Pacific Gas and Electric Company
Power Generation
Fossil Plant Construction

Colusa Generating Station Project
915 Highland Pointe Drive
Suite 130
Roseville, CA 95678

August 14, 2008

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Docket Unit
California Energy Commission
1516 Ninth Street, MS-4
Sacramento, CA 95814

Subject: Pacific Gas & Electric's Colusa Generating Station Project (06-AFC-9C) License Petition Amendment

Enclosed for filing with the California Energy Commission are one original and twelve (12) copies of Pacific Gas and Electric Company's Petition to Amend the Colusa Generating Station License.

Sincerely,

Jon Maring, Director
New Generation

Colusa Generating Station

(06-AFC-09)

Amendment 1

Submitted to the

California Energy Commission

Submitted by

Pacific Gas & Electric Company

August 2008

With Assistance from

CH2MHILL

2485 Natomas Park Drive
Suite 600
Sacramento, CA 95833

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SECTION 1

Introduction

1.1 Background

On November 6, 2006, E&L Westcoast, LLC (E&LW), submitted an Application for Certification (AFC) to the California Energy Commission (CEC) for the Colusa Generating Station (CGS). The proposed project would be located on 31-acres within a 100-acre site leased by E&LW. The site is located 14 miles north of Williams and 4 miles west of Interstate-5 (I-5) in Colusa County, California. The CGS will be adjacent to Pacific Gas and Electric Company's (PG&E) existing Delevan Gas Compressor Station. The project was granted a license by the CEC on April 23, 2008.

In December 2007, E&LW and PG&E executed an option agreement to transfer and assign the CGS assets to PG&E assuming certain conditions were satisfied. On January 11, 2008, E&LW and PG&E closed under the agreement and PG&E became the sole owner of the CGS assets.

1.2 Description of Proposed Amendment

After careful evaluation and a comprehensive review of the project design, PG&E has determined that several changes to the CGS project description are necessary. The changes to the project design are proposed for CEC approval in this amendment. The major changes are summarized below; more detail on all of the specific project changes is provided in Section 2.1 of this amendment.

The redesigned CGS project will include the following components:

- Relocation of the administrative and water treatment building, consolidation of the motor control centers (MCC) to one building and relocation of the building between the combustion turbine trains, modification of the length of the road between the two combustion turbines, relocation of the access road 20 feet north on the northern side of the project site, and incorporation of an additional onsite road on the west side of the water treatment building.
- Removal of the diesel emergency generator.
- Replacement of the second fire water pump diesel engine with an electric motor driven fire pump.
- Removal of the auxiliary boiler.
- Relocation of the gas meter station to the north side of the project site.
- Addition of a natural gas water bath heating system.
- Addition of a wet surface air cooler for additional lubrication oil cooling.

Based on a review by PG&E's engineers, the proposed design changes will not require a larger construction work force or a longer construction period.

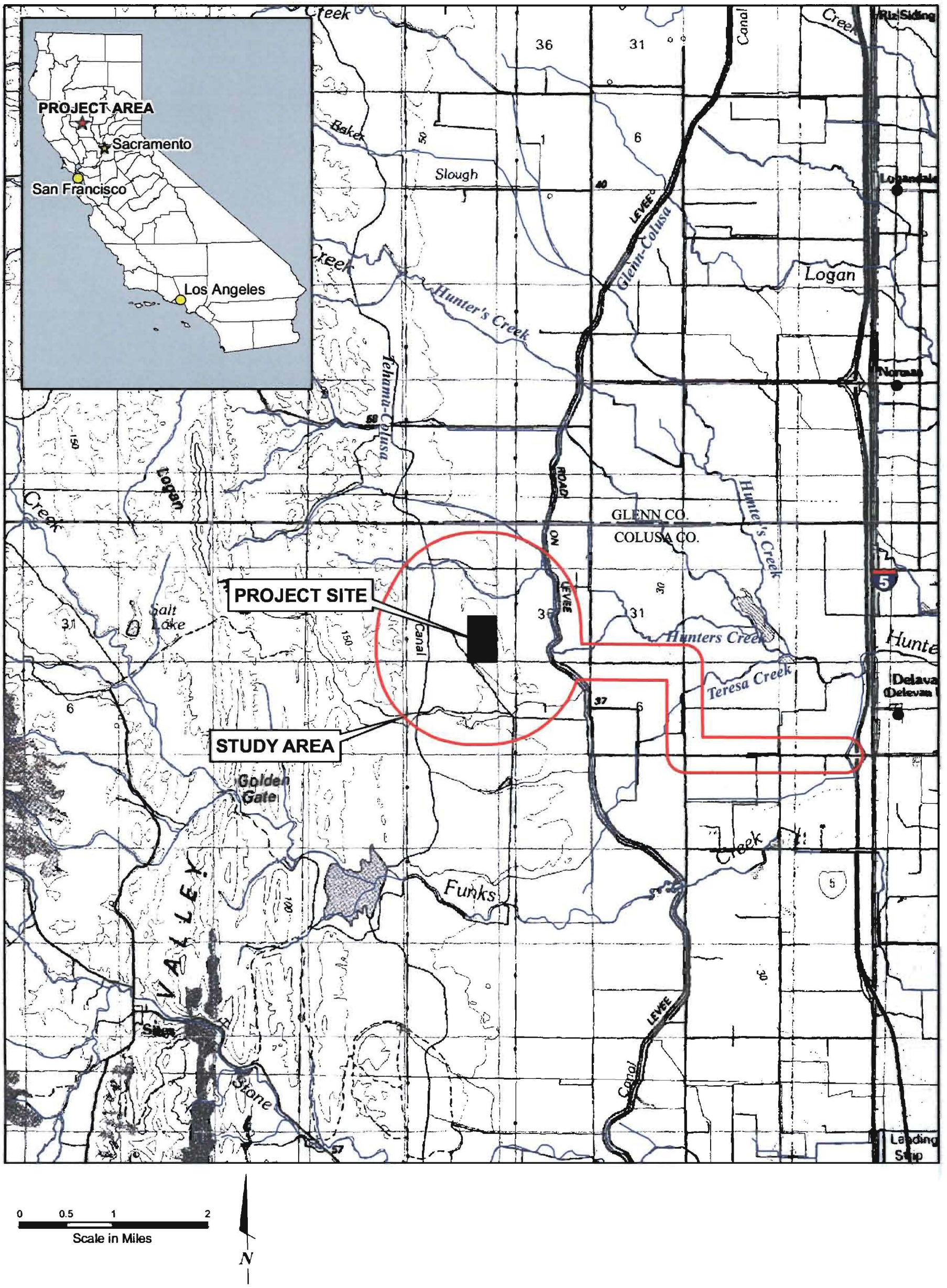
Figure 1-1 presents a project vicinity map for the CGS project. The remainder of this amendment presents a detailed project description (Section 2), environmental analysis of the proposed project changes (Section 3), proposed modifications to the Conditions of Certification (COCs) (Section 4), potential effects on the public (Section 5), a list of property owners potentially impacted by the proposed changes (Section 6), and potential effects on the property owners (Section 7).

1.3 Summary of Environmental Impacts

Section 1769 (a)(1)(E) of the CEC Siting Regulations requires that an analysis be conducted that addresses impacts that the modification might have on the environment and proposed measures to mitigate any significant adverse impacts. In addition, Section 1769 (a)(1)(F) of the Siting Regulations requires a discussion of the impacts the modification might have on the project's ability to comply with applicable laws, ordinances, regulations and standards (LORS).

1.4 Consistency of Amendment with License

Section 1769 (a)(1)(D) of the CEC Siting Regulations requires a discussion of the amendment's consistency with the LORS and whether the modifications are based on new information that changes or undermines the assumptions, rationale, findings, or other basis of the final decision. If the project is no longer consistent with the license, an explanation why the modification should be permitted must be provided. In the sections that follow, PG&E will provide an explanation of the proposed modifications, rationale for the modifications, and a LORS compliance analysis. Proposed modifications to the existing COCs are included in Section 4 and Appendix 4.



Source: URS, 2008

FIGURE 1-1
VICINITY MAP
COLUSA GENERATING STATION
PACIFIC GAS AND ELECTRIC
APPLICATION FOR CERTIFICATION
AMENDMENT 1

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EY082008001SAC Figure_1-1.ai 08.13.08 ldaus

SECTION 2

Project Description

2.1 Description of Project Amendment

Consistent with CEC Siting Regulations, Section 1769 (a)(1)(A) and 1769(a)(1)(B), this section includes a complete description of the project modifications, as well as the necessity for the amendment. PG&E has determined that several changes to the CGS project description are necessary to conform to the project to PG&E's design and operational philosophy. The proposed changes are presented in detail below.

2.1.1 Project Description Modifications

This section lists the proposed changes to the project design that are proposed for CEC approval. Figure 2-1 presents a detailed plot plan of the project that includes the proposed changes. Figure 2-2 presents revised elevation drawings for the project. Figures 2-3 and 2-4 present revised heat and mass balance and water balance drawings for annual average and peak conditions. The major changes being proposed by PG&E are summarized below.

- Relocate the administrative and water treatment building, consolidate the MCCs to one building and relocate it between the combustion turbine trains, reduce the length of the road in between the two combustion turbines, relocate the access road 20 feet north on the northern side of the project site, and incorporate an additional onsite road on the west side of the water treatment building.
- Remove the diesel emergency generator.
- Replace second fire water pump diesel engine with an electric motor driven fire pump.
- Remove the auxiliary boiler.
- Relocate the gas meter station to the north side of the project site.
- Incorporate a natural gas water bath heating system.
- Incorporate a wet surface air cooler for additional lubrication oil cooling.

These design changes are discussed in greater detail below.

2.1.2 Modified General Arrangement

The proposed changes to the general equipment arrangement reflect the differences in design philosophies between the previous project owner and PG&E. Many of these changes stem from PG&E's past experience in designing, operating, and maintaining power plants. The proposed changes have the added benefit of reducing overall construction and operational costs. The major changes are due to the elimination of plant equipment and a reduction in the size of other equipment. For instance, the air-cooled condenser (ACC) was licensed as a 45-cell unit and the redesign proposes a 42-cell unit. Also, the number of lubricating oil fin fan coolers were reduced.

