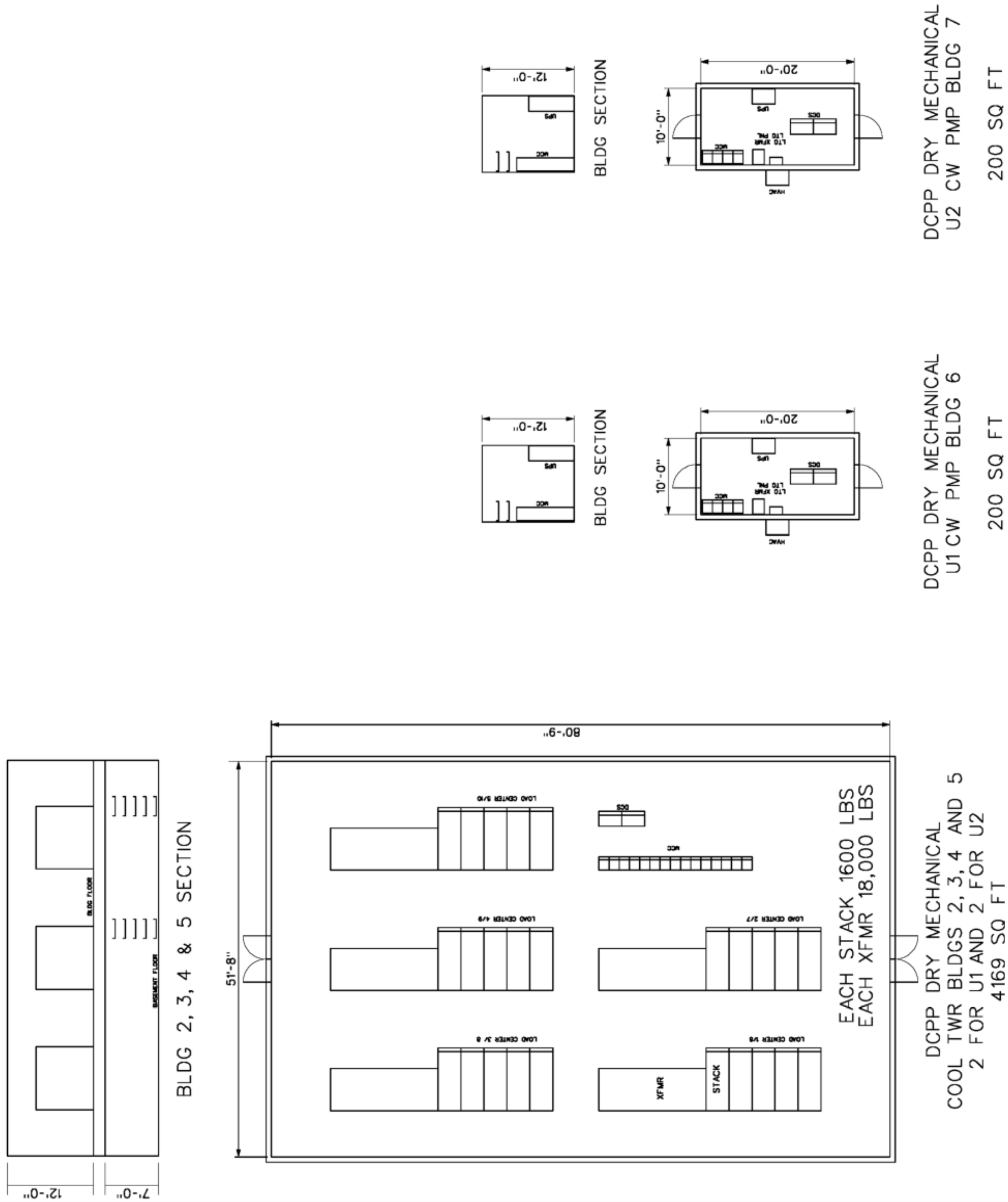

Figure 4.3-11. Mechanical (Forced) Draft Dry/Air Cooling—Cooling Tower and Pumphouse Electrical Buildings

4.3.4 Wet Cooling Technologies—Overview

4.3.4.1 Mechanical Design

The primary differences between wet cooling towers and dry cooling towers are that a wet cooling tower consumes water due to evaporation, drift, and blowdown and achieves lower cold water temperatures because of the difference between wet and dry bulb temperatures. Currently DCPP does not have the resources to produce water of adequate quality needed for the proposed cooling towers. Therefore, water required for the towers would be obtained from a new onsite desalination plant and from processed grey water obtained from the surrounding communities. A water balance was performed for the wet cooling tower variants to determine the quantity of water required (refer to Water Balance 2562-110-M5K-YA-00001). The towers for each unit would consume approximately 16,550 gpm.

Currently, up to 2,800 gpm of reclaimed water can be obtained from the following wastewater treatment plants, both within a 20-mile radius of DCPP:

- San Luis Obispo
- Moro Bay/Cayucos

Because this quantity is insufficient to support DCPP operation, a supplementary desalinization plant has been included, designed to supply 100 percent of the required makeup water. Refer to Figure 4.3-12 for proposed reclaim water routing.

The desalination facility would be located north of the turbine building and north of the SLO-2 archeological site. Three desalination seawater supply pumps would be installed in the existing plant shoreline intake structure. Piping would be routed from the intake structure around the SLO-2 archeological site to the desalination facility (refer to General Arrangement Drawing 25762-110-P1K-WL-00032). A second line would be routed from the desalination facility back to the plant outfall to discharge the brine produced by the desalination process (refer to General Arrangement Drawing 25762-110-P1K-WL-00030). The water produced by the desalination facility would be pumped to an approximately 5-million-gallon HDPE-lined storage pond located adjacent to the cooling towers. The storage pond size would allow 2 hours of operation of both units upon loss of both the recycle source and the desalinization system, to allow for an orderly shutdown if the makeup source cannot be restored. Tower blowdown would be accomplished via a connection from the CW piping supply line to the condensers that would be routed to the plant outfall (refer to P&I Schematic 25762-110-M6K-WO-00001). The existing CW pump motors and pump internals (two per unit) would be decommissioned and removed from the existing shoreline intake structure, and modifications would be made to accommodate three new desalination saltwater supply pumps.

Two offsite pump stations would be provided to pump water from the reclaimed water sources to an onsite storage tank. The reclaimed water would need to be pretreated before use in the cooling towers. Recycled water treatment equipment would be located adjacent to the new onsite desalination facility. Treated reclaimed water would be blended with desalinated water and stored in the pond. Refer to P&I Schematic 25762-110-M6K-WR-00001.

The cooling towers would be located northeast of the turbine building and east of the SLO-2 archeological site. The existing portion of the mountain at this location would be lowered to an elevation of 115 feet to accommodate the towers as with the other closed-cycle cooling technologies. New pumphouses would be furnished for each unit. The Unit 1 pumphouse would be located northeast of the turbine building and south of the SL-2 archeological site. The Unit 2 pumphouse would be located west of the Unit 1 turbine building. Refer to General Arrangement

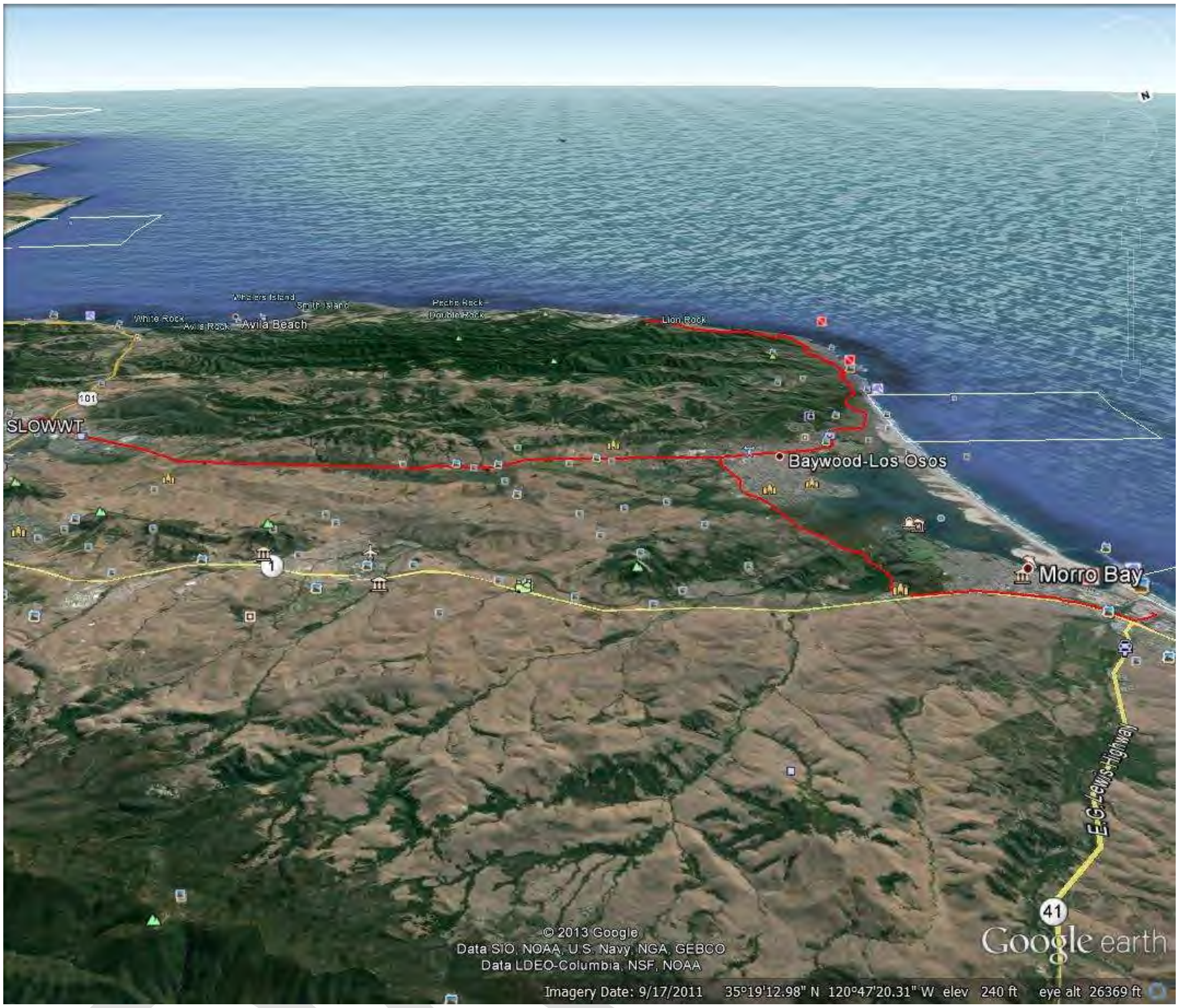

Figure 4.3-12. Proposed Reclaim Water Routing

Drawing 25762-110-P1K-WI-00031 and the general arrangements included below for each variant.

Four 25-percent-capacity CW pumps with common suction and discharge headers would be provided per unit. A combination of 12-foot-in-diameter FRP pipes and 16-foot-by-16-foot concrete conduits per unit would be connected to modified condenser outlet concrete conduits and routed to the associated unit's CW pumphouse. Similar piping and concrete conduits would be routed to/from the cooling towers by the west side of the turbine building and connect the towers to the new pumphouses and existing condensers. Refer to General Arrangement Drawings 25762-110-P1K-WL-00031 and the general arrangements included below for each variant. The routing and pipe/conduit sizes are very similar for all closed-cycle cooling technology variants except in the local area of the towers.

Significant demolition/modification of the existing CW concrete conduits west of the turbine building would be required. Refer to Drawing 25762-110-P1K-00013. The modifications necessary on the west side of the turbine building are shown in Figure 4.3-4.

A closed cycle cooling system would require an increase in the overall design pressure of the CWS. The tube side of the main condensers would be modified to increase the tube-side pressure design from 25 psig to 50 psig. This pressure increase would account for the system losses and the increased hydrodynamic loading that result from the CWS modified arrangement.

The increase in cold water temperature from the original 76°F would require that the service water heat exchanger and component coolers be replaced with larger surface area heat exchangers to provide the same hot-side cold water temperatures as provided in the original system.

The existing fire water and potable water systems would be extended to the cooling tower and desalination plant areas. A sanitary lift station would be installed at the desalination plant and piped to the plant existing sanitary system.

Access/maintenance roads would be provided to service the cooling towers and desalination facility.

The existing CW pump motors and pump internals would be decommission and removed as necessary and the existing shoreline intake structure would be modified to accommodate the three desalination saltwater supply pumps.