2.1.3 Eliminate the Diesel Emergency Generator

The diesel emergency generator was intended to provide emergency electrical power to operate critical controls and systems in the event of electrical interruption. However, due to the parasitic electrical demand required for a dry cooled plant (approximately 2.5 megawatts), the emergency generator is significantly undersized. As a result, PG&E proposes to connect CGS to the two adjacent 230-kilovolt (kV) transmission lines at the north and south switchgear. Furthermore, PG&E will keep interconnected to the 12-kV distribution line that will supply CGS with electrical power during construction. The potential of these three redundant electrical sources being out of service at the same time is highly unlikely. Therefore, PG&E has determined that the emergency generator is no longer required.

2.1.4 Replace the Diesel Fire Pump with an Electric Fire Pump

The CGS was licensed with two 100-percent-redundant firewater pumps (one electric and one diesel-fired) to ensure that the fire water is available during emergencies. As discussed in subsection 2.1.3, PG&E has identified a solution for the issue of emergency electrical power through interconnection of the CGS to two redundant electrical sources (the two 230-kV transmission lines and the 12-kV distribution line). PG&E has requested both the CBO and Colusa County Fire Marshall to review the approach. Both the CBO and Fire Marshal have approved PG&E's electrical solution to replace the second diesel fire pump with an electric fire pump. There will be some further reduction in emissions when the diesel engine is replaced by an electric motor.

2.1.5 Eliminate the Auxiliary Boiler

The CGS license includes an auxiliary boiler to facilitate start up of the plant. Based on PG&E's operating experience, the benefits of using the auxiliary boiler to increate plant start up do not warrant the added capital and maintenance cost. PG&E expects that the required heat to maintain the steam turbine and heat recovery steam generators (HRSG) in a start-ready condition can be extracted from HRSG the high pressure drum. Therefore, PG&E is proposing that the auxiliary boiler be eliminated from the CGS project description

2.1.6 Relocate the Natural Gas Metering Station

As with other changes to the CGS general arrangement, the relocation of the natural gas metering station to the north side of the plant will provide PG&E with a more logical plant layout.

2.1.7 Incorporate a Natural Gas Water Bath Heater System

The natural gas supply supplied to the CGS is expected to have some condensation in the pipeline when the gas temperature falls below the dew point of approximately 42°F. PG&E has established a minimum natural gas fuel temperature of 45°F in order to avoid operational issues. The natural gas will be supplied at a pressure of 900 pounds per square inch gauge (psig), and the CGS will require the pressure to be reduced to approximately 500 psig. This pressure reduction is estimated to cause a 28°F decrease in the natural gas temperature (7°F decrease for each 100 psig pressure reduction). Therefore, PG&E has determined that natural gas heating is required. PG&E proposes to install a water bath

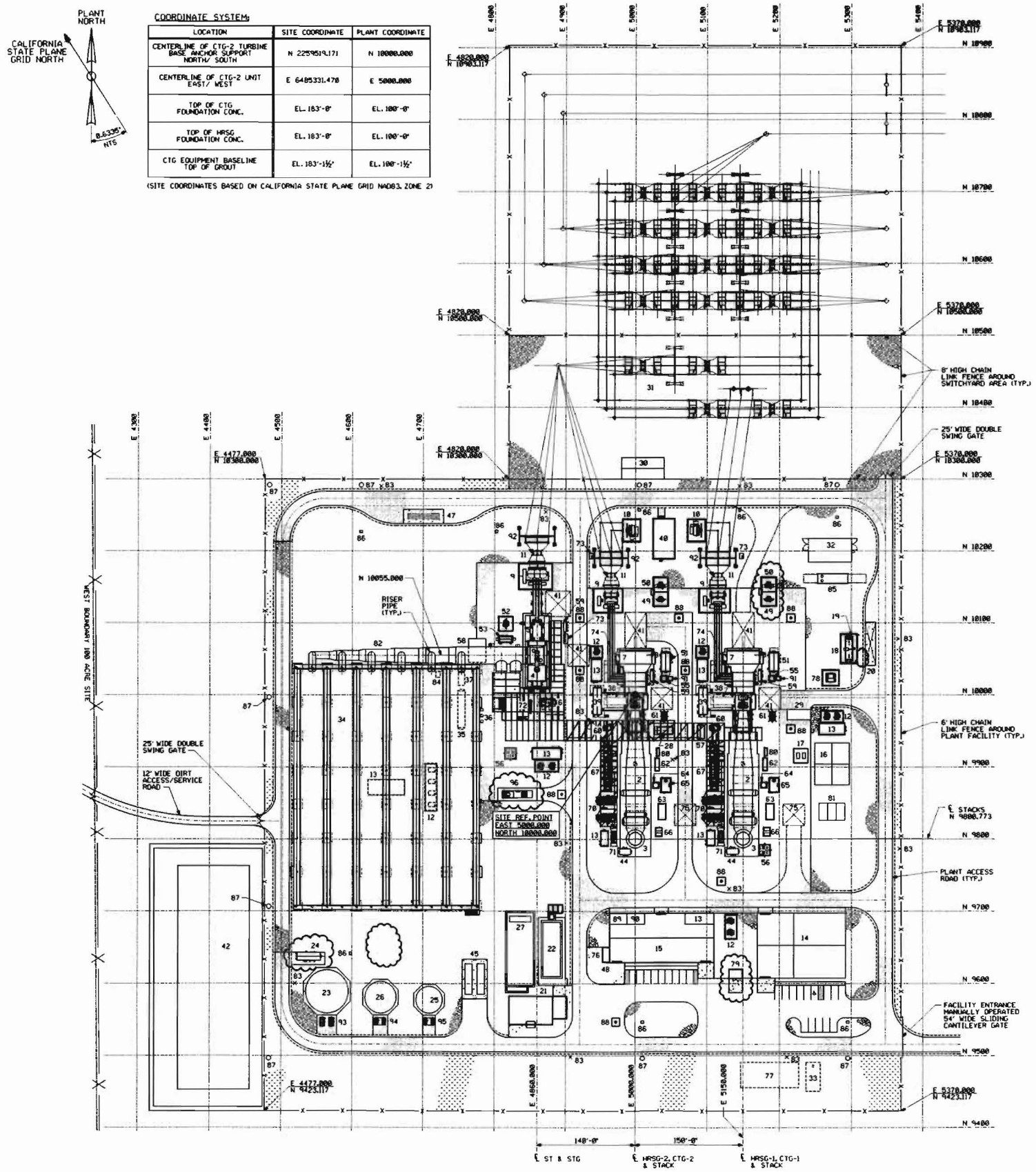
heating system to maintain the natural gas temperature for the CGS at approximately 75°F. A schematic and specifications for the water bath heater are included in Appendix 2.

2.1.8 Incorporate a Wet Surface Air Cooler

The current cooling system utilizes a fin-fan cooling system (similar to an automotive radiator). This system has reduced cooling capacity during warmer ambient conditions. PG&E has determined through its design review process that additional steam turbine lubricating oil cooling may be necessary, and proposes to install a wet surface air cooler (WSAC) to provide this additional cooling capacity. The WSAC operates by passing the lubricating oil through heat transfer tubes in the WSAC that are sprayed with cooled water. Similar to a cooling tower, air is drawn into the WSAC from the sides and exhausted through the top of the cooler. Cooling is achieved from the evaporation of the water off the heat transfer tubing. Appendix 2 contains the specifications for the WSAC system.

2.2 Necessity of Proposed Change

Section 1769 (a)(1)(B) and 1769(a)(1)(C) of the CEC Siting Regulations require a discussion of the necessity for the proposed changes to the project and whether this modification is based on information that was known by the petitioner during the certification proceeding. During the licensing period, the changes to the project design proposed in this amendment were not known by PG&E as it had not yet performed the detailed design engineering until after the license had been issued by the CEC.



COORDINATE SYSTEMS

LOCATION	SITE COORDINATE	PLANT COORDINATE
CENTERLINE OF CTG-2 TURBINE BASE ANCHOR SUPPORT NORTH/ SOUTH	N 2295519.171	N 10000.000
CENTERLINE OF CTG-2 UNIT EAST/ WEST	E 6485331.478	E 5000.000
TOP OF CTG FOUNDATION CONC.	EL. 183'-0"	EL. 100'-0"
TOP OF HRSG FOUNDATION CONC.	EL. 183'-0"	EL. 100'-0"
CTG EQUIPMENT BASELINE TOP OF GROUT	EL. 183'-1½"	EL. 100'-1½"

(SITE COORDINATES BASED ON CALIFORNIA STATE PLANE GRID NAD83, ZONE 2)

NEW PLANT DESCRIPTION

1 COMBUSTION TURBINE
2 HEAT RECOVERY SYSTEM GENERATOR (HRSG)
3 HRSG EXHAUST STACK
4 STEAM TURBINE
5 STEAM TURBINE GENERATOR
6 S1 COMBINED LUBE OIL/HYDRAULIC OIL STORAGE TANK
7 COMBUSTION TURBINE AIR INLET
8 NOT USED
9 GSU TRANSFORMER
10 STATION SERVICE TRANSFORMER
11 HIGH VOLTAGE BREAKER
12 SUS TRANSFORMERS
13 POWER DISTRIBUTION CENTER
14 ADMIN/CONTROL/MAINT/WARE BUILDING (11,000 S.F.)
15 WATER TREATMENT BUILDING (10,000 S.F.)
16 FIN FAN COOLERS
17 AUX.COOLING WATER PUMPS
18 AMMONIA STORAGE TANK
19 AMMONIA FORWARDING PUMPS
20 AMMONIA UNLOADING AREA
21 ZERO LIQUID DISCHARGE AREA (OUTDOOR)
22 WASTE WATER SUMP
23 RAW/ FIRE WATER STORAGE TANK
24 FIRE WATER PUMP HOUSE
25 DEMINERALIZED WATER STORAGE TANK
26 FILTERED WATER STORAGE TANK
27 OIL WATER SEPARATOR
28 SAMPLE PANEL ENCLOSURE
29 CYCLE CHEMICAL FEED SHELTER
30 SWITCHYARD CONTROL HOUSE (1,800 S.F.)
31 230KV SWITCHYARD
32 GAS METERING AREA
33 SEPTIC TANK
34 AIR COOLED CONDENSER (ACC)
35 CONDENSATE TANK AND DEAERATOR
36 CONDENSATE PUMPS
37 STEAM JET AIR EJECTOR (SJAE) SKIDS (HOLDING & HOGGING)
38 ACCESSORY MODULE
39 PACKAGED ELECTRICAL, ELECTRONIC CONTROL CENTER (PEECC)
40 ELECTRICAL SWITCHGEAR ENCLOSURE
41 PLANT MAINTENANCE AREAS
42 STORMWATER DETENTION BASIN
43 NOT USED
44 CEMS ENCLOSURE
45 DEMINERALIZED WATER TRAILERS
46 NOT USED
47 HYDROGEN STORAGE AREA
48 CHEMICAL UNLOADING AREA
49 CTG EXCITATION TRANSFORMER
50 CTG ISOLATION TRANSFORMER
51 LCI / EX2100
52 STG EXCITATION TRANSFORMER
53 STG EX2100
54 NOT USED
55 DC LINK REACTOR
56 AREA SUMP
57 WATER WASH SKID
58 ACC SUMP AND PUMPS
59 CO2 PURGE RACK ENCLOSURE
60 CTG FIRE PROTECTION SKID
61 WASH WATER DRAIN TANK (UNDERGROUND)
62 DUCT BURNER SKID
63 AIG SKID
64 BLOWDOWN TANK
65 BLOWDOWN TANK SUMP AND PUMPS
66 RECIRCULATION PUMPS
67 FUEL GAS CONDITIONING SYSTEM SKID
68 NOT USED
69 NOT USED
70 BOILER FEEDWATER PUMPS
71 HRSG STAIRTOWER
72 GLAND STEAM CONDENSER
73 FIRE PROTECTION VALVE ENCLOSURE
74 AIR PROCESSING UNIT
75 HRSG CATALYST REMOVAL AREA
76 CHEMICAL STORAGE AREA
77 LEACH FIELD
78 ALTERNATE POWER TRANSFORMER
79 OIL & CHEMICAL STORAGE ENCLOSURE
80 DUCT BURNER FUEL GAS PRESSURE REDUCING STATION
81 WET SURFACE AIR COOLER (WSAC)
82 STEAM TURBINE DUCT
83 FIRE HYDRANT
84 A.C.C. CLEANING SKID
85 WATER BATH HEATER
86 STORM DRAINAGE CATCH BASIN
87 STORM DRAINAGE MANHOLE
88 ELECTRICAL MANHOLE
89 POTABLE WATER EQUIPMENT
90 COMPRESSED AIR EQUIPMENT
91 AC LINE REACTOR
92 DEAD END STRUCTURE
93 RAW WATER FORWARDING PUMPS
94 FILTERED WATER FORWARDING PUMPS
95 DEMINERALIZED WATER FORWARDING PUMPS
96 TEMPORARY CONDENSATE POLISHER

LEGEND

GRAVEL
CONCRETE
ASPHALT
GRASS

FIGURE 2-1
GENERAL ARRANGEMENT
COLUSA GENERATING STATION
PACIFIC GAS AND ELECTRIC
APPLICATION FOR CERTIFICATION
AMENDMENT 1

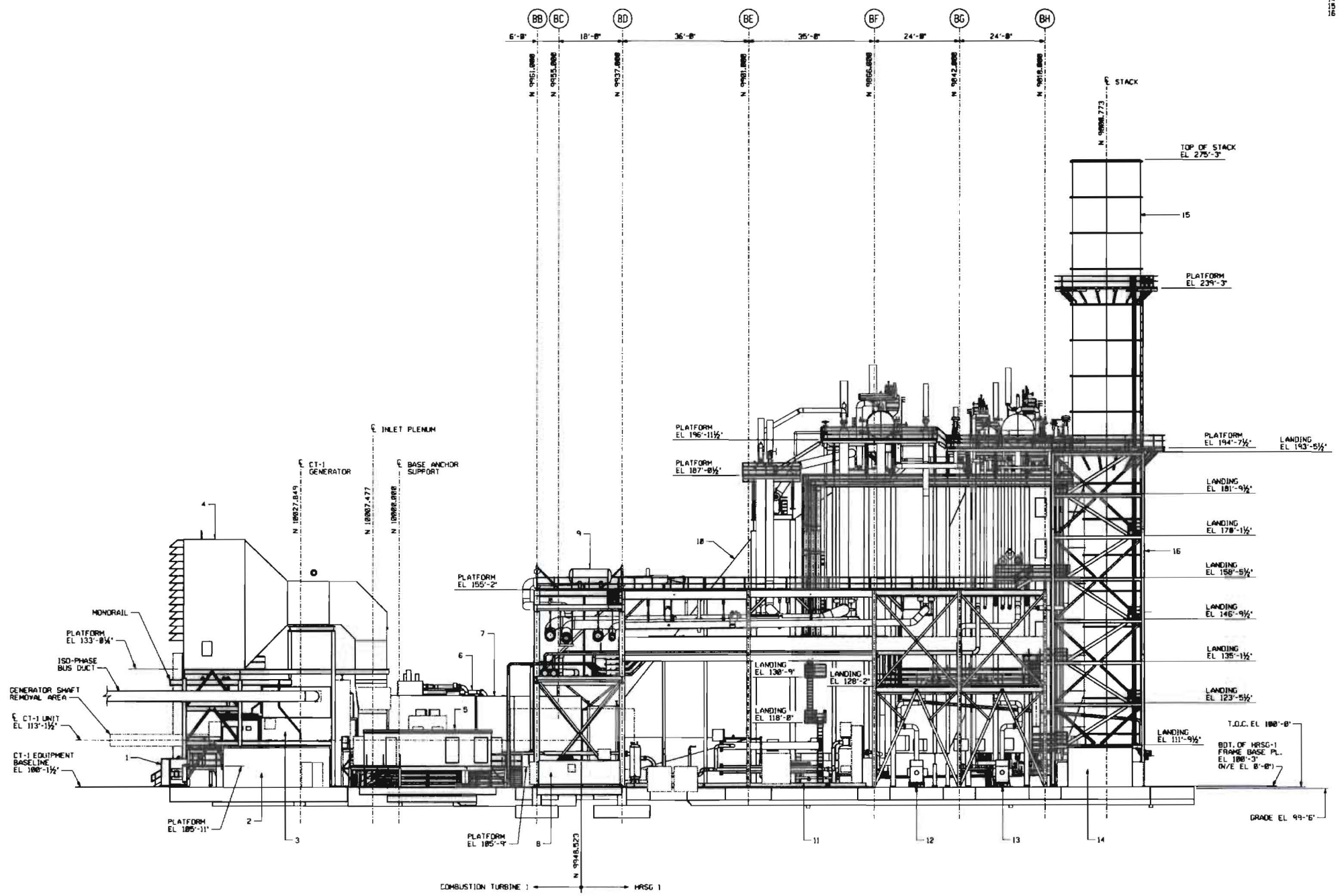
Source: WorleyParsons LTD., Drawing COLS-1-DW-111-002-002F, 04/28/08

CH2MHILL

EY082008001SAC Figure_2-1.ai 08.11.08 tdaus

NEW PLANT DESCRIPTION

1 SUS TRANSFORMER
2 CT-1 POWER DISTRIBUTION CENTER
3 COMBUSTION TURBINE GENERATOR 1
4 CT-1 AIR INLET FILTER
5 CT-1 PEECC COMPARTMENT
6 COMBUSTION TURBINE 1
7 CT-1 ACOUSTICAL BARRIER
8 WATER WASH SKID
9 AUX COOLING HEAD TANK
10 HEAT RECOVERY SYSTEM GENERATOR 1 (HRSG-1)
11 FUEL GAS CONDITIONING SYSTEM SKID
12 HRSG-1 BOILER FEEDWATER PUMP A
13 HRSG-1 BOILER FEEDWATER PUMP B
14 HRSG-1 POWER DISTRIBUTION CENTER
15 HRSG-1 STACK
16 HRSG-1 STAIRTOWER



ELEVATION LOOKING EAST

REFERENCE DRAWINGS:

COLS-1-DW-111-002-001	OVERALL SITE PLAN
COLS-1-DW-111-002-002	SITE PLAN
COLS-1-DW-111-002-101	HRSG-1 AREA - GRADE EL.
COLS-1-DW-111-002-102	HRSG-1 AREA - EL.155'-2"
COLS-1-DW-111-002-103	CT-1 AREA - GRADE EL.
COLS-1-DW-111-002-201	HRSG-2 AREA - GRADE EL.
COLS-1-DW-111-002-202	HRSG-2 AREA - EL.155'-2"
COLS-1-DW-111-002-203	CT-2 AREA - GRADE EL.
COLS-1-DW-111-002-204	CT-2 & HRSG-2 AREA - ELEV. LOOKING WEST
COLS-1-DW-111-002-301	ST AREA - GRADE EL.
COLS-1-DW-111-002-302	ST AREA - EL.121'-6"
COLS-1-DW-111-002-303	ST AREA - EL.142'-9"
COLS-1-DW-111-002-304	ST AREA - ELEV. LOOKING NORTH
COLS-1-DW-111-002-305	ST AREA - ELEV. LOOKING EAST

10 0 10 20 30 40 50
GRAPHIC SCALE IN FEET
3/32" = 1'