Drift is an important consideration when siting wet cooling towers at a power station. When the cooling towers are in operation, water droplets become entrained in the air flow being induced through the tower and exiting through the tower discharge. These droplets are known as drift. The drift rate for the different wet cooling tower technologies being considered for DCPP would be limited to 0.0005 percent of the circulating water flow rate by using drift eliminators in the cooling towers. The sizes of the drift droplets would range from 0.1–300 µm, depending on the drift eliminator manufacturer and type being used. This range is the lowest achievable from a single layer of the most efficient drift eliminators available in the industry at this time, and it equates to a total drift loss of approximately 5 gallons per minute from all of the cooling towers collectively.

The drift droplets would be of the same water quality as the circulating water and would contain any water treatment chemicals being used at the site. Based on the estimated circulating water quality for DCPP, the 0.0005-percent drift rate would result in the emission of approximately 30 tons of solids per year from the towers. After drift droplets leave a tower and land on surrounding areas and structures, the contaminants in the droplets are deposited when the droplets evaporate. Different tower design considerations, including tower discharge height and air exit velocity, affect how far the drift droplets travel and thus the area on which the drift can land, as well as the concentration of contaminants deposited on the affected surfaces.

One concern is that the presence of salts and chemicals in the drift droplets could result in a conductive film being left on insulators if the droplets land on the switchyard. This film could cause electrical arcing and other safety and operational issues. Based on the conceptual plot plans, the wet cooling technologies would be located approximately 1,300–1,700 feet from the nearest boundary of the 500 kV switchyard. The predominant wind direction for the site is from the NW. This wind direction would not result in tower discharge being blown directly on the switchyard. However, for approximately 14 percent of the year, the wind direction is from the W/WNW and would be likely to result in drift droplets being blown toward the switchyard. This does not necessarily mean that all of the drift would deposit on the switchyard area; the actual volume of solids deposition on the switchyard area (in acres per month) can be quantified by using the Electric Power Research Institute's Seasonal/Annual Cooling Tower Impact model or a similar program. To mitigate some of the negative effects that drift deposition could have on the switchyard, it may be desirable to adjust maintenance frequencies when the wind directs the drift droplets toward the switchyard. For example, insulators could be washed more frequently to avoid significant solids deposition.

4.3.4.2 Control System Design

The philosophy used to develop the control systems approach is similar for each wet technology variant. Control systems and equipment were estimated in accordance with the equipment shown on P&I schematics, the mechanical equipment lists, and the equipment described in the mechanical section of this report. The cooling tower control systems and equipment were estimated based on preliminary information received from cooling tower suppliers. Information from the water treatment suppliers was used to estimate the cost for the controls and instrumentation associated with adding the desalination plant, and a P&I schematic and preliminary information from the recycled water treatment equipment supplier were used to estimate the cost for the controls and instrumentation associated with adding the recycled water clarifier facility.

As with the dry technologies, a DCS would be provided to control and monitor equipment. DCS I/O cabinets would be located at the intake area (for new desalination seawater supply pump control/monitoring), in the electrical building near the new CW pumps (each unit), at each cooling tower, in the desalination plant/recycle water treatment electrical building/room, and in the existing main control room (to house network switches to tie in new controllers to the existing network). It is assumed that an OWS HMI would be provided at each cooling tower building and that two OWSs (per unit) would be added to the main control room to control and monitor the new equipment added by each option. The desalination equipment vendor would provide programmable logic controller (PLC) control and HMI with the equipment for desalination control. The recycled water treatment equipment vendor would provide PLC control and HMI with the equipment for reclaimed water treatment. The DCS would be data-linked via Ethernet to PLCs for the desalination equipment and reclaimed water equipment to allow supervisory control and monitoring from the main control room via the DCS. It is assumed that there is enough space in the existing plant areas (intake area electrical building, control room) to accommodate these new DCS I/O cabinet(s) and HMIs.

The DCS would have redundant processors and communications networks. Separate and independent DCS networks would be provided for each of the two units. Hardware for the DCS would include functionally and geographically distributed I/O cabinets, I/O modules (analog and digital), OWSs, and the connective computer hardware modules. One EWS and the software needed to develop control logic and graphic displays would be provided for each unit. The EWS would have the capability to upload and download configuration information and logic display changes into the OWSs and processors. The DCS would annunciate, indicate, time stamp, and track the status of critical parameters. Alarm history would be available on the alarm summary display screen. A color laser printer would be provided to print DCS graphic displays, logic configurations, log reports, and alarm summaries.

As part of these modifications, controls associated with the plant's existing CW pumps would be decommissioned and removed. New CW pumps and valves would be installed at a new pumphouse to circulate the cooling water from the condenser outlet to the new cooling towers. Some of the existing traveling screens at the intake would remain in operation to be used for the new desalination plant seawater supply pumps. The costs associated with removing the unused screens' instrumentation and controls and control panels has been included in the estimate. Local instrumentation and control panels for existing CW pumps would be decommissioned and removed. The estimate includes the demolition costs for these panels and instrumentation. The estimate also includes necessary revisions to plant drawings and documents (such as logic diagrams, instrument installation details, instrument list, and instrument data sheets).

Custom-built DCS graphics would show overview and group or detailed information to assist the operator in any type of control action required. Other DCS features are:

- Annunciation would be predominantly in the main DCS. Major alarms and protections would be time tagged.
- Positive indications would be provided for plant status (e.g., run/stop, open/close), and these indications would be fed back to the DCS and indicated using an appropriate graphic display.
- Plant personnel would be able to modify and tune control loops, create or change displays, and make database changes without training in high-level programming languages.

The DCS network would have a redundant Ethernet data highway and Ethernet links to the MV switchgear multifunction relays and to the existing plant computer system. Redundant DCS Ethernet switches and cabling would be provided for the connection between the DCS local/remote I/O cabinets and the DCS HMIs to permit data transfer. All DCS printers and HMIs, including the historian, would be interconnected via Ethernet. All DCS communication cabling between plant buildings would be fiber optic. All DCS communication cabling within the same room would be Category V/VI copper.

The DCS would control each new MV switchgear main, tie, and load center feeder breaker. The status of each MV bus would be monitored from the DCS via data link to MV meters/relays.

4.3.4.3 Civil Design

The philosophy used to develop the civil design approach is similar for each wet technology variant, with the primary difference occurring at the cooling towers.

The designs for the CW main piping and pumps are virtually identical to those described for the variant dry technologies in Section 4.3.1. The major differences are the inclusion of cooling tower blowdown piping and valve, the makeup water supply systems, the storage pond, and the cooling tower foundations.

The makeup water system would only be required for the wet cooling tower variants, and it would consist of the following structures and components:

a. A desalination plant to provide treated makeup water to the CWS through the cooling tower basin. Based on cooling tower supplier data, preliminary engineering has been performed to provide foundation and excavation quantities.

b. A reclaimed water treatment plant with a 90-minute contact basin to treat grey water from offsite for use as makeup to the cooling towers. Based on water treatment vendor preliminary design data, preliminary engineering has been performed to provide foundation and excavation quantities.

c. A 5,000,000-gallon-capacity storage pond to store treated water for the units. The proposed storage pond would have an HDPE liner with a layer of protective sand over it. The water would be discharged to the cooling tower basins by gravity (no need for pumps). A concrete discharge structure with screens and a discharge outfall would be provided for the gravity-fed water supply to the cooling towers.

d. Two offsite reclaimed water sources, each requiring a pumphouse, an electrical building, and buried cement-lined ductile iron pipes routed to the onsite pumphouse grey water storage tank. Preliminary engineering has been performed to provide structural and excavation quantities for these facilities.

4.3.5 Wet Natural Draft Cooling

4.3.5.1 Mechanical Design

P&I Schematic 25762-110-M6K-WL-00003 represents the piping arrangement for the CWS for the wet natural draft cooling arrangement. Two concrete hyperbolic natural draft towers approximately 590 feet in diameter by 590 feet high would be required to support each unit, resulting in a total of four towers. The towers would provide a design cold water temperature of 80.6°F. Refer to General Arrangement Drawings 25762-110-P1K-WL-00030 and -00031 for tower locations, pump locations, and pipe routings.

Two new shell-and-tube service water heat exchangers and one new condensate cooler per unit, all with increased surface areas, would be provided. Each would provide a hot-side cold water temperature of 95°F at the original design duty.

Four new volute-style CW pumps would be provided per unit, each capable of a design circulating water flow of 218,250 gpm. Three vertical turbine saltwater supply pumps would be provided, each capable of a design flow rate of 36,800 gpm.

Equipment List 25762-110-M0X-YA-00003 provides additional details about the new mechanical equipment that would be furnished, and Valve List 25762-110-M6X-YA-00003 lists the new major valves that would be furnished.

4.3.5.2 Control System Design

The control system design approach for the wet natural draft cooling technology is discussed in Section 4.3.2. The quantity of equipment required is adjusted to support the control needs of the given technology.

4.3.5.3 Civil Design

The method used to develop quantities for the various variant technologies is discussed in Section 4.3.2. The quantities differ for each technology based on the size and spacing of the towers and the amount of support equipment required. The spacing and equipment are shown on the general arrangement drawings referenced in each section. The tower foundations for the wet natural draft tower are based on preliminary supplier input. Four hyperbolic cooling towers (two per unit) are proposed. Foundations would include one concrete ring foundation to support the tower shell, a concrete slab on grade for a water basin, and an outfall concrete structure for the makeup water. For the cooling tower and piping general arrangement, refer to Drawing 25762-110- P1K-WL-00040.

4.3.5.4 Electrical Design

The electrical load for this option is estimated to be approximately 64 MVA per unit. In each unit, two new three-winding, 70 MVA transformers would feed the auxiliary loads (cooling tower fans, CW pumps, and desalination loads). The existing DCPP 500 kV switchyard would be expanded by two additional bays (breaker-and-a-half scheme) to provide the four circuits for the transformers (refer to Single-Line Drawing 25762-110-E1K-0000-00003). The four CW pumps would be fed from each of the secondary windings. The new electrical distribution voltage levels would be 12 kV (in line with the existing MV level at DCPP) for the large CW motors (11.5 kV), and desalination and water reclaim systems, 480 V for the cooling tower fans and other cooling tower/CW pumphouse auxiliary equipment, and 120 V ac for smaller loads. There would be dedicated 125 V dc batteries (along with an associated battery charger) for critical UPS loads and control power for distribution equipment. The batteries would be sized for a 2-hour duration, and the charger would be sized to recharge them in 8 hours.

New loads located in the existing plant intake area (e.g., the desalination seawater supply pumps, two per unit) would be fed from the existing power distribution system. The existing power distribution system would have adequate spare capacity because the existing feed to the CW pumps (two at 13,000 hp per unit) would be decommissioned.

Based on the auxiliary system single-line design for the wet natural draft cooling system, the quantity and sizes of electrical equipment were estimated and used to develop the building sizes. Based on the number and size of conductors from the single-line drawing, the raceway system was designed and the quantities were estimated (trays/conduits within building, interconnecting duct banks). Supplier vendor drawings showing the layout of the wet natural cooling tower were used as appropriate for physical design quantity estimates. Eight electrical buildings would be provided: one for the main switchgear, one at each of the four towers, one at each of the two CW pumphouses, and one at the desalination plant. Refer to Raceway Layout Drawing 25762-110-ERK-WL-00040.

The desalination and water reclaim vendors have provided estimates for the electrical equipment required for power distribution for their supplied equipment. The desalination vendor provided a typical single-line diagram showing the electrical equipment configuration. The desalination/reclaim area electrical building size, tray quantity, and duct bank quantity were estimated from the desalination vendor typical single-line diagram, mechanical equipment lists, and vendor-supplied conceptual plant general arrangement drawings.

Quantity estimates were determined for the following items: tray, duct bank conduit, grounding, lighting, MV cable, nonsegregated phase bus duct, communication equipment, aboveground conduit length per circuit, and average circuit length.

Figures 4.3-13 through 4.3-15 depict the layouts of the electrical buildings for the wet natural draft cooling option.