Source: WorleyParsons LTD., Drawing COLS-1-DW-111-002-104A, 07/30/08

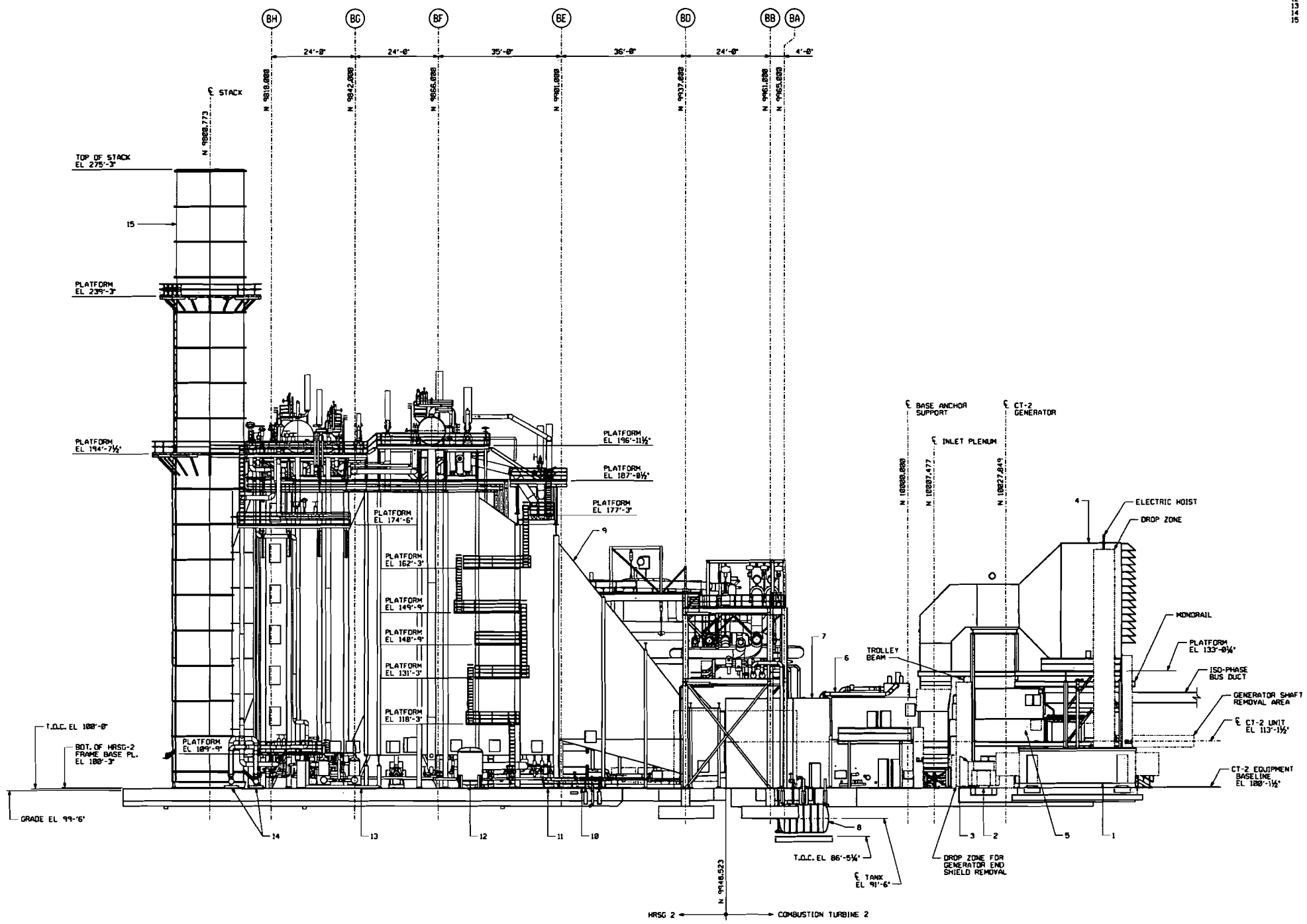
FIGURE 2-2A
ELEVATION OF TURBINE LOOKING EAST
COLUSA GENERATING STATION
PACIFIC GAS AND ELECTRIC
APPLICATION FOR CERTIFICATION
AMENDMENT 1

CH2MHILL

EY082008001SAC Figure_2-2A.ai 08.11.08 ldaus

NEW PLANT DESCRIPTION

1 CTG-2 LCI/EXCITATION COMPARTMENT
2 CTG-2 AC LINE REACTOR
3 CTG-2 DC LINK REACTOR
4 CT-2 AIR INLET FILTER
5 COMBUSTION TURBINE GENERATOR 2
6 COMBUSTION TURBINE 2
7 CT-2 ACOUSTICAL BARRIER
8 CT-2 WATER WASH DRAINS TANK
9 HEAT RECOVERY SYSTEM GENERATOR 2 (HRSG-2)
10 HRSG-2 DUCT BURNER FG PRESS. REDUCING STATION
11 HRSG-2 DUCT BURNER SKID
12 HRSG-2 BLOWDOWN TANK
13 HRSG-2 AIG SKID
14 HRSG-2 RECIRCULATION SKID
15 HRSG-2 STACK



ELEVATION LOOKING WEST

REFERENCE DRAWINGS:

COLS-1-DW-111-002-001	OVERALL SITE PLAN
COLS-1-DW-111-002-002	SITE PLAN
COLS-1-DW-111-002-101	HRSG-1 AREA - GRADE EL.
COLS-1-DW-111-002-102	HRSG-1 AREA - EL. 155'-2"
COLS-1-DW-111-002-103	CT-1 AREA - GRADE EL.
COLS-1-DW-111-002-104	CT-1 & HRSG-1 AREA - ELEV. LOOKING EAST
COLS-1-DW-111-002-201	HRSG-2 AREA - GRADE EL.
COLS-1-DW-111-002-202	HRSG-2 AREA - EL. 155'-2"
COLS-1-DW-111-002-203	CT-2 AREA - GRADE EL.
COLS-1-DW-111-002-301	ST AREA - GRADE EL.
COLS-1-DW-111-002-302	ST AREA - EL. 121'-6"
COLS-1-DW-111-002-303	ST AREA - EL. 142'-9"
COLS-1-DW-111-002-304	ST AREA - ELEV. LOOKING NORTH
COLS-1-DW-111-002-305	ST AREA - ELEV. LOOKING EAST

10 0 10 20 30 40 50
GRAPHIC SCALE IN FEET
3/32" = 1'

FIGURE 2-2B
ELEVATION OF TURBINE LOOKING WEST
COLUSA GENERATING STATION
PACIFIC GAS AND ELECTRIC
APPLICATION FOR CERTIFICATION
AMENDMENT 1

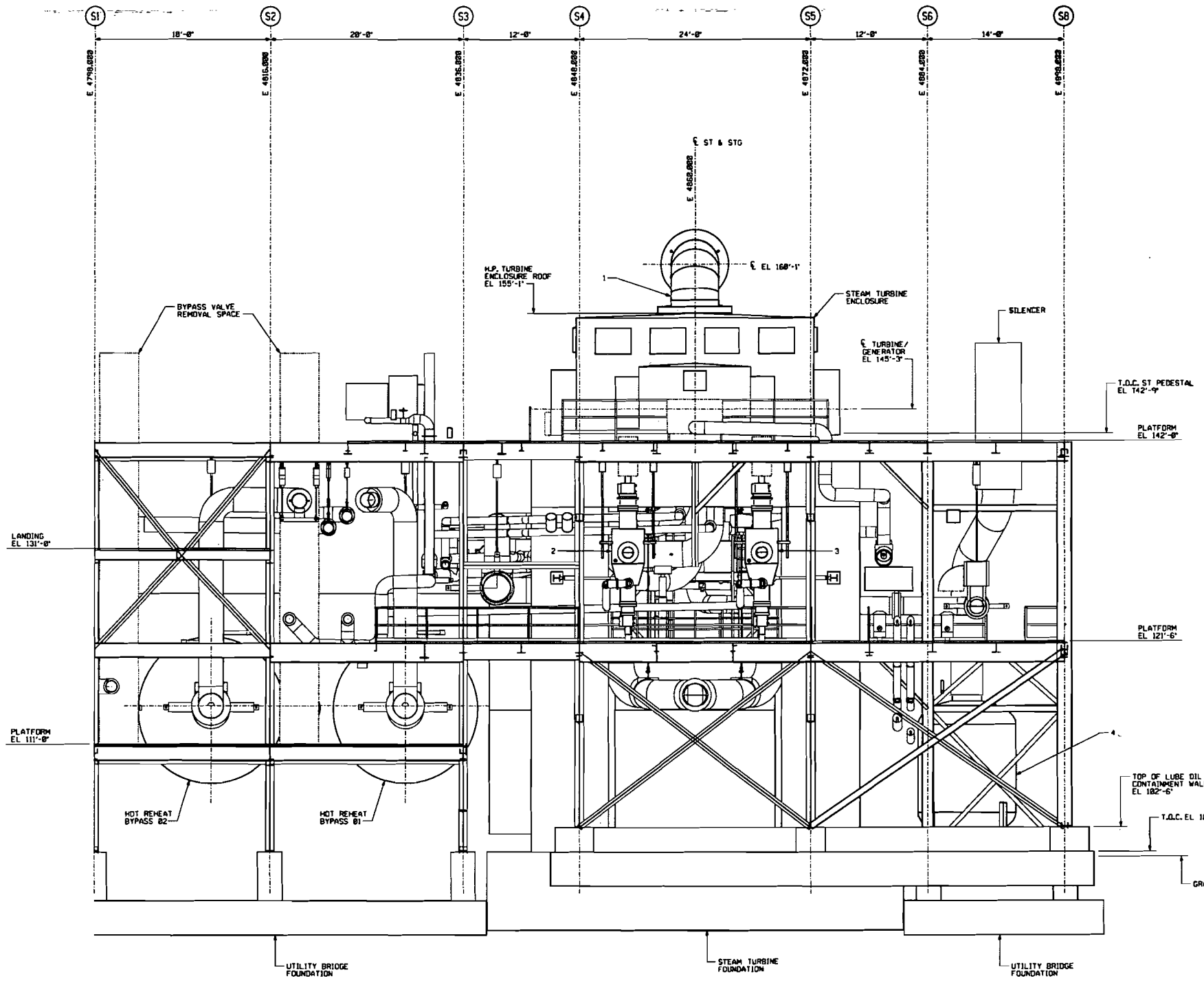
Source: WorleyParsons LTD., Drawing COLS-1-DW-111-002-204A, 07/30/08

CH2MHILL

EY082008001SAC Figure_2-2B.ai 08.11.08 tdaus

NEW PLANT DESCRIPTION

1 HP/IP/LP STEAM TURBINE
2 MAIN STOP CONTROL VALVE 1
3 MAIN STOP CONTROL VALVE 2
4 EXTERNAL DRAINS TANK



ELEVATION LOOKING NORTH

REFERENCE DRAWINGS:

COLS-1-DW-111-002-001	OVERALL SITE PLAN
COLS-1-DW-111-002-002	SITE PLAN
COLS-1-DW-111-002-101	HRSG-1 AREA - GRADE EL.
COLS-1-DW-111-002-102	HRSG-1 AREA - EL. 155'-2"
COLS-1-DW-111-002-103	CT-1 AREA - GRADE EL.
COLS-1-DW-111-002-104	CT-1 & HRSG-1 AREA - ELEV. LOOKING EAST
COLS-1-DW-111-002-201	HRSG-2 AREA - GRADE EL.
COLS-1-DW-111-002-202	HRSG-2 AREA - EL. 155'-2"
COLS-1-DW-111-002-203	CT-2 AREA - GRADE EL.
COLS-1-DW-111-002-204	CT-2 & HRSG-2 AREA - ELEV. LOOKING WEST
COLS-1-DW-111-002-301	ST AREA - GRADE EL.
COLS-1-DW-111-002-302	ST AREA - EL. 121'-6"
COLS-1-DW-111-002-303	ST AREA - EL. 142'-9"
COLS-1-DW-111-002-305	ST AREA - ELEV. LOOKING EAST