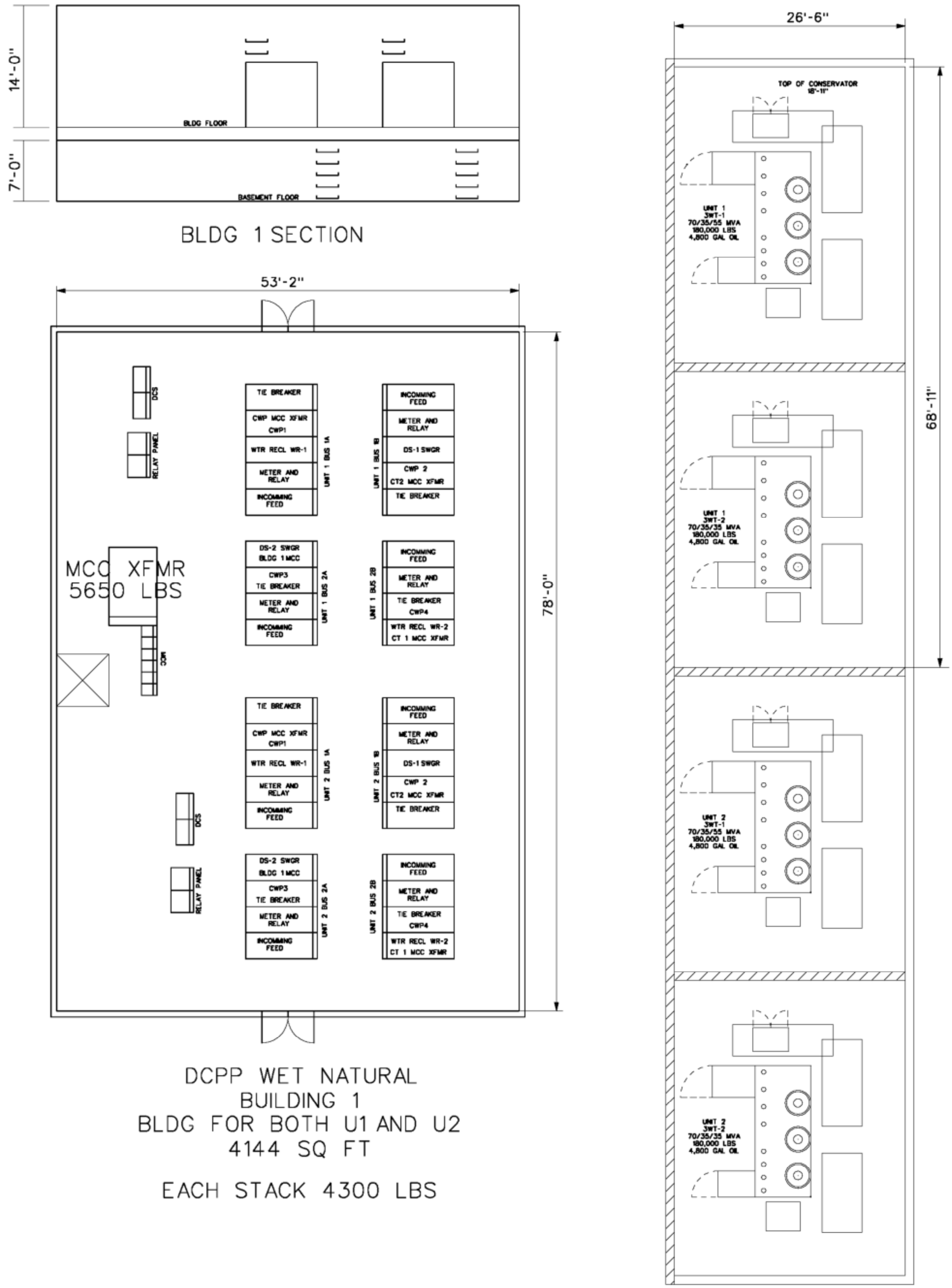

Figure 4.3-13. Wet Natural Draft Cooling—Main Switchgear Electrical Building

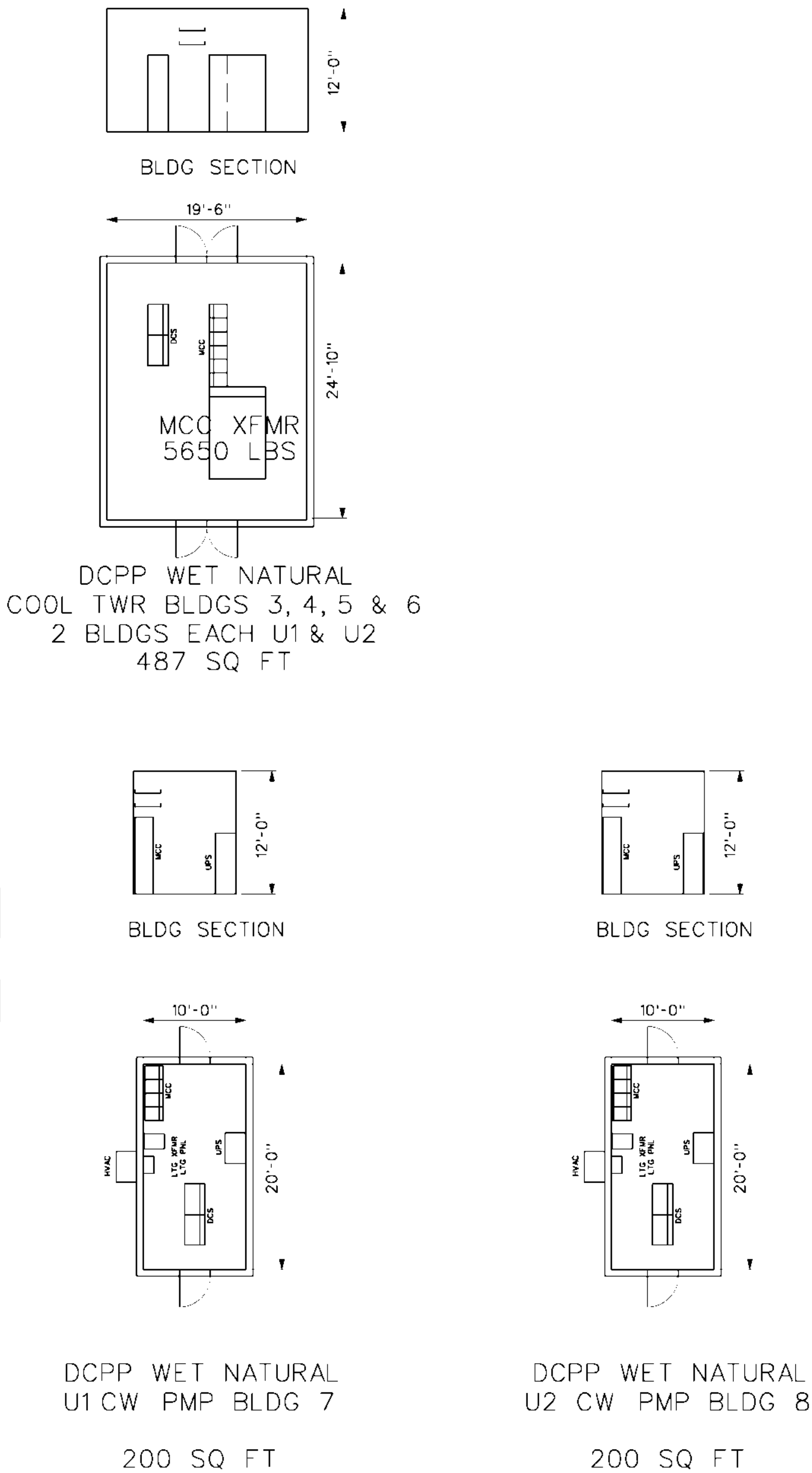

Figure 4.3-14. Wet Natural Draft Cooling—Cooling Tower and Pumphouse Electrical Buildings

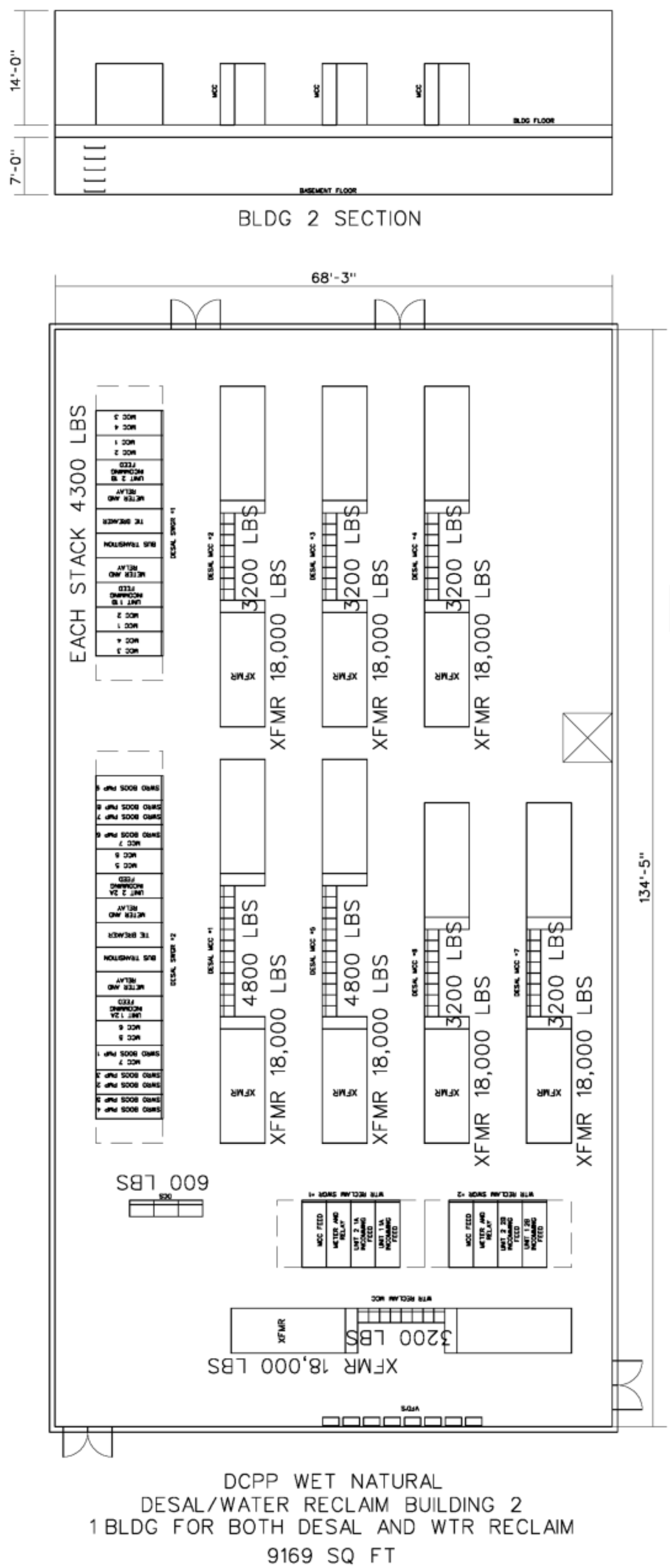

Figure 4.3-15. Wet Natural Draft Cooling—Desalination/Water Reclaim Electrical Building

4.3.6 Wet Mechanical (Forced) Draft Cooling

P&I Schematic 25762-110-M6K-WL-00004 represents the CWS piping arrangement for the wet natural draft cooling arrangement. One circular concrete mechanical (forced) draft cooling tower 542 feet in diameter by 180 feet high would be required for each unit, for a total of two towers. Each tower would have 40 fans, each driven by a 300 hp motor, to provide the required air flow through the tower (refer to General Arrangement Drawing 25762-110-P1K-WL-00050). The towers would be capable of maintaining a design cold CW temperature of 80.6°F. Refer to General Arrangement Drawings 25762-110-P1K-WL-00013, -00030, and -00031 for tower locations, pump locations, and pipe routings.

Two new shell-and-tube service water heat exchangers and one new condensate cooler per unit, all with increased surface areas, would be provided. Each would provide a hot-side cold water temperature of 95°F at the original design duty.

Four new volute-style CW pumps would be provided per unit, each capable of a design CW flow of 218,250 gpm. Three vertical turbine saltwater supply pumps would be provided, each capable of a design flow rate of 36,800 gpm.

Equipment List 25762-110-M0X-YA-00004 provides additional details about the new mechanical equipment that would be furnished, and Valve List 25762-110-M6X-YA-00004 lists the new major valves that would be furnished.

4.3.6.1 Control System Design

The control system design approach for the wet mechanical (forced) draft cooling technology is discussed Section 4.3.2. The quantity of equipment required is adjusted to support the control needs of the given technology.

4.3.6.2 Civil Design

The method used to develop quantities for the variant technologies is discussed in Section 4.3.2. The quantities differ for each variant based on the size and spacing of the towers and the amount of support equipment required. The spacing and equipment are shown on the general arrangement drawings referenced in each section. The tower foundations for the wet mechanical (forced) draft tower are based on preliminary supplier input. Two concrete, circular cooling towers (one per unit) are proposed. Per the preliminary foundation design, there would be one concrete ring foundation to support the tower shell, a concrete slab on grade for a water basin, and an outfall concrete structure for the makeup water. For the cooling towers and piping general arrangement, refer to Drawing 25762-110- P1K-WL-00050.

4.3.6.3 Electrical Design

The electrical load for this option is estimated to be approximately 74 MVA per unit. In each unit, two new three-winding, 80 MVA transformers would feed the auxiliary loads (cooling tower fans, CW pumps and desalination loads). The existing DCPP 500 kV switchyard would be expanded by two additional bays (breaker-and-a-half scheme) to provide the four circuits for the transformers. Refer to Single-Line Drawing 25762-110-E1K-0000-00004.

The four CW pumps would be fed from each of the secondary windings. The new electrical distribution voltage levels would be 12 kV (in line with the existing MV level at DCPP) for the large CW motors (11.5 kV) and the desalination and water reclaim systems, 480 V for the cooling tower fans and other cooling tower/CW pumphouse auxiliary equipment, and 120 V ac for smaller loads. There would be dedicated 125 V dc batteries (along with an associated battery charger) for critical UPS loads and control power for distribution equipment. The batteries would be sized for a 2-hour duration, and the charger would be sized to recharge them in 8 hours.

New loads located in the existing plant intake area (e.g., the desalination seawater supply pumps, two per unit) would be fed from the existing power distribution system. The existing power distribution system would have adequate spare capacity because the existing feed to the CW pumps (two at 13,000 hp per unit) would be decommissioned

Based on the auxiliary system single-line design for the wet mechanical (forced) draft cooling system, the number and size of electrical equipment were estimated and used to develop building sizes. Based on the number and size of conductors from the single-line drawing, the raceway system was designed and the quantities were estimated (trays/conduits within building, interconnecting duct banks). Supplier vendor drawings showing the layout of the wet mechanical cooling tower were used as appropriate for physical design quantity estimates. Seven electrical buildings would be provided: one for the main switchgear, one at each of the two towers, one at each of the two CW pumphouses, and one at the desalination plant. Refer to raceway layout drawing 25762-110-ERK-WL-00050.

The desalination and water reclaim vendors have provided estimates for the electrical equipment required for power distribution for their supplied equipment. The desalination vendor provided a typical single-line diagram showing the electrical equipment configuration. The desalination/reclaim area electrical building size, tray quantity, and duct bank quantity were estimated from the desalination vendor typical single-line diagram, mechanical equipment lists, and vendor-supplied conceptual plant general arrangement drawings.

Quantity estimates were determined for the following items: tray, duct bank conduit, grounding, lighting, MV cable, nonsegregated phase bus duct, communication equipment, aboveground conduit length per circuit, and average circuit length.

Figures 4.3-16 through 4.3-18 depict the layouts of the electrical buildings for the wet mechanical (forced) draft cooling option.

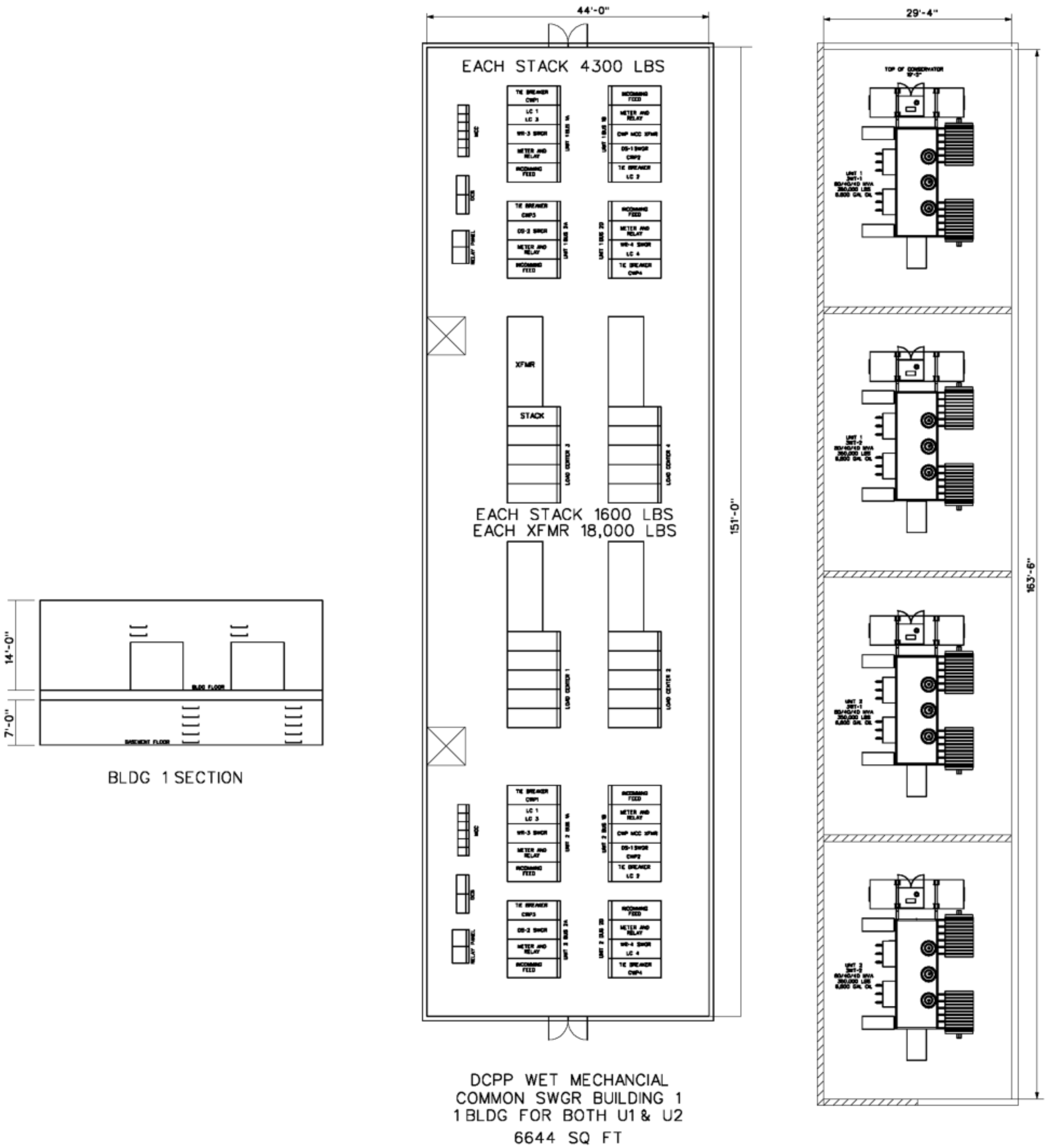

Figure 4.3-16. Wet Mechanical (Forced) Draft Cooling—Main Switchgear Electrical Building

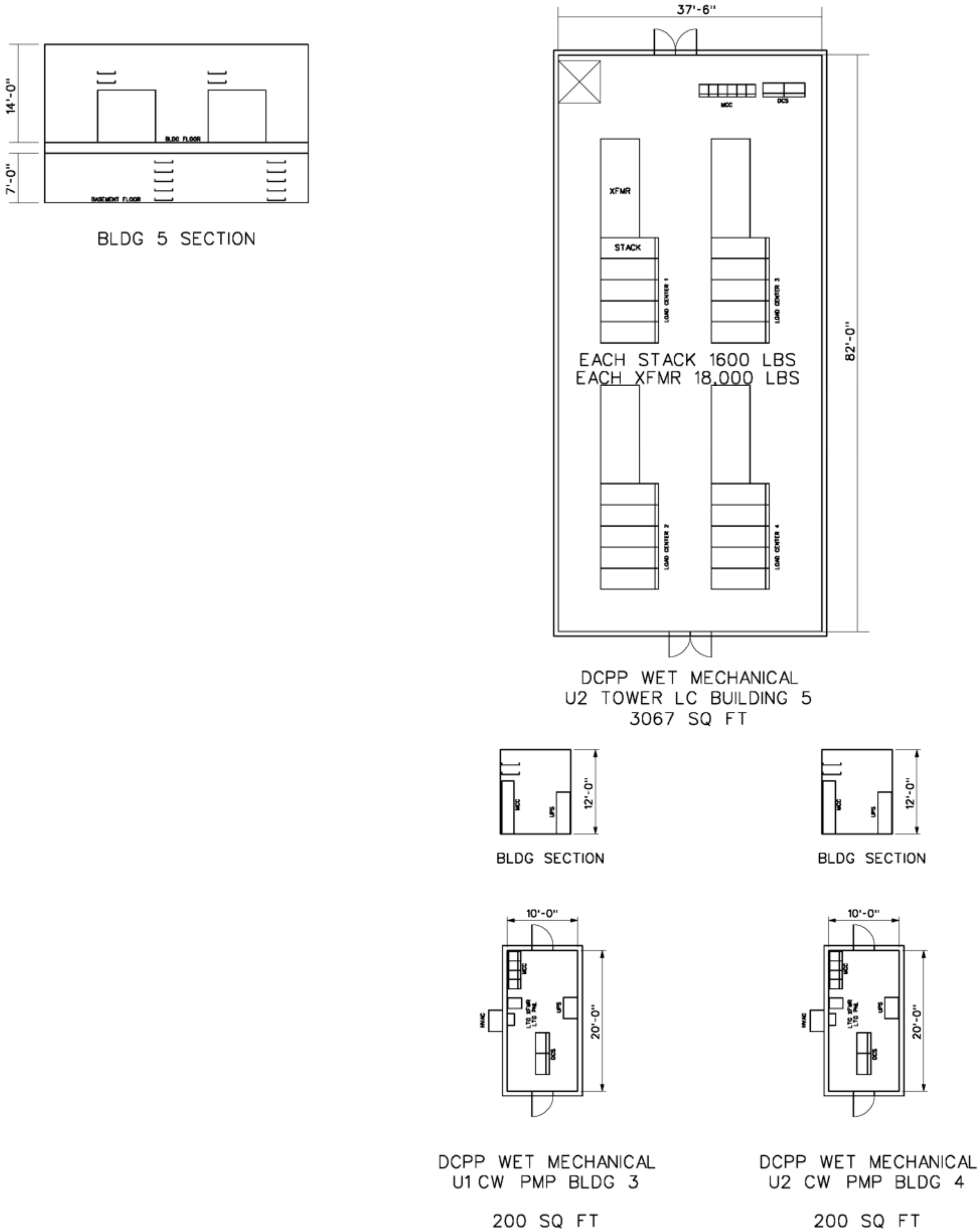

Figure 4.3-17. Wet Mechanical (Forced) Draft Cooling—Cooling Tower and Pumphouse Electrical Buildings

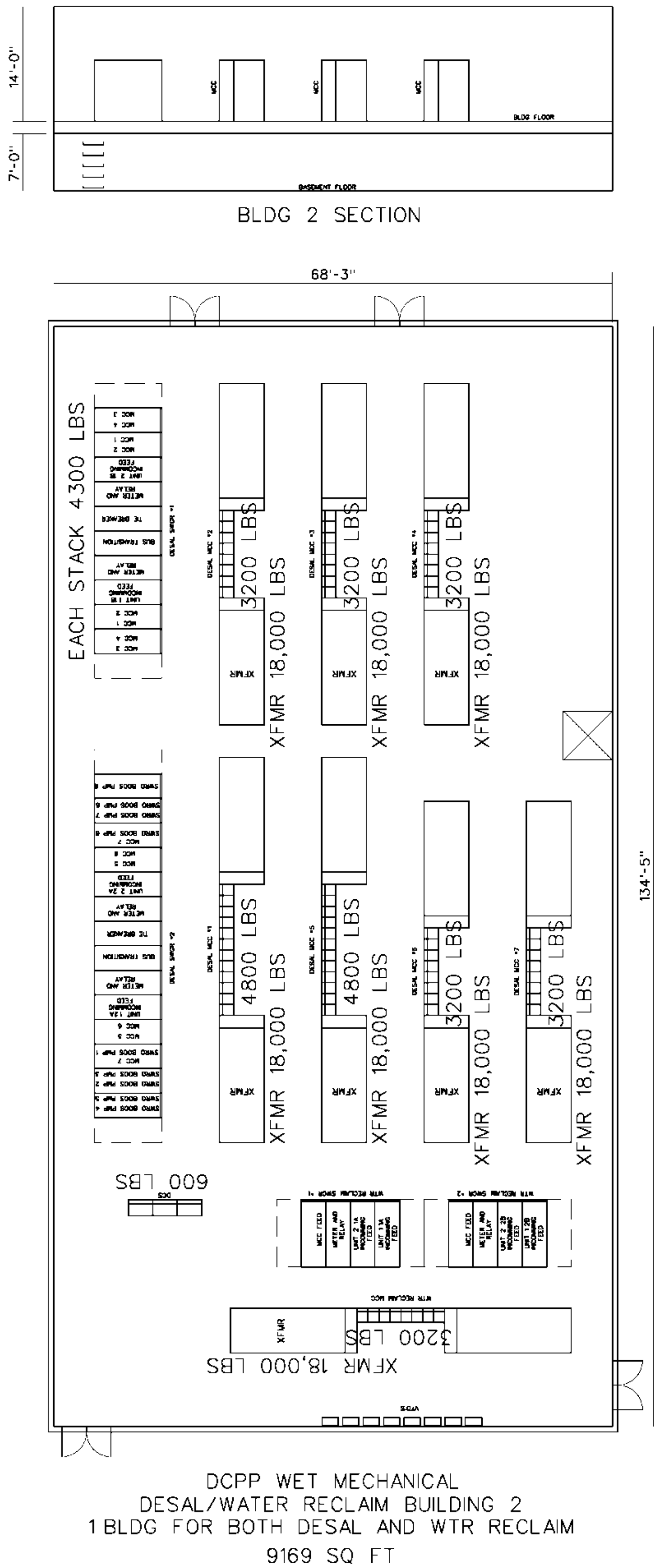

Figure 4.3-18. Wet Mechanical (Forced) Draft Cooling—Desalination/Water Reclaim Electrical Building