5 0 5 10 15 20 25
GRAPHIC SCALE IN FEET
1/8" = 1'

Source: WorleyParsons LTD., Drawing COLS-1-DW-111-002-304A, 07/30/08

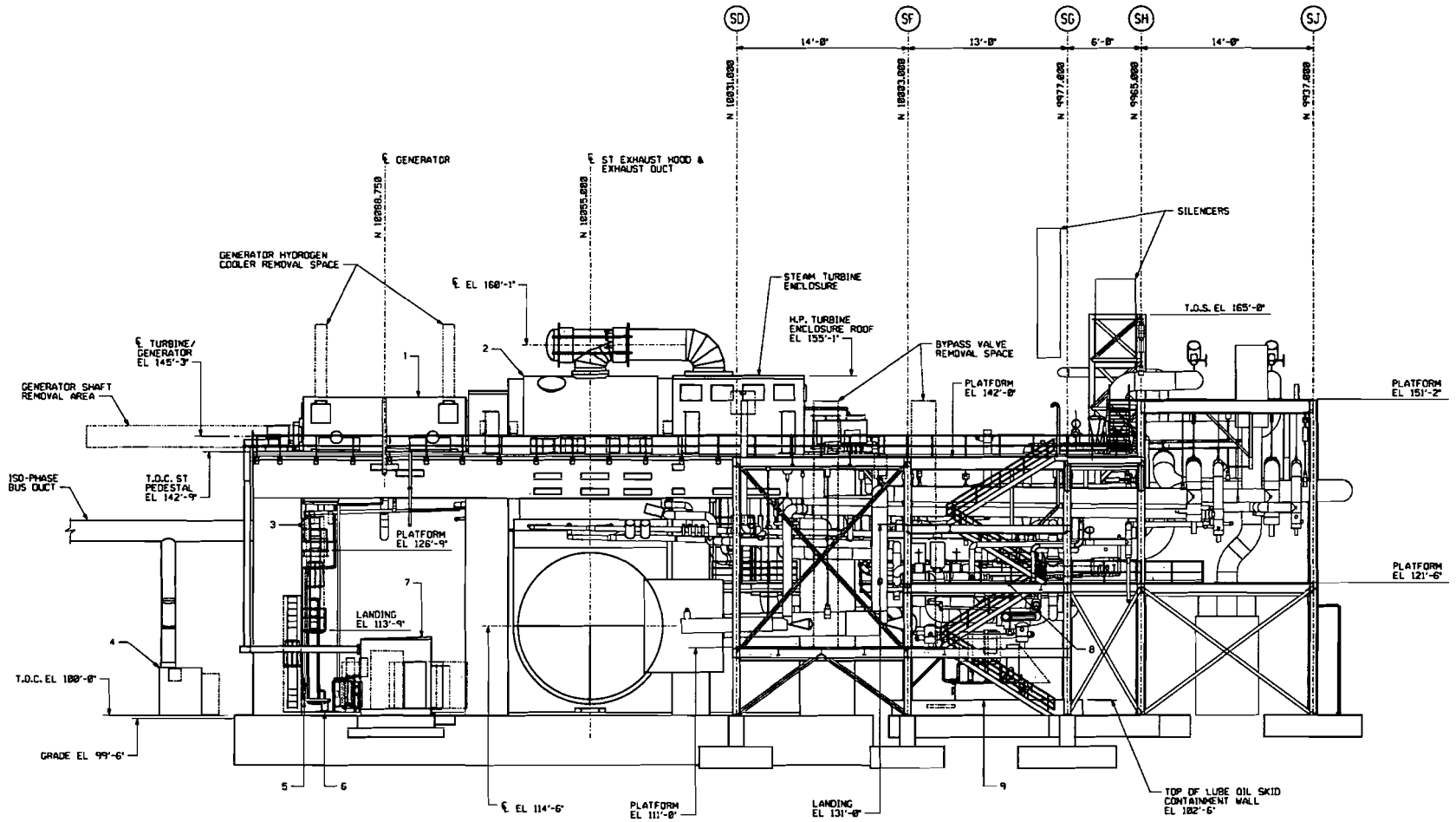
FIGURE 2-2C
ELEVATION OF TURBINE LOOKING NORTH
COLUSA GENERATING STATION
PACIFIC GAS AND ELECTRIC
APPLICATION FOR CERTIFICATION
AMENDMENT 1

CH2MHILL

EY082008001SAC Figure_2-2C.ai 08.11.08 tdaus

NEW PLANT DESCRIPTION

1. STEAM TURBINE GENERATOR
2. HP/IP/LP STEAM TURBINE
3. FLOAT TRAP ASSEMBLY
4. PT & SURGE PROTECTION CUBICLE
5. LIQUID LEVEL DETECTOR SKID
6. HYDROGEN SEAL OIL SKID
7. STG EXCITATION COMPARTMENT
8. GLAND STEAM CONDENSER
9. ST LUBE OIL SKID



ELEVATION LOOKING EAST

REFERENCE DRAWINGS:

COLS-1-DW-111-002-001	OVERALL SITE PLAN
COLS-1-DW-111-002-002	SITE PLAN
COLS-1-DW-111-002-101	HRSG-1 AREA - GRADE EL.
COLS-1-DW-111-002-102	HRSG-1 AREA - EL. 155'-2"
COLS-1-DW-111-002-103	CT-1 AREA - GRADE EL.
COLS-1-DW-111-002-104	CT-1 & HRSG-1 AREA- ELEV. LOOKING EAST
COLS-1-DW-111-002-201	HRSG-2 AREA - GRADE EL.
COLS-1-DW-111-002-202	HRSG-2 AREA - EL. 155'-2"
COLS-1-DW-111-002-203	CT-2 AREA - GRADE EL.
COLS-1-DW-111-002-204	CT-2 & HRSG-2 AREA - ELEV. LOOKING WEST
COLS-1-DW-111-002-301	ST AREA - GRADE EL.
COLS-1-DW-111-002-302	ST AREA - EL. 121'-6"
COLS-1-DW-111-002-303	ST AREA - EL. 142'-9"
COLS-1-DW-111-002-304	ST AREA - ELEV. LOOKING NORTH

10 0 10 20

GRAPHIC SCALE IN FEET

½" = 1'

Source: WorleyParsons LTD., Drawing COLS-1-DW-111-002-305A, 07/30/08

FIGURE 2-2D
ELEVATION OF STEAM GENERATOR LOOKING EAST
COLUSA GENERATING STATION
PACIFIC GAS AND ELECTRIC
APPLICATION FOR CERTIFICATION
AMENDMENT 1

CH2MHILL

EY082006001SAC Figure_2-2D.ai 08.11.08 tdaus

Item	Description	Units	NATURAL GAS FUEL	
			Case A 701354s1_c1g1 1155	Case B 701354s1_c2g2 1189
A. Operation Description				
1	Ambient Temperature	°F	59.00	94.00
2	Ambient Relative Humidity	%	60.00	25.40
3	Ambient Wet Bulb Temperature	°F	51.46	67.91
4	Ambient Pressure	psia	14.67	14.67
5	Supplemetary Firing		Off	On
6	Inlet Air Evaporative Cooling		Off	On
7	CTGs in Operation		2.00	2.00
8	CTG Load	%	100	100
B. Cycle Operating Parameters				
1	Stack Exit Temperature	°F	188	180
2	STG Throttle Pressure	psia	1015	1912
3	STG Throttle Flow	pph	910953	1752568
4	Throttle Temperatures	°F	1048	1046
5	Cold Reheat Temperature	°F	756	737
6	Cold Reheat Pressure	psia	350	633
7	Hot Reheat Flow	pph	981354	1781476
8	Hot Reheat Pressure	psia	313	565
9	Hot Reheat Temperature	°F	1049	1046
10	LP Steam Flow	PPH	114572	21212
11	LP Steam Enthalpy	BTU/Lbm	1301	1365
12	STG Exhaust Flow	pph	1106978	1817882
13	STG Exhaust Enthalpy	BTU/Lbm	1051	1050
14	STG Exhaust Pressure	inHgA	1.92	4.35
16	Air Cooled Condenser ITD	°F	41.27	32.81
17	HP Piping Pressure Drop	psid	26.85	50.00
18	HRH Piping Pressure Drop	psid	8.42	15.00
19	CRH Piping Pressure Drop	psid	6.24	12.00
20	LP Piping Pressure Drop	psid	10.00	0.28
	Steam Parameters at HRSG			
1	Main Steam Temperature at HRSG	°F	1051	1050
2	Main Steam Pressure at HRSG	psia	1042	1962
3	Main Steam Flow at HRSG	pph	455474	876284
4	Cold Reheat Temperature at HRSG	°F	753	734
5	Cold Reheat Pressure at HRSG	psia	449953	621
6	Cold Reheat Flow at HRSG	pph	450478	865738
7	Hot Reheat Temperature at HRSG	°F	1052	1049
8	Hot Reheat Pressure at HRSG	psia	344	580
9	Hot Reheat Steam Flow at HRSG	pph	490677	890738
10	LP Steam Pressure at HRSG Outlet	psia	69	96
11	LP Steam Pressure at Tied-in Tee from two HRSGs	psia	64	96
12	LP Steam Pressure at ST Tied-in point	psia	59	96
13	LP Steam Flow at HRSG	pph	57286	10606
14	IP Steam Temp at HRSG	°F	522	476
15	IP Steam Flow at HRSG	pph	40724	0
16	IPE Extraction water Temp to FG HTR	°F	398	476
17	IPE Extraction water Flow to FG HTR	pph	55155	42094
18	Condensate Temp to HRSG	°F	97	122
19	Condensate Flow to HRSG	pph	555486	955985
20	Gas Temp Entering HRSG	°F	1116	1132
21	Gas Flow Entering HRSG	pph	3604001	3489240
22	HP Steam Flow Dumped to CRH	pph	0	25000
23	LP DA Venting Flow	pph	2000	2000
C. Plant Performance				
1	CTG Output each	kW	174031	167268
2	STG Output	kW	187658	327678
3	Total Plant Gross Output	kW	535720	662214
4	Aux Loads and losses	kW	15290	22214
5	STG to CTG Output Ratio	%	53.92%	97.95%
6	**Net Plant Output (1)**	**kW**	**520,430**	**640,000**
7	**Net Plant Heat Rate**	**BTU/kW-Hr LHV**	**6,197**	**6,733**
8	**Net Plant Heat Rate (2)**	**BTU/kW-Hr HHV**	**6,873**	**7,467**
D. Plant Fuel Consumption				
1	CTG Fuel Consumption, each	MMBTU/Hr LHV	1612.6	1577
2	Duct Burner Fuel Flow, each	kpph	0.00	28.33
3	DB Fuel Heat Input, each	MMBTU/Hr LHV	0	575
4	Total Fuel Gas Consumption	MMBTU/Hr LHV	3225.3	4309