4.3.7 Hybrid Wet/Dry Cooling

P&I Schematic 25762-110-M6K-WL-00005 represents the CW piping arrangement for the hybrid wet/dry cooling arrangement. The hybrid wet/dry cooling variant is identical to the wet mechanical (forced) draft variant except for the tower design. The tower would be fitted with an additional set of fans that would draw ambient air through fin-tube heat exchangers located above the cooling tower fill section to change the state of the air exiting the tower to minimize/eliminate the tower plume. One circular concrete hybrid wet/dry cooling tower 576 feet in diameter by 180 feet high would be required for each unit, resulting in a total of two towers. To provide the required air flow through the tower, each would have 40 fans associated with the wet section, each driven by a 300 hp motor, and 40 fans associated with the dry section, each driven by a 200 hp motor. The towers would be capable of maintaining a design cold CW temperature of 80.3°F. Refer to General Arrangement Drawings 25762-110-P1K-WL-00013, -00030, and -00031 for tower locations, pump locations, and pipe routings.

Two new shell-and-tube service water heat exchangers and one new condensate cooler per unit, all with increased surface area, would be provided. Each would provide a hot-side cold water temperature of 95°F at the original design duty.

Four new volute-style CW pumps would be provided per unit, each capable of a design CW flow of 218,250 gpm. Three vertical turbine saltwater supply pumps would be provided, each capable of a design flow rate of 36,800 gpm.

Equipment List 25762-110-M0X-YA-00005 provides additional details on the new mechanical equipment that would be furnished, and Valve List 25762-110-M6X-YA-00005 lists the new major valves that would be furnished.

4.3.7.1 Control System Design

The control system design approach for the hybrid wet/dry cooling technology is discussed in Section 4.3.2. The quantity of equipment required is adjusted to support the control needs of the given technology.

4.3.7.2 Civil Design

The method used to develop quantities for the variant technologies is discussed in Section 4.3.2. The quantities differ for each variant based on the size and spacing of the towers and the amount of support equipment required. The spacing and the equipment are shown on the general arrangement drawings referenced in each section. The tower foundations for the hybrid wet/dry tower are based on preliminary supplier input. Two circular concrete cooling towers are proposed. The foundation design would consist of one concrete ring foundation to support the tower shell, a concrete slab on grade for a water basin, and an outfall concrete structure for the makeup water. For the cooling tower and piping general arrangement, refer to Drawing 25762-110-P1K-WL-00030.

4.3.7.3 Electrical Design

The electrical load for this option is estimated to be approximately 86 MVA per unit. In each unit, two new three-winding, 90 MVA transformers would feed the auxiliary loads (cooling tower fans, CW pumps, and desalination loads). The existing DCPP 500 kV switchyard would be expanded by two additional bays (breaker-and-a-half scheme) to provide the four circuits for the transformers. Refer to Single-Line Drawing 25762-110-E1K-0000-00005.

The four CW pumps would be fed from each of the secondary windings. The new electrical distribution voltage levels would be 12 kV (in line with the existing MV level at DCPP) for the large CW motors (11.5 kV) and the desalination and water reclaim systems, 480 V for the cooling tower fans and other cooling tower/CW pumphouse auxiliary equipment, and 120 V ac for smaller loads. There would be dedicated 125 V dc batteries (along with an associated battery charger) for critical UPS loads and control power for distribution equipment. The batteries would be sized for a 2-hour duration, and the charger would be sized to recharge them in 8 hours.

Mechanical equipment lists depicting the pumphouse power requirements, P&I schematics depicting the system components for the various options, general arrangement drawings depicting the plant design, and instrumentation list and quantities (by control system) were primarily the inputs for electrical design.

New loads located in the existing plant intake area (e.g., the desalination seawater supply pumps, two per unit) would be fed from the existing power distribution system. The existing power distribution system would have adequate spare capacity because the existing feed to the CW pumps (two at 13,000 hp per unit) would be decommissioned.

Based on the auxiliary system single-line design for hybrid wet/dry cooling, the number and size of electrical equipment were estimated and used to develop building sizes. Based on the number and size of conductors from the single-line drawing, the raceway system was designed and the quantities were estimated (trays/conduits within building, interconnecting duct banks). Supplier vendor drawings showing the layout of the hybrid cooling tower were used as appropriate for physical design quantity estimates. Seven electrical buildings would be provided: one for the main switchgear, one at each of the two towers, one at each of the two CW pumphouses, and one at the desalination plant. Refer to raceway layout drawing 25762-110-ERK-WL-00030.

The desalination and water reclaim vendors have provided estimates for the electrical equipment required for power distribution for their equipment. The desalination vendor provided a typical single-line diagram showing its electrical equipment configuration. The desalination/reclaim area electrical building size, tray quantity, and duct bank quantity were estimated from the desalination vendor typical single-line diagram, mechanical equipment lists, and vendor-supplied conceptual plant general arrangement drawings.

Quantity estimates were determined for the following items: tray, duct bank conduit, grounding, lighting, MV cable, nonsegregated phase bus duct, communication equipment, aboveground conduit length per circuit, and average circuit length.

Figures 4.3-19 through 4.3-21 depict the layouts of the electrical buildings for the wet natural draft cooling option.

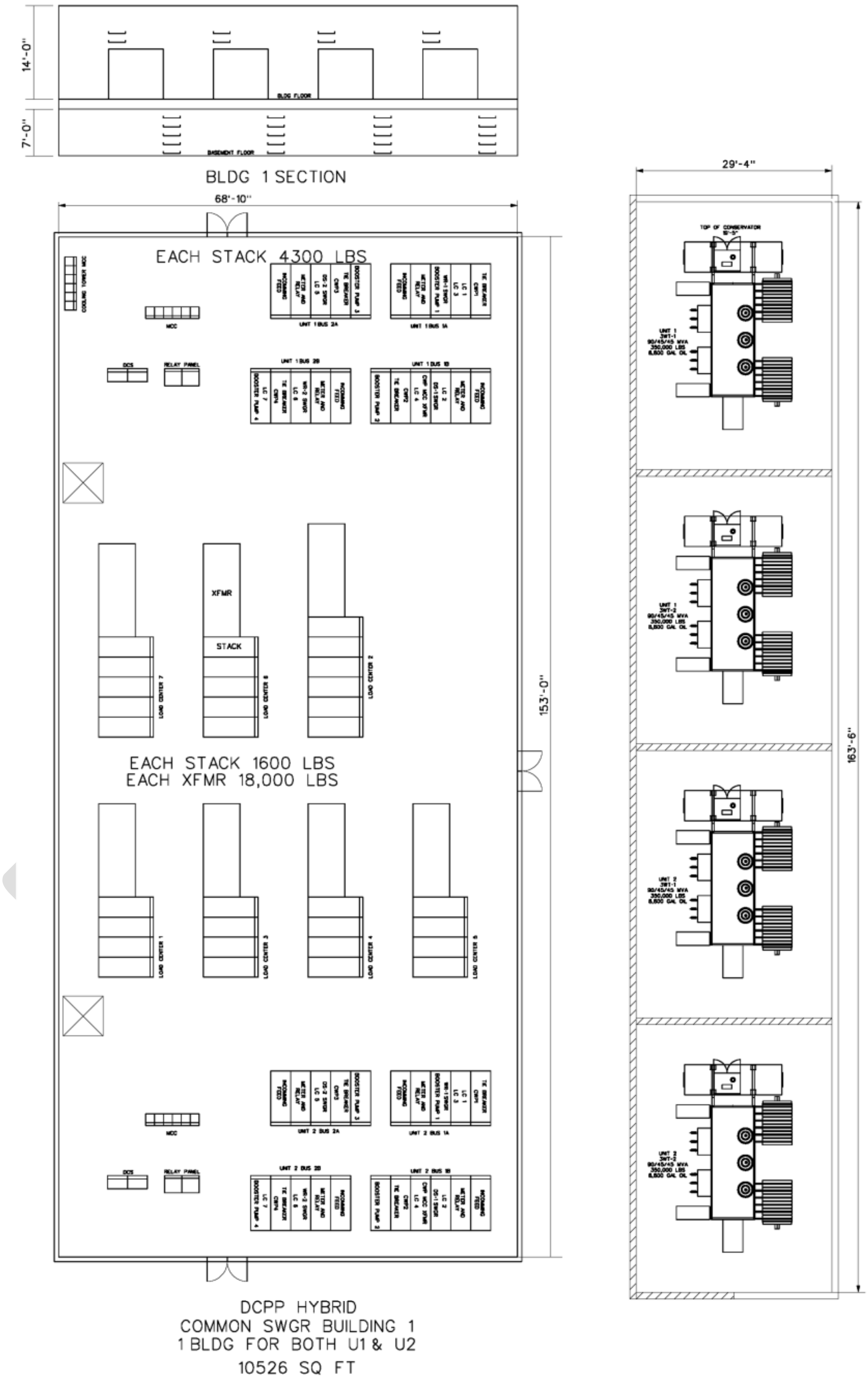

Figure 4.3-19. Hybrid Wet/Dry Cooling—Main Switchgear Electrical Building

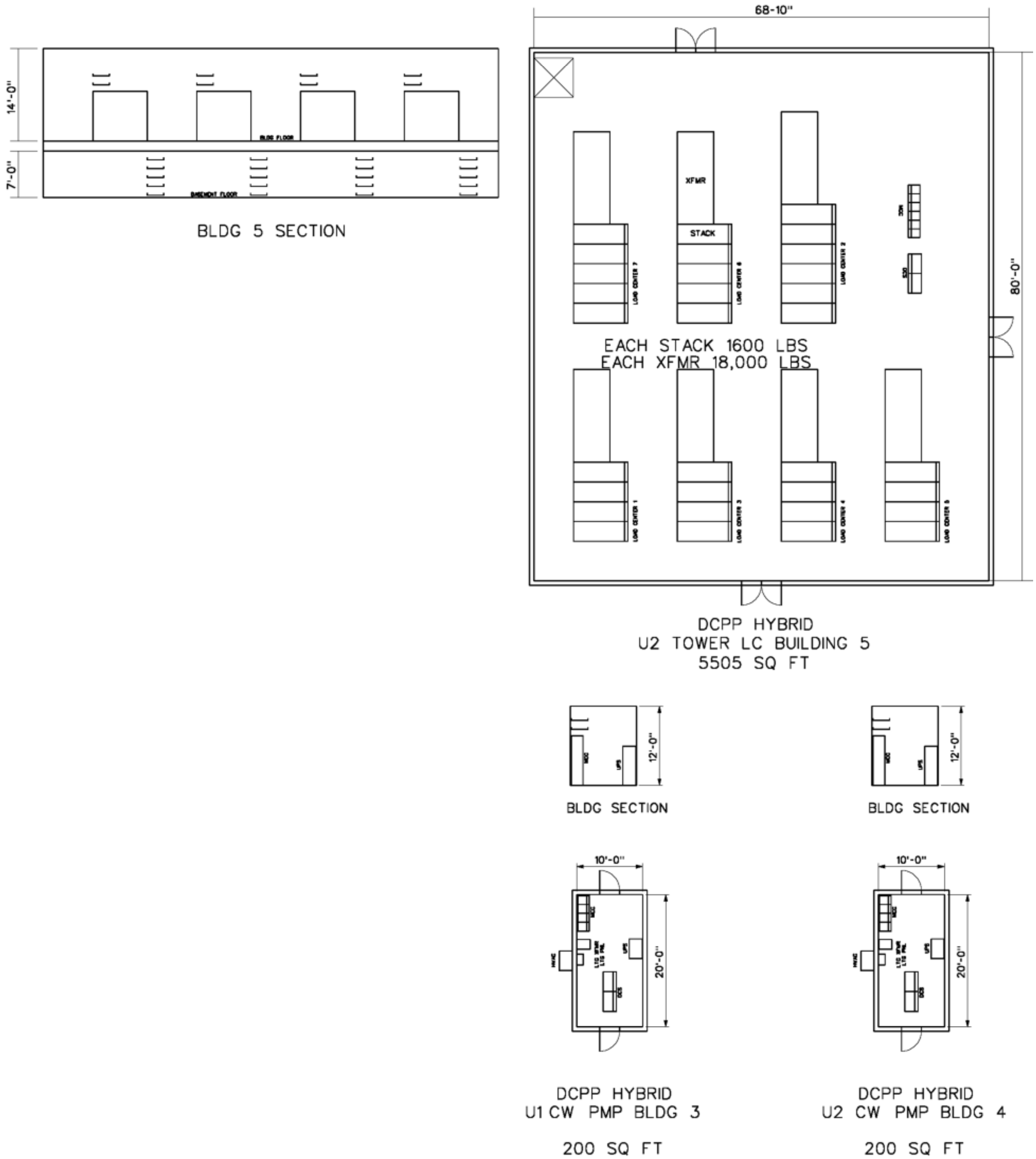

Figure 4.3-20. Hybrid Wet/Dry Cooling—Cooling Tower and Pumphouse Electrical Buildings

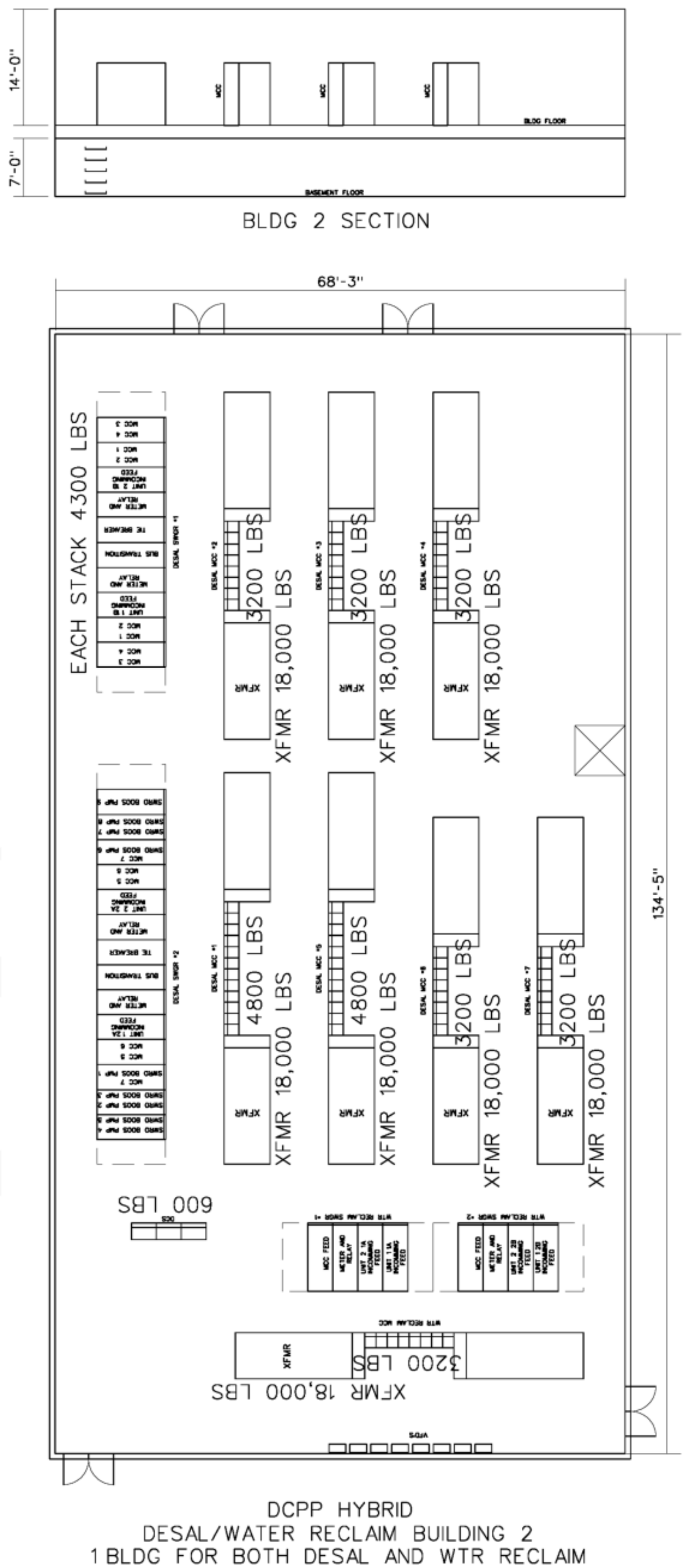

Figure 4.3-21. Hybrid Wet/Dry Cooling—Desalination/Water Reclaim Electrical Building

4.3.8 Permitting

The initial Phase 1 permitting assessment focused on identifying the applicable (required) permits and approvals for constructing and operating the various closed-cycle cooling technology options (passive draft dry/air, mechanical (forced) draft dry/air, wet natural draft, wet mechanical (forced) draft, and hybrid wet /dry). A comprehensive list of potentially applicable permits and approvals at the federal, California, county, and municipal levels (as applicable) was developed for each technology. The applicability of each permit/approval to the various options was evaluated. Those permits and approvals deemed applicable were subsequently scrutinized to characterize the expected duration and complexity of the regulatory review process. Ultimately, most of the closed-cycle cooling system options (except the saltwater-based systems) were selected for the Phase 2 assessment.

The subsequent permitting assessment focused on identifying the critical path (longest duration) initial preconstruction permitting processes and the associated project costs. The preconstruction permits are those approvals that directly support site mobilization, physical site access, and initial earthwork/foundations for the subject cooling system technology. The costs include direct permit filing, impact mitigation, and permitting application development (services).

4.3.8.1 Cost and Schedule Evaluation

The cost and schedule to secure the following major applicable permits were developed based on discussions with key relevant regulatory authorities and from associated website resources:

- California Environmental Quality Act (CEQA) – Final Notice of Determination
- Nationwide or Section 404/10 Permit, U.S. Army Corps of Engineers (USACE)
- Determination of No Hazard to Air Navigation – Federal Aviation Administration
- California Public Utilities Commission
- Coastal Development Permit, California Coastal Commission (CCC)
- Coastal Development Lease, California State Lands Commission (CSLC)
- Notice of Intent, General Permit for Stormwater Discharges Associated with Construction Activity, Central Coast Regional Water Quality Control Board (CCRWQCB)
- National Pollutant Discharge Elimination System (NPDES) Industrial Discharge Permit, CCRWQCB and State Water Resources Control Board
- 2081 Permit for California Endangered Species Act of 1984, California Department of Fish and Wildlife (CDFW)
- Lake and Streambed Alteration Agreement, CDFW
- Waste Discharge Requirements – Central Coast Regional Water Quality Control Board (CCRWQCB)
- Dust Control Plan, San Luis Obispo Air Pollution Control District (SLO-APCD)
- Road Crossing or Encroachment Permit, Caltrans
- Local Approvals, San Luis Obispo County

Tables CC-1 and CC-2 summarize the key cost and schedule details and assumptions for the selected closed-cycle cooling system options. Legal costs associated with managing appeal processes and related litigation have not been included. The bulk of the potential mitigation costs would be developed through negotiation and are consequently not included in the cost estimate.

Table CC-1. DCPP Environmental Permit/Approval Cost Assessment:
Dry/Air Cooling Technologies—Passive Draft and Mechanical (Forced) Draft

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Nationwide Permit – U.S. Army Corps of Engineers (USACE)	If required, there are no filing fees for the USACE permits and no Environmental Assessment document fees for nationwide form of the permit, which generally is not associated with a formal EA. Labor costs for preparing/submitting related forms = 20 hours @ $150/hr.	Owner	1–3 months if required	$0	$0	$3,000
Section 7 Consultation with U.S. Fish and Wildlife Service (USFWS), Endangered Species Act of 1973	It is unlikely the project would have sufficient “federal nexus” (federal funding, federal lands) to trigger USFWS consultation. However, California Department of Fish and Wildlife (CDFW) would likely provide the consultation.	Owner	May be part of CEQA review	$0	$0	$0
For Passive Draft Dry/Air Cooling only: Notice of Determination of No Hazard to Air Navigation – Federal Aviation Administration (FAA)	There are no formal filing fees associated with this Notice. Labor costs for preparing/submitting related forms = 4 hours @ $150/hr.	Owner	1–2 months	$0	$0	$600
For Passive Draft Dry/Air Cooling only: Notice of Determination of No Hazard to Air Navigation – FAA, Temporary Construction Facilities	There are no formal filing fees associated with this Notice. Labor costs for preparing/submitting related forms = 4 hours @ $150/hr.	Contractor	1–2 months	$0	$0	$600
California Public Utilities Commission (CPUC) Approval	While formal CPUC review and approval may prove necessary, the primary costs of this process are associated with the CEQA review process. The CPUC could be the lead CEQA agency or share this role with another regulatory organization (e.g., San Luis Obispo County). These CEQA costs are addressed in the County Conditional Use Plan Approval Process.	Owner	About 12 months if required	$0	$0	$0

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Coastal Development Permit – California Coastal Commission (CCC)/Local Coastal Programs	The CCC indicates that the filing fee for non-residential development is $265,000 (CCC, 2008). There may be additional fees for reimbursement of reasonable expenses, including public notice costs. CEQA costs are covered in the County Condition Use Plan Approval Process. Labor costs for preparing/submitting related forms and documentation = 2,000 hours @ $150/hr.	Owner	A 3–9 month process is advertised but would be aligned with the CEQA review process	$265,000	$0	$300,000
Coastal Development Lease – California State Lands Commission and potential CEQA Lead Agency	The Commission lease-related fees include (CSLC, 2011): Industrial Lease: $25,000 Dredge Lease Fee: $1,500 Filing Fee: $25 Labor costs for preparing/submitting related forms and documentation = 2,000 hours @ $150/hr.	Owner	Depends on duration of CEQA/EIR process; about 2 years	$26,525	$0	$300,000
Dust Control Plan or Construction Activity Management Plan (CAMP) – San Luis Obispo Air Pollution Control District (SLO-APCD)	While SLO-APCD does not list any specific fee for the Dust Control Plan, other CARB entities are known to charge $300 to reimburse review costs. If the construction ozone precursor emissions (ROG + NOx) exceed the SLO-APCD quarterly significance threshold of 6.3 tons, the SLO County CEQA Handbook (SLO-APCD, 2012) defined mitigation rate is $16,000 per ton of ozone precursor plus 15% administrative fee. The current assumption is that precursor emissions are below this threshold. Labor costs for preparing/submitting the plan = 80 hours @ $150/hr.	Contractor	1-month plan development process	$0	$0	$12,000