NOTE: The above table are estimates only and do not represent Gemma's Guarantee

FIGURE 2-3
HEAT AND MASS BALANCE
COLUSA GENERATING STATION
PACIFIC GAS AND ELECTRIC
APPLICATION FOR CERTIFICATION
AMENDMENT 1

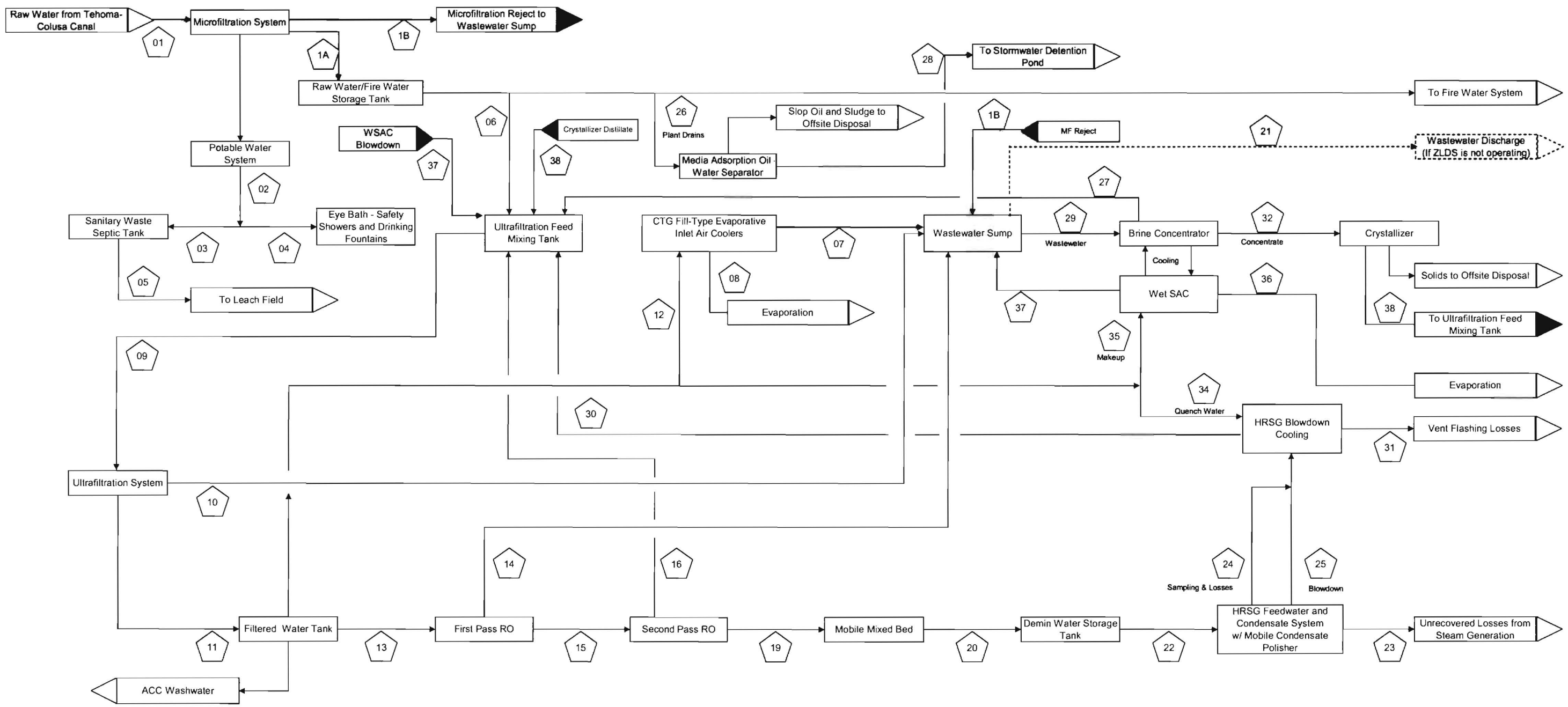


FIGURE 2-4
WATER BALANCE
COLUSA GENERATING STATION
PACIFIC GAS AND ELECTRIC
APPLICATION FOR CERTIFICATION
AMENDMENT 1

Source: WorleyParsons LTD., 05/09/08

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SECTION 3

Environmental Analysis of the Project Changes

The proposed project description changes are all contained within the licensed project site and no additional ground-disturbing activities are expected. In addition, the proposed changes will not require a change in the construction workforce, equipment, or schedule. Therefore, impacts to environmental disciplines that analyzed impacts based on ground disturbance and construction workforce/equipment are expected to be the same as those analyzed during the licensing proceeding. This section presents an analysis of the proposed project changes on the 16 discipline areas, consistency with LORS, and a discussion of cumulative impacts.

3.1 Air Quality

This section reviews the potential air quality impacts associated with the proposed changes to the project description relative to the air quality impacts identified in the CEC Final Decision. The following areas were reviewed:

- Construction
- Operations
- Cumulative Impacts
- Mitigation Measures
- Compliance with LORS
- Conclusions

3.1.1 Proposed Emissions

3.1.1.1 Construction Emissions

No changes to the construction workforce or schedule are expected. Therefore, the construction air quality impacts of the proposed project changes are expected to be comparable or slightly lower (due to the elimination of several pieces of equipment and efficiencies resulting from the proposed general arrangement changes).

3.1.1.2 Operating Emissions

Proposed modifications with potential to affect air quality impacts due to the revised operational activities include:

- Eliminating the auxiliary boiler
- Eliminating the emergency generator diesel engine
- Eliminating the firewater pump diesel engine
- Reducing the allowable PM10/PM2.5 emissions from the two CTG/HRSG stacks
- Adding a small WSAC heat exchanger unit as part of the auxiliary cooling system
- Adding a small water bath heater

Tables 3.1-1 summarizes the revised hourly emissions of criteria pollutants generated from operational activities as a result of the elimination of the auxiliary boiler, emergency generator and firewater pump, the reduced $PM_{10}/PM_{2.5}$ emissions from the CTGs and the addition of the water bath heater and the WSAC. A calculation of the emissions from the modified project including the CTGs, the water bath heater and the PM_{10} emissions from the WSAC is included in Appendix 3.1-1.

TABLE 3.1-1
Change in Maximum Hourly Emissions, lb/hour

	Emissions, lb/hour				
Operational Source	**NO_x**	**SO_x**	**CO**	**POC**	**$PM_{10}/PM_{2.5}$**
Auxiliary Boiler[a]	(0.79)	(0.13)	(1.61)	(0.18)	(0.33)
Emergency Generator[a]	(13.90)	(0.01)	(0.32)	(0.15)	(0.09)
Firewater Pump[a]	(1.98)	(<0.01)	(0.22)	Incl in NOx	(0.08)
CTGs	No change	No change	No change	No change	(13.2)[b]
Water Bath Heater	0.391	0.028	0.793	0.027	0.029
WSAC	—	—	—	—	0.24
Change in Max. Hourly Emissions	(16.279)	(0.112)	(1.357)	(0.303)	(13.46)

Negative values shown in parentheses.

[a]Source eliminated. Value from Table 9 of the CEC Final Decision dated April 23, 2008.

[b]Previous value was 40.2 lb/hr (from Table 8 of the CEC Final Decision) total for two turbines, revised value is 27 lb/hr.

3.1.2 Environmental Consequences

3.1.2.1 Construction Impacts

Because no significant changes to the construction activities are anticipated as a result of the proposed changes to the project, no significant change to the original assessment of construction impacts is expected.

3.1.2.2 Operations Impacts

The immediate effect of the proposed amendment on project emissions is the reduction in emissions, as shown in Table 3.1-1. However, the change in the physical configuration of the project could affect the modeled impacts of the project by altering the dispersion of the CTG exhaust.

To evaluate the potential impacts of the change in the physical configuration of the project, the BPIP-Prime analysis submitted as part of the original ambient air quality impact analysis was rerun with the new general arrangement. The AERMOD impact analysis for the modified sources was then re-run for the new emissions rates. The results of the AERMOD analysis are shown in Table 3.1-2. The revised BPIP-Prime analysis and the new AERMOD analysis are both provided separately on CD (five copies) as part of this filing.

TABLE 3.1-2
Worst-Case Facility Impacts on Ambient Air Quality

Pollutant	Averaging Period	Max Modeled Impact[a] ($\mu g/m^3$)	Background[b] ($\mu g/m^3$)	Total Impacts ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)	State Standard ($\mu g/m^3$)
NO_2	1-hour	182.9	131.8	309.5	—	339
	Annual	0.6	24.6	25.2	100	57
SO_2	1-hour	14.33	78.0	92.3	—	655
	24-hour	0.05	2.6	2.6	365	105
CO	1-hour	1,450	4,889	6,339	40,000	23,000
	8-hour	102	3,767	3,869	10,000	10,000
PM_{10}	24-hour	3.3	91	94.3	150	50
	Annual	0.38	25.5	25.9	50[c]	20
$PM_{2.5}$	24-hour	3.3	27.0[d]	30.3	35	—
	Annual	0.38	11.0	11.4	15	12

[a] Ozone Limiting Method (OLM) used in NO_2 modeling. NO_2 1-hour results reflect one turbine running and second turbine undergoing cold start up.

[b] Background concentrations from ARB ADAM and EPA AirDATA websites, accessible at *http://www.arb.ca.gov/aqd/aqdpage.htm* and *http://www.epa.gov/air/data/reports.html*. NO_2 and CO from Yuba City. SO_2 from Sacramento. PM_{10} and $PM_{2.5}$ from Colusa.