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
National Pollutant Discharge Elimination System (NPDES) Industrial Discharge Permit – Central Coast Regional Water Quality Control Board (CCRWQCB) and State Water Resources Control Board (SWRCB)	The operating project is incurring annual fees based on its current discharge process. Fee structure: $1,606 + $2,840 x flow (mgd) Maximum fee: $410,568 + surcharges ($5,000 to $15,000) (SWRCB, 2012) The fee would drop dramatically with the removal of the current substantial once–through discharge rate (about $400,000 savings). Labor costs for preparing/submitting related permit forms = 1,000 hours @ $150/hr.	Owner	About 6 months	–$400,000	$0	$150,000
Notice of Intent – NPDES General Permit for Storm Water Discharges Associated with Construction Activity – CCRWQCB	Construction stormwater fee for disturbed areas > 100 acres is $2,618 + 21% fee ($550). Labor costs for preparing/submitting related forms = 40 hours @ $150/hr.	Owner	1 week – electronic submittal	$3,192	$0	$6,000
Storm Water Pollution Prevention Plan – NPDES General Permit for Storm Water Discharges Associated with Construction Activity – CCRWQCB	There are no direct filing fees or regulatory charges associated with the SWPPP. Labor costs for preparing plan = 120 hours @ $150/hr.	Contractor	3 months for SWPPP development process	$0	$0	$18,000
2081 Permit for California Endangered Species Act of 1984 – California Department of Fish and Wildlife (CDFW)	While there does not appear to be a direct filing fee for this permit, there are related CEQA review services: Negative or Mitigated Negative: $2,156.25 Environmental Impact Review: $2,995.25 Certified Regulatory Program Fee: $1,018.50 County Clerk Processing Fee: $50 (CDFW–CEQA, 2013) Labor costs for preparing/submitting related forms, documentation, and field work = 500 hours @ $150/hr.	Owner	Potentially part of CEQA review	$3,049.50	$0	$75,000

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Lake and Streambed Alteration Agreement – CDFW	If project costs > $500,000, then fees are $4,482.75 + $2,689.50. If there is a separate Master Agreement, the supplemental fees could total $33,620 + $2,801.50 + $280.25. (CDFW-LSA, 2013) Labor costs for preparing/submitting related forms, documentation, and field work = 500 hours @ $150/hr.	Owner	1–2 months (if application complete) Could extend to 4–6 months	$44,000	$0	$75,000
Waste Discharge Requirements – CCRWQCB	Fill & Excavation Discharges: $944 + $4,059 x disturbed area (acres) Dredging Discharges: $944 + $0.15 x cy Channel and Shoreline Discharges: $944 + Discharge Length (ft) x $9.44 – not to exceed $59,000 + surcharges (CCR Title 23§2200) Assumed 100 acres of jurisdictional lands (state waters) are affected – triggers maximum fee (no extra surcharges). Labor costs for preparing/submitting related forms, documentation, and field work = 120 hours @ $150/hr.	Owner	4–6 months	$944	$59,000	$18,000
Office of Historic Preservation (OHP) Review	OHP review is part of the CEQA process and does not demand any additional fees or pose direct regulatory costs. Labor costs are captured in CEQA discussion.	Owner	Integral to CEQA review process	$0	$0	$0

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Notification of Waste Activity – Resource Conservation and Recovery Act (RCRA) Hazardous Waste Identification Number (Small Quantity Generator) – Construction Phase – Department of Toxic Substance Control, USEPA, San Luis Obispo County Environment Health Services – California Unified Program Agency	Securing the Construction Phase Hazardous Waste ID (if necessary) does not demand a filing fee. Labor costs for preparing/submitting related forms = 4 hours @ $150/hr.	Contractor	1–2 weeks if required	$0	$0	$600
Spill Prevention, Control, and Countermeasure (SPCC) Plan – 40 CFR 112 and Aboveground Petroleum Storage Act – San Luis Obispo Environmental Health Services – California Unified Program Agency and USEPA	SPCC modification process would not demand any additional filing fees. Aboveground storage tank annual renewal fee ($288/facility) should remain unchanged – no new fee. (SLO-EHS, 2013) Labor costs for preparing/submitting related plan = 120 hours @ $150/hr.	Owner	1–2 months for plan revision	$0	$0	$18,000
Underground Storage Tank (UST) Permit – San Luis Obispo County Environmental Health – California Unified Program Agency and State Water Resources Control Board (SWRCB)	The new cooling tower system could force the relocation of underground tanks, mandating new permits from the county and a revised inspection program. The associated fees may apply, primarily facility modification fee ($1,725/facility) and closure fee ($2,216/ facility) (SLO-EHS, 2013). The maintenance fee ($0.14/gallon of oil) should remain unchanged (CBOE, 2011). Labor costs for securing underground tank permits (modification/closure) = 40 hours @ $150/hr.	Owner	1–2 months	$3,941	$0	$6,000

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Conditional Use Plan Amendment – San Luis Obispo County Department of Planning and Building and Potential CEQA Lead Agency	As the CEQA lead agency or co-lead, the county would assess fees for development of the Initial Study, environmental coordination fees, and EIR processing fees (SLO-DPB, 2012). Initial Study Cost: $14,603 Other fees include: CalFire Review: $603 Health Department Review: $600 Geological Review: $2,671 (min) Resource Conservation District Review: $375 (min) Labor costs for EIR consultant + 50% premium = 4,000 hours @ 150/hr x 1.5.	Owner	Depends on duration of CEQA review process; about 2 years	$20,000	$0	$900,000
Erosion and Sediment Control Plan (Rain Event Action Plan) – San Luis Obispo County Department of Public Works	No filing fee for this plan. Development costs are included in the SWPPP section.	Contractor	Parallel to SWPPP development 3 months	$0	$0	$0
Building Permits – San Luis Obispo County Department of Planning and Building and Public Works: Grading Site Plan Reviews/Checks Mechanical, Plumbing, and Electrical Tanks Roads Septic Systems Fences Fire inspections	County of San Luis Obispo Department of Planning and Building has a complex fee schedule (SLO-DPB, 2012). Recent SLO County experience on a significant solar PV project indicates that overall building permit and inspection fees could total $750,000. Labor costs for preparing/submitting related engineering packages = 2,000 hours @ $150/hr.	Contractor	4–6 weeks for initial permits following completion of CEQA and conditional use permit	$750,000	$0	$300,000
Fire Safety Plan Approval, Certificate of Occupancy, Flammable Storage – San Luis Obispo County Fire Department	Revisions to the existing Fire Safety Plan are not expected to result in additional filing or direct regulatory fees. The initial filing fee of $408 would probably not apply. Labor costs for revising Fire Safety Plan = 20 hours @ $150/hr.	Contractor	1 month for plan approval	$0	$0	$3,000

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Road Crossing or Encroachment Permit – Caltrans, San Luis Obispo County	If needed. Caltrans fees vary by type of encroachment and are based on $82/hr review & approval fee. County encroachment permits are: Driveway review and encroachment: $607 General encroachment: $338 Utility non-franchise: $597 (Caltrans Encroachment, 2013) (Caltrans FAQ, 2013) Labor costs for preparing/submitting related engineering information and forms = 40 hours @ $150/hr.	Owner	1–3 months	$5,000	$0	$6,000
San Luis Obispo County Well Water Permit – San Luis Obispo County Environmental Health Services	If needed. New well installation: $433 Abandonment of existing wells: $121 (SLO-EHS, 2013) Well-related costs assumed to be $1,000. Labor costs for preparing/submitting well packages = 8 hours @ $150/hr.	Contractor	1–2 weeks if required	$1,000	$0	$1,200
Passive Draft Dry/Air TOTAL				**$722,651.50**	**$59,000.00**	**$2,193,000.00**
Mechanical (Forced) Draft Dry/Air TOTAL				**$722,651.50**	**$59,000.00**	**$2,191,800.00**

Table CC-2. DCPP Environmental Permit/Approval Cost Assessment:
Wet Cooling Technologies—Natural Draft, Mechanical (Forced) Draft, and Hybrid Wet/Dry (Fresh and Reclaimed Water)

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Nationwide Permit – U.S. Army Corps of Engineers (USACE)	If required, there are no filing fees for the USACE permits and no Environmental Assessment document fees for nationwide form of the permit, which generally is not associated with a formal EA. Labor costs for preparing/submitting related forms – 20 hours @ $150/hr.	Owner	1–3 months if required	$0	$0	$3,000
Section 7 Consultation with U.S. Fish and Wildlife Service (USFWS), Endangered Species Act of 1973	It is unlikely project would have sufficient "federal nexus" (federal funding, federal lands) to trigger USFWS consultation. However, California Department of Fish and Wildlife (CDFW) would likely provide the consultation.	Owner	May be part of CEQA review	$0	$0	$0
For Wet Natural Draft Cooling Towers only: Notice of Determination of No Hazard to Air Navigation – Federal Aviation Administration (FAA)	There are no formal filing fees associated with this Notice. Labor costs for preparing/submitting related forms = 4 hours @ $150/hr.	Owner	1–2 months	$0	$0	$600
For Wet Natural Draft Cooling Towers only: Notice of Determination of No Hazard to Air Navigation – FAA, Temporary Construction Facilities	There are no formal filing fees associated with this Notice. Labor costs for preparing/submitting related forms = 4 hours @ $150/hr.	Owner	1–2 months	$0	$0	$600
California Public Utilities (CPUC) Commission Approval	While formal CPUC review and approval may prove necessary, the primary costs of this process are associated with the CEQA review process. The CPUC could be the lead CEQA agency or share this role with another regulatory organization (e.g., California Coastal Commission, San Luis Obispo County). These CEQA costs are addressed in the County Conditional Use Plan Approval Process.	Owner	About 12 months if required	$0	$0	$0

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Coastal Development Permit – California Coastal Commission (CCC)/Local Coastal Programs	The CCC indicates that the filing fee for non-residential development is $265,000 (CCC, 2008). There may be additional fees for reimbursement of reasonable expenses including public notice costs. CEQA costs are covered in the County Condition Use Plan Approval Process. Labor costs for preparing/submitting related forms and documentation = 2,000 hours @ $150/hr.	Owner	A 3–9 month process is advertised but would be aligned with CEQA review process	$265,000	$0	$300,000
Coastal Development Lease – California State Lands Commission and potential CEQA Lead Agency	The Commission lease related fees include (CSLC-2011): Industrial Lease: $25,000 Dredge Lease Fee: $1,500 Filing Fee: $25 Labor costs for preparing/submitting related forms and documentation = 2,000 hours @ $150/hr.	Owner	Depends on duration of CEQA/EIR process; about 2 years	$26,525	$0	$300,000
Regional Pollution Control District Permit to Construct (ATC) – San Luis Obispo Air Pollution Control District (SLO-APCD)	The SLO-APCD standard filing fee ($195) is somewhat incidental (SLO-APCD, 2011). The evaluation fee is on a time-and-materials basis and can be in the order of $20,000 to $30,000 ($115/hr). Additionally, the fees associated with securing the necessary PM-10 credits have a recent average price of $20,000/ton in the Santa Barbara APCD (CARB, 2011). Assuming 18% of cooling tower PM is PM-10, the total is about 24 tpy. There have not been any recent PM-10 ERC sales in SLO-APCD. Labor costs for preparing/submitting related forms and documentation = 500 hours @ $150/hr.	Owner	6–12 months	$31,000	$480,000	$75,000

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Regional Control District Permit to Operate (PTC) – SLO-APCD	The SLO-APCD standard filing fee ($195) is somewhat incidental (SLO-APCD, 2011). The evaluation fee is on a time-and-materials basis and can be in the order of $20,000 to $30,000 (115/hr). The emission reduction credits fees associated with PM-10 are paid in the ATC phase of air permitting. Labor costs for preparing/submitting related forms and documentation = 200 hours @ $150/hr.	Owner	Not preconstruction permit	$31,000	$0	$30,000
Title V Federal Operating Permit – SLO-APCD and USEPA	Assuming 7,000 mg/l TDS from freshwater application, the total particulate emissions (132 tpy) exceed 100 tpy, which makes this a major source if one assumes all PM is PM-10. Federal Presumptive Fee: $46.73/ton for Title V permits Labor costs for preparing/submitting related forms and documentation = 200 hours @ $150/hr.	Owner	Not preconstruction permit	$6,170	$0	$30,000
Dust Control Plan or Construction Activity Management Plan (CAMP) – SLO-APCD	While SLO-APCD does not list any specific fee for the Dust Control Plan, other CARB entities are known to charge $300 to reimburse review costs. If the construction ozone precursor emissions (ROG + NOx) exceed the SLO-APCD quarterly significance threshold of 6.3 tons, the SLO County CEQA Handbook (SLO-APCD, 2012) defined mitigation rate is $16,000 per ton of ozone precursor, plus 15% administrative fee. The current assumption is that precursor emissions are below this threshold. Labor costs for preparing/submitting the plan = 80 hours @ $150/hr.	Contractor	1-month plan development process	$0	$0	$12,000