[c] Federal annual PM_{10} standard withdrawn effective December 18, 2006.

[d] 3-year average 98th percentile value.

The proposed changes provide a net reduction in air quality impacts. Therefore, the CEC's conclusion that the air quality impacts are not significant is still applicable and in fact the project modifications will result in a net air quality benefit compared to the initial project design presented in the AFC.

3.1.3 Cumulative Impacts

Because no increase in ambient impacts are anticipated as a result of the proposed changes to the project, no significant change to the original assessment of the cumulative impact is expected.

3.1.4 Mitigation Measures

The proposed project modifications would result in a net reduction in air quality impacts when compared to the initial project design presented in the AFC. Therefore, no new mitigation measures are required.

3.1.5 Laws, Ordinances, Regulations, and Standards

The project will be in compliance with all applicable LORS regarding long-term and short-term project impacts.

3.1.6 Conclusions

CEC Staff's conclusions that air quality impacts from construction and operation of the CGS project are less than significant are still applicable.

3.2 Biological Resources

The proposed project changes are contained within the approved project site and no additional ground disturbance is expected. The impacts associated with the disturbance of the project site were analyzed during the licensing proceeding, with 20 COCs required to mitigate impacts to below significant levels. PG&E believes that these conditions do not require modification and will mitigate impacts from the proposed project changes and comply with the applicable LORS.

3.3 Cultural Resources

The proposed project changes are contained within the approved project site and no additional ground disturbance is expected. The impacts associated with the disturbance of the project site were analyzed during the licensing proceeding, with seven COCs required to mitigate impacts to below significant levels. PG&E believes that these conditions do not require modification and will mitigate impacts from the proposed project changes and comply with the applicable LORS.

3.4 Land Use

The proposed project changes are contained within the approved project site and no additional ground disturbance is expected. The impacts associated with the disturbance of the project site were analyzed during the licensing proceeding, with two COCs required to mitigate impacts to below significant levels. PG&E believes that these conditions do not require modification and will mitigate impacts from the proposed project changes and comply with the applicable LORS.

3.5 Noise

This section analyzes the potential change in noise impacts as a result of the proposed modifications to the project. The proposed changes having the greatest influence on noise include the following:

- Replacing the 45-cell ACC tower with a 42 cell ACC
- Elimination of the auxiliary boiler
- Reduction in the number and placement of fin fan coolers

The effects of these modifications on noise impacts are discussed in the following subsections

3.5.1 Affected Environment

No new potentially noise sensitive uses have been identified in the project area.

3.5.2 Environmental Consequences

3.5.2.1 Construction Impacts

The proposed project changes do not result in significant changes to the potential noise emissions during construction.

3.5.2.2 Operational Impacts

A detailed noise model incorporating the proposed new project design features was developed by URS Corporation. The results of that analysis are summarized below. As is the case on all projects at this stage of development, the data presented are representative of anticipated project equipment levels and resulting overall project noise levels. The noise analysis will continue to be refined as detailed design efforts progress to ensure the overall project noise objectives are met.

Table 3.5-1 presents the new equipment noise levels used to develop the model of the proposed project changes. All other noise source levels are included in the AFC.

TABLE 3.5-1
Summary of Octave Band Sound Power Levels of Proposed Equipment (dB Flat)

Equipment	31.5	63	125	250	500	1K	2K	4K	8K	Overall dB
Air Cooled Condenser (per cell)	110	107	107	103	100	97	90	85	81	114
Boiler Feed Water Pump		107	106	106	106	015	103	101	98	114

Sound power levels are based on currently available data and do not reflect attenuation due to mitigation measures such as barriers, shielding, enclosures, buildings, etc

Table 3.5-2 presents the anticipated steady state noise level of the project under full load at the locations identified in Condition of Certification NOISE-4. These results indicate a reduction of 6 dB from the levels originally modeled and previously presented in the initial AFC.

TABLE 3.5-2
Predicted Project Noise Level (dBA L_{90})

Location	Approx. Distance to Project	Project Noise Level (dBA L_{90})
ML1	8,400	30
ML2	12,075	32

3.5.3 Cumulative Impacts

Table 3.5-3 presents the cumulative levels based on the available monitoring and project noise level data. This shows a maximum increase of 3 dBA.

TABLE 3.5-3
Summary of Cumulative Noise Levels (dBA L_{90})

Location	Ambient Background Level (dBA L_{90})	Project Noise Level	Cumulative Noise Level	Predicted Change
ML1	31	30	**34**	+3
ML2	32	32	**35**	+3

The changes proposed in the project reduce the cumulative increase in L_{90} at the nearest sensitive receptors compared to the Final Staff Assessment (CEC-700-2007-03-FSA, NOISE Table 8).

3.5.4 Mitigation Measures

Noise modeling reflecting the proposed project modifications indicate that noise levels would be reduced compared to the project design presented in the initial AFC. Therefore, no new mitigation measures are required.

3.5.5 Laws, Ordinances, Regulations and Standards

The project is located within unincorporated Colusa County approximately one mile south of the Glenn County line. The project complies with all applicable LORS.

3.6 Public Health

The diesel emergency generator and diesel fire pump were the largest contributors to the cancer risk and the chronic total hazard index (THI) in the original CGS health risk assessment due to their emissions of diesel particulate matter (DPM). Removal of the two diesel engines and the resulting elimination of DPM emissions during operation would not increase project emissions or ambient impacts and these changes would not result in an increase in the cancer risk or the chronic THI.

Acute THI impacts were driven by the amount of natural gas combusted during operation. The proposed changes would not affect the amount of natural gas combusted in the CTGs and would reduce the amount of natural gas combusted in the ancillary sources. These changes would not result in an increase in the acute THI.

Because these proposed changes would not increase project emissions or ambient impacts, the changes would not result in an increase in the cancer risk or in the chronic or acute THI that were evaluated for the project as originally licensed, and the CEC's determination is still valid.

3.7 Worker Safety and Health

The CEC Final Decision found that the project would not result in significant impacts to worker health and safety with the implementation of the seven COCs. The proposed project changes will not alter the basis for this determination.

3.8 Socioeconomics

The proposed project changes are not expected to alter the construction workforce or significantly alter the project finances. The socioeconomic impacts associated with the construction and operation of the project are expected to be identical to those analyzed during the licensing proceeding. PG&E believes that implementation of the two COCs mitigate the socioeconomic impacts to below significant levels. PG&E believes that these conditions do not require modification and will mitigate impacts from the proposed project changes and comply with the applicable LORS.

3.9 Agricultural Resources

The CEC Final Decision found that the project site was located in an appropriately zoned area and the project is a compatible use. The CEC further determined that conversion of the project site from farmlands to an industrial use would not have an adverse significant impact on agricultural resources. The proposed changes to the project design do not alter the basis for this conclusion. Additionally, implementation of the two Land Use COCs will ensure the project as proposed will not result in significant adverse impacts.

The project as proposed is expected to comply with all applicable land use LORS. Therefore, no impacts to agricultural lands are expected.

3.10 Traffic and Transportation

The proposed changes in the project design have not altered the construction workforce estimates or timing used in the licensing proceeding. Therefore, traffic and transportation impacts are expected to be the same as those analyzed during the licensing proceeding.

Likewise, the proposed changes will not result in additional operational employee or material deliveries to the facility.

3.11 Visual Resources

The WSAC has the potential to generate water vapor plumes that would result in increased visual resource impacts. However, the WSAC operation is being added to the project to increase steam turbine lubricating oil cooling during warm ambient air temperatures (above 80°F). Under this expected operating profile, significant water vapor plumes would not be expected. Furthermore, the WSAC is significantly smaller in physical size and cooling capacity than a cooling tower that would be used for condensing steam from a project the size of CGS. This smaller size (both physical and cooling capacity) will result in a smaller visible plume that will likely be masked by the other larger project features (ACC, HRSGs,

turbine inlet conditioning system, and turbine skids). Therefore, the proposed project design changes are not expected to result in significant visual resources impacts and the implementation of the three COCs will ensure the project as proposed will not result in significant adverse impacts.

3.12 Hazardous Materials Management

The only changes in the use of hazardous materials are the inclusion of water treatment chemicals for the WSAC. These chemicals include a corrosion inhibitor, sulfuric acid, and sodium hypochlorite. Appendix 3.12 presents the material data safety sheets for these materials. The chemicals will be stored in 400-gallon totes and less than 10 deliveries are expected annually due to the limited operating schedule for the WSAC (warm ambient conditions). Because these materials are common and do not pose a risk to the environment or worker safety, they are not expected to result in significant hazardous materials impacts.

3.13 Waste Management

No changes are proposed for the types, quantities, or frequency of waste generation by the project site during either construction or operation.

3.14 Water Resources

The proposed changes to the project design will not result in any changes to the supply or use of construction water. Therefore, water resource impacts from construction of the proposed project design are expected to be the same as those analyzed during licensing.

The project is expected to increase operation water demand to 21 acre-feet per year (AFY) on an annual average basis. This increase is due to the addition of the WSAC system. The total annual average water use is expected to be 151 AFY (increased from 130 AFY). The Glenn-Colusa Irrigation District (GCID) agreement provides up to 180 AFY of water to the project. The Final Staff Assessment concludes that the long-term sale of up to 180 AFY of GCID's water will not cause or contribute to impacts of surface water supply.[1] Therefore, increasing the annual average water use to 151 AFY is consistent with the basis used by the CEC to license the project. In addition, this slight increase in water use is expected to be consistent with applicable LORS.

3.15 Geologic Hazards and Resources

The CEC Final Decision found that the project would not have an adverse significant impact on geologic resources. The proposed changes to the project design do not alter the basis for this conclusion. Additionally, implementation of the geologic resources COCs will ensure the project as proposed will not result in significant adverse impacts.

The project as proposed is expected to comply with all applicable geologic hazard and resources LORS.

[1] CGS Final Staff Assessment (CEC-700-2007-003-FSA, page 4.9-12.

3.16 Paleontological Resources

The CEC Final Decision found that the project would not have an adverse significant impact on paleontological resources. The proposed changes to the project design do not alter the basis for this conclusion. Additionally, implementation of the seven paleontological resources COCs will ensure the project as proposed will not result in significant adverse impacts.