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
National Pollutant Discharge Elimination System (NPDES) Industrial Discharge Permit – Central Coast Regional Water Quality Control Board (CCRWQCB) and State Water Resources Control Board (SWRCB)	The operating project is incurring annual fees based on its current discharge process. Fee structure: $1,606 + $2,840 x flow (mgd) Maximum fee: $410,568 + surcharges ($5,000 to $15,000) (SWRCB, 2012) The fee would drop dramatically with the removal of the current substantial once–through discharge rate (about $400,000 savings). Labor costs for preparing/submitting related permit forms = 1,000 hours @ $150/hr.	Owner	About 6 months	–$400,000	$0	$150,000
Notice of Intent – NPDES General Permit for Storm Water Discharges Associated with Construction Activity – CCRWQCB	Construction stormwater fees for disturbed areas > 100 acres is $2,618 + 21% fee ($550). Labor costs for preparing/submitting related forms = 40 hours @ $150/hr.	Owner	1 week – electronic submittal	$3,192	$0	$6,000
Storm Water Pollution Prevention Plan –NPDES General Permit for Storm Water Discharges Associated with Construction Activity – CCRWQCB	There are no direct filing fees or regulatory charges associated with the SWPPP. Labor costs for preparing plan = 120 hours @ $150/hr.	Contractor	3 months for SWPPP development process	$0	$0	$18,000
2081 Permit for California Endangered Species Act of 1984 – California Department of Fish and Wildlife (CDFW)	While there does not appear to be a direct filing fee for this permit, there are related CEQA review services: Negative or Mitigated Negative: $2,156.25 Environmental Impact Review: $2,995.25 Certified Regulatory Program Fee: $1,018.50 County Clerk Processing Fee: $50 (CDFW–CEQA, 2013) Labor costs for preparing/submitting related forms, documentation, and field work = 500 hours @ $150/hr.	Owner	Potentially part of CEQA review	$3,049.50	$0	$75,000

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Lake and Streambed Alteration Agreement – CDFW	If project costs > $500,000, then fees are $4,482.75 + $2,689.50. If a separate Master Agreement, the supplemental fees could total $33,620 + $2,801.50 + $280.25. (CDFW–LSA, 2013) Labor costs for preparing/submitting related forms, documentation, and field work = 500 hours @ $150/hr.	Owner	1–2 months (if application complete) Could extend to 4–6 months	$44,000	$0	$75,000
Waste Discharge Requirements – CCRWQCB	Fill & Excavation Discharges: $944 + $4,059 x disturbed area (acres) Dredging Discharges: $944 + $0.15 x cy Channel and Shoreline Discharges: $944 + Discharge Length (ft) x $9.44 – not to exceed $59,000 + surcharges (CCR Title 23§2200) Assumed 100 acres of jurisdictional lands (state waters) are affected – triggers maximum fee (no extra surcharges). Labor costs for preparing/submitting related forms, documentation, and field work = 120 hours @ $150/hr.	Owner	4–6 months	$944	$59,000	$18,000
Office of Historic Preservation (OHP) Review	OHP review is part of the CEQA process and does not demand any additional fees or pose direct regulatory costs. Labor costs are captured in CEQA discussion.	Owner	Integral to CEQA review process	$0	$0	$0

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Notification of Waste Activity – Resource Conservation and Recovery Act (RCRA) Hazardous Waste Identification Number (Small Quantity Generator) – Construction Phase – Department of Toxic Substance Control, USEPA, San Luis Obispo County Environment Health Services – California Unified Program Agency	Securing the Construction Phase Hazardous Waste ID (if necessary) does not demand a filing fee. Labor costs for preparing/submitting related forms = 4 hours @ $150/hr.	Contractor	1–2 weeks if required	$0	$0	$600
Spill Prevention, Control, and Countermeasure (SPCC) Plan – 40 CFR 112 and Aboveground Petroleum Storage Act – San Luis Obispo Environmental Health Services – California Unified Program Agency and USEPA	SPCC modification process would not demand any additional filing fees. Aboveground storage tank annual renewal fee ($288/facility) should remain unchanged – no new fee. (SLO-EHS, 2013) Labor costs for preparing/submitting related plan = 120 hours @ $150/hr.	Owner	1–2 months for plan revision	$0	$0	$18,000
Underground Storage Tank (UST) Permit – San Luis Obispo County Environmental Health – California Unified Program Agency and State Water Resources Control Board (SWRCB)	The new cooling tower system could force the relocation of underground tanks, mandating new permits from the county and a revised inspection program. The associated fees may apply, primarily the facility modification fee ($1,725/facility) and closure fee ($2,216 per facility) may apply (SLO-EHS, 2013). The maintenance fee ($0.14/gallon of oil) should remain unchanged (CBOE, 2011). Labor costs for securing underground tank permits (modification/closure) = 40 hours @ $150/hr.	Owner	1–2 months	$3,941	$0	$6,000

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Conditional Use Plan Amendment – San Luis Obispo County Department of Planning and Building and Potential CEQA Lead Agency	As the CEQA lead agency or co-lead, the county would assess fees for development of the Initial Study, environmental coordination fees, and EIR processing fees (SLO-DPB, 2012). Initial Study Cost: $14,603 Other fees include: CalFire Review: $600 Health Department Review: $600 Geological Review: $2,671 (min) Resource Conservation District Review: $375 (min) Labor costs for EIR consultant + 50% premium = 4,000 hours @ $150/hr x 1.5.	Owner	Depends on duration of CEQA review process; about 2 years	$20,000	$0	$900,000
Erosion and Sediment Control Plan (Rain Event Action Plan) – San Luis Obispo County Department of Public Works	No filing fee for this plan. Development costs are included in the SWPPP section.	Contractor	Parallel to SWPPP development 3 months	$0	$0	$0
Building Permits – San Luis Obispo County Department of Planning and Building and Public Works: Grading Site Plan Reviews/Checks Mechanical, Plumbing, and Electrical Tanks Roads Septic Systems Fences Fire inspections	County of San Luis Obispo Department of Planning and Building has a complex fee schedule (SLO-DPB, 2012). Recent SLO County experience on a significant solar PV project indicates that overall building permit and inspection fees could total $750,000 for onsite work. Offsite fresh or reclaimed water pipeline building permits would add substantial costs (about $500,000). Labor costs for preparing/submitting related engineering packages = 3,000 hours @ $150/hr.	Contractor	6 months for initial permits following completion of CEQA and conditional use permit	$1,250,000	$0	$450,000

Permit/Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Fire Safety Plan Approval, Certificate of Occupancy, Flammable Storage – San Luis Obispo County Fire Department	Revisions to the existing Fire Safety Plan are not expected to result in additional filing or direct regulatory fees. The initial filing fee of $408 would probably not apply. Labor costs for revising Fire Safety Plan = 20 hours @ $150/hr.	Contractor	1 month for plan approval	$0	$0	$3,000
Road Crossing or Encroachment Permit (Caltrans, San Luis Obispo County)	If needed. Caltrans fees vary by type of encroachment and are based on $82/hr review & approval fee. County encroachment permits are: Driveway review and encroachment: $607 General encroachment: $338 Utility non-franchise: $597 (Caltrans Encroachment, 2013) (Caltrans FAQ, 2013) Labor costs for preparing/submitting related engineering information and forms = 40 hours @ $150/hr.	Owner	1–3 months	$5,000	$0	$6,000
San Luis Obispo County Well Water Permit – San Luis Obispo County Environmental Health Services	If needed. New well installation: $433 Abandonment of existing wells: $121 (SLO-EHS, 2013) Well related costs assumed to be $1,000. Labor costs for preparing/submitting well packages = 8 hours @ $150/hr.	Contractor	1–2 weeks if required	$1,000	$0	$1,200
Wet Natural Draft TOTAL				**$1,290,821.50**	**$539,000.00**	**$2,478,000.00**
Wet Mechanical (Forced) Draft TOTAL				**$1,290,821.50**	**$539,000.00**	**$2,476,800.00**
Hybrid Wet/Dry TOTAL				**$1,290,821.50**	**$539,000.00**	**$2,476,800.00**

4.3.8.2 Summary

The list of potentially applicable federal, state, and local permits for the closed-cycle cooling system options reflects the potentially significant impacts to the onshore and near-shore environment. The efforts to conduct a successful CEQA review would be the primary critical path permitting process. The CEQA lead agency may be a shared responsibility among a number of key regulatory departments (e.g., San Luis Obispo County, CSLC). The requisite USACE Section 404 permit, CCC Coastal Development Permit, CSLC Lease, and NPDES permit modification would have potentially lengthy review processes but would all be essentially bounded by the critical path CEQA/EIR review process.

The CEQA review process duration varies. The shortest path appears to be a nominal 210-day (7-month) period that would include the minimum 30-day review period to determine that the initial CEQA application is complete. This process culminates in a Negative Declaration and does not involve developing a comprehensive EIR. However, all of the closed-cycle cooling processes under consideration would likely demand preparation of an EIR, which would further extend this review process. The process—inclusive of the initial 30-day completeness review, a 1-year EIR review, and a so-called 90-day "reasonable extension" triggered by compelling circumstances recognized by both the applicant and lead agency—would then extend out to 16 months. (CEQA Flowchart)

The CEQA review process would be extended even further by conservatively adding an additional 8 months to cover "unreasonable delays" ostensibly associated with the applicant's difficulty in supplying requested information. Collectively, this longer and probably more applicable 2-year CEQA review process would likely follow a 1-year period of permit application development. The other permitting processes are assumed to proceed in parallel to the critical path CEQA review process. While there could be some variation on the permitting timeline for the various closed-cycle cooling systems under consideration, such variation would be effectively enveloped by the lengthened CEQA review process.

The total permit filing and permitting service costs associated with the various closed-cycle cooling system options does vary. The permitting costs for the dry cooling options total about $3.0 million. The permitting costs for the wet cooling options increase to $4.3 million in response to the additional costs associated with the offsite reclaimed water pipelines. As noted earlier, the overall 3-year permitting process and associated costs do not reflect the impact of permit appeals, litigation, or potentially negotiated CEQA-related mitigation fees.

4.3.8.3 Sources

1. California Air Resources Board Emission Reduction Offset Transaction Costs Summary Report for 2011.

2. California Board of Equalization Underground Storage Tank Maintenance Fee – as of June 30, 2011 (http://www.boe.ca.gov/info/fact_sheets/underground_strg_tank_maint.htm).

3. California Coastal Commission Permit Application Instructions, Appendix E Filing Fee Schedule (3/17/2008).

4. California Code of Regulations Title 23§2200 Annual Fee Schedules - Subpart a(3) Dredge and Fill Materials.

5. California Department of Fish and Wildlife Document Filing Fees (www.dfg.ca.gov/habcon/ceqa/ceqa_changes.html), April 3, 2013.

6. California Department of Fish and Wildlife Lake and Streambed Alteration Agreements and Fees (http://www.nrm.dfg.ca.gov/FileHandler.ashx?DocumentID37872), April 3, 2013.

7. California Department of Transportation Encroachment Permits (www.dot.ca.gov/hq/traffops/developserv/permits), April 3, 2013.

8. California Department of Transportation FAQ #2 (www.dot.ca.gov/hq/traffops/permits/faq.htm). April 3, 2013.

9. California State Lands Commission, Land Management Division Application Guidelines (10/12/2011).

10. California State Water Resources Control Board Fee Schedule 2012-2013, 2012 http://www.swrcb.ca.gov/resources/fees/docs/fy12_13_fee_schedule_npdes_permit.pdf.

11. CEQA Flowchart for Local Agencies: California Code - Section 21151.5, http://www.ceres.ca.gov/planning/ceqa/flowchart.html.

12. San Luis Obispo County Air Pollution Control District CEQA Air Quality Handbook – A Guide For Assessing the Air Quality Impacts for Projects Subject to CEQA Review, April 2012.

13. San Luis Obispo County Air Pollution Control District Rule 302 Schedule of Fees, July 27, 2011.

14. San Luis Obispo County Department of Planning and Building – Fee Schedule 2012-2013, 2012.

15. San Luis Obispo County Environmental Health Services Fees – Aboveground and Underground Storage Tanks (http://www.slocounty.ca.gov/Assets/AD/Fees/12-13+Fees/Schedule+B+Fees/160+PH+-+Environmental+Hlt+fee+workbook+FY12-13.pdf), April, 3 2013.

5. Construction Approach

[Later]

6. Schedule Development

[Later]

7. Estimate Development

[Later]

8. References

1. Bechtel Power Corporation, "Independent Third-Party Interim Technical Assessment for the Alternative Cooling Technologies or Modifications to the Existing Once-Through Cooling System for Diablo Canyon Power Plant," Report No. 25762-000-30R-C01G-00009, Rev. 0, prepared for Pacific Gas and Electric Company and the State Water Resources Control Board Nuclear Review Committee, September 14, 2012.

2. Pacific Gas and Electric Company, "Report on the Analysis of the Shoreline Fault Zone, Central Coastal California," report to the U.S. Nuclear Regulatory Commission for Diablo Canyon, January 2001.