The project as proposed is expected to comply with all applicable paleontological resources LORS.

3.17 Cumulative Impacts

This amendment will not change the assumptions or conclusions made in the CEC Final Decisions the proposed design changes will not result in cumulative impacts not already analyzed by the CEC.

3.18 Laws, Ordinances, Regulations, Standards

The CEC Final Decision certifying the Project concluded that the project complied with all applicable LORS. The potential impacts from modifications described in this amendment will be equal to or less than the impacts analyzed in the CEC Final Decision.

SECTION 4

Proposed Modifications to the Conditions of Certification

Consistent with the requirements of the CEC Siting Regulations Section 1769 (a)(1)(A), this section addresses the proposed modifications to the project's COCs.

The proposed modifications to the applicable of COCs are presented in Appendix 4.

SECTION 5

Potential Effects on the Public

Consistent with the requirements of the CEC Siting Regulations Section 1769 (a)(1)(G), this section addresses the proposed amendment's effects on the public.

The proposed project design changes are expected to result in comparable impacts to the public as were analyzed during project licensing. Therefore, impacts to the public are expected to be the same or slightly lower than those analyzed during the license proceeding for the project.

SECTION 6

List of Property Owners

Consistent with the CEC Siting Regulations Section 1769(a)(1)(H), the property owners affected by the proposed modifications are presented in Appendix 6.

SECTION 7

Potential Effects on Property Owners

Consistent with the CEC Siting Regulations Section 1769(a)(1)(I), this section addresses potential effects of the proposed amendment on nearby property owners, the public, and parties in the application proceeding.

The proposed project design changes are expected to result in comparable impacts to the project as licensed. Therefore, impacts to the property owners are expected to be the same or slightly lower than those analyzed during the license proceeding for the project.

APPENDIX 2

Natural Gas Water Bath Heater System and Wet Surface Air Cooler Specification

WorleyParsons
resources & energy
2675 Morgantown Road, Reading, PA 19607 · Tel: (610) 855-2000 · Fax (610) 855-2182

2675 Morgantown Road, Reading, PA 19607
(610) 855-2000 • FAX (610) 855-2182

Control No.: File: COLS-1-CO-096801-WMDD-0425 WBS: N/A

TO:	DATE:	ACTION DATE:
Pacific Gas & Electric Company **P.O. Box 770000** **Mail Code N11E** **San Francisco CA 94177-0001** ATTENTION: **Hoc Phung**	**7/16/2008**	7/22/2008

PROJECT: **Colusa Generating Station**

DESCRIPTION OF CONTENTS: **INDIRECT FIRED WATER BATH HEATER ENGINEERING REQUISITION, SPECIFICATION & DATASHEET - PG&E REVIEW**

Issuing Engineer **Steven J. Ruzze** Project Engineering Manager Deanna Witzel

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Transmittal No: COLS-1-CO-096801-WMDD-0425
Date: 7/16/2008
Subject: INDIRECT FIRED WATER BATH HEATER ENGINEERING REQUISITION, SPECIFICATION & DATASHEET - PG&E REVIEW

Status Legend

P Preliminary — Represents acceptable design concept, subject to change. Can be released for bidding purposes but will require approval prior to placing orders.

Issued Document No./ Electronic File Name	Sht	Rev	Titles	Status
COLS-1-DS-096801-0001 COLS-1-DS-096801-0001-RB.DOC	-	B	DATASHEET DESIGN REQUIREMENTS FOR INDIRECT FIRED WATER BATH HEATER	P
COLS-1-ER-096801 COLS-1-ER-096801-RB.DOC	-	B	ENGINEERING REQUISITION INDIRECT FIRED WATER BATH HEATER SKID	P
COLS-1-SP-096801 COLS-1-SP-096801-RB.DOC	-	B	SPECIFICATION INDIRECT FIRED WATER BATH HEATER	P

Total: 3 Documents

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DESIGN REQUIREMENTS FOR
INDIRECT FIRED WATER BATH HEATER
Sheet 1 of 4

Tag Number(s)	1-561-SKD-9001
Quantity Required	1
Location (outdoor/indoor)	Outdoor
Ambient Conditions	See Site Specific Data in COLS-1-ER-096801
Process Fluid	Natural Gas
Design Flow Rate	229,178 lb/hr
Minimum Flow Rate	1,800 lb/hr
Specific Gravity at 60°F (Ideal Gas)	0.59
"Design" Temperature In	33°F
Normal Operating Temperature In	50°F
Temperature Out	100°F
Operating Pressure	525 psig – 911 psig
Design Pressure	925 psig
Design Temperature	130°F
MDMT	18°F
Max Process Flow Pressure Drop	5 psi
Outlet Connection	12" RFF 600#
Inlet Connection	12" RFF 600#
Process Coil Material	Seamless SA-106, Gr. B pipe
Water Bath Composition	Water
Fuel	Natural Gas (See Fuel Gas Analysis at the end of this Datasheet)
Heating Value (HHV)	22,520 Btu/lb (HHV/LLV = 1.109)
Heating Value (LHV)	20,300 Btu/lb
Supply Temperature	18°F – 114°F
Supply Pressure	525 psig – 911 psig
Heater Shell Material	5/16" min thick SA-36
Power Available	120V single phase
Hydrostatic Test Required (yes/no)	Yes
Noise Requirement	<85 dBA at 3 feet per paragraph 3.1.10 of COLS-1-SP-096801
Service Life, yrs.	30

COLS-1-DS-096801-0001
INDIRECT FIRED WATER BATH HEATER DATASHEET
Information to be supplied by Seller, except as noted.
Sheet 2 of 4

Tag Number(s)	
Number of heaters required	
Manufacturer Name / Model Number	
Delivery, weeks	
Stack Height	15 ft
Stack Outlet Diameter	16 in
Maximum Sound Level at Stack Outlet	
Maximum Stack Airflow	
Maximum Stack Velocity	
Maximum Sound Level at any point 3 ft above ground and 3ft from heater	
Process Coil	
Design Pressure (psig)	
Design Temperature (°F)	
Hydrotest Pressure (psig)	
Material	
Maximum Flow Rate	
Burner	
Manufacturer	
Model	
Size	
Burner Fuel Supply Inlet Connection Size and Type	
Natural Gas Press. Req'd at Burner	
Combustion Efficiency	
Maximum Heat Input (HHV basis) (MMBtu/hr)	
Minimum Heat Input (HHV basis), (MMBtu/hr)	
Maximum Volumetric Heat Release Rate (Btu/hr-in^2) (HHV basis)	
Burner Turndown Capability	
Maximum Capacity (HHV basis)	
Maximum Gas Consumption for Pilot (Btu/hr)	

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INDIRECT FIRED WATER BATH HEATER DATASHEET
Information to be supplied by Seller, except as noted.
Sheet 3 of 4

Emissions (Maximum)	
NO_X @ 3% (lb/MMBtu)	0.0793
CO @ 3% (lb/MMBtu)	0.0391
VOC (lb/MMBtu)	0.0027
PM_{10} (lb/MMBtu)	0.0029
SO_2 (0.3 gr S/100 SCF)(lb/MMBtu)	0.0008
SO_2 (1.0 gr S/100 SCF)(lb/MMBtu)	0.0028

Heater Shell and Firetube	
Heater Shell Material	
Safety Relieving Device	
Insulation Thickness	
Insulation Material	
Design Pressure (psig)	
Design Temperature (°F)	
Heater Rating (Heat transferred to gas) and rated conditions (i.e. gas inlet temp, water-bath temp, etc.)	
Average Heat Flux Rate per square foot	
Maximum Bath Temperature (°F)	
Water volume of the heater (gal)	
Hydrostatic Test Pressure (psig)	
Fire Tube Type	
Fire Tube Material	
Maximum pressure drop across firetube flame arrester (in wc)	

Dimensions:	
Mounting Base Size, in.	
Required Min. Clearance, Side (ft)	
Required Min. Clearance, End (ft)	
Required Min. Clearance, Above (ft)	

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INDIRECT FIRED WATER BATH HEATER DATASHEET
Information to be supplied by Seller, except as noted.
Sheet 4 of 4

Shipping Weight (lbs.) _____
Approximate Filled Weight (lbs.) _____

Heaviest Piece Handled During
Installation _____
Part Name _____
Weight (lb) _____

Heaviest Piece Handled During
Maintenance _____
Part Name _____
Weight (lb) _____

FUEL GAS ANALYSIS

	PERFORMANCE DESIGN VALUES
C6	Less than 0.01% mol.
Propane	0.1% mol.
I Butane	Neg.
N Butane	0.02% mol.
Iso Pent	Neg.
N Pent	0.01% mol.
Nitrogen	2.2% mol.
Methane	94% mol.
CO2	0.66% mol.
Ethane	3% mol.
Total	100%

WorleyParsons

resources & energy

COLUSA GENERATING STATION

SPECIFICATION

COLS-1-SP-096801

REV. B

FOR

INDIRECT FIRED WATER BATH HEATER

JULY 2008

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1.0 SCOPE

1.1 GENERAL

1.1.1 This Specification describes the technical requirements for designing, fabricating, inspecting, testing, cleaning, painting, packaging, and delivering of one (1) indirect natural gas fired water bath heater package for heating natural gas; complete with all accessories and controls as herein defined to operate as an stand alone equipment receiving only high level commands from the Buyer's DCS.

1.1.2 Seller is expected to comply fully with the complete requirements of this specification.

1.1.3 The Manufacturer of this equipment shall have experience in the design and manufacture of fuel gas heater systems.

1.1.4 All equipment, controls, instrumentation, etc. shall be weatherproof, suitable for outdoor installation and designed for unattended operation. The Seller shall clearly indicate the processes and materials used in preparing the heater shell and stack for painting.

1.1.5 All electrical equipment and instrumentation shall be completely pre-piped, wired and factory tested.

1.1.6 Related Specifications

1. Specification 01300 – Supplier Submittal Requirements, Mechanical
2. Specification 05061 – Structural Welding
3. Specification 05120 – Structural Steel
4. Specification 09900 – Painting
5. Specification 15062 – Piping
6. Specification 16180 – Electrical Requirements for Packaged Mechanical Equipment
7. Specification 16908 – PLC System Requirements
8. Specification 16941 – Controls and Instrumentation Installation
9. Specification 17180 – Instrumentation Requirements for Packaged Mechanical Equipment
10. COLS-1-LS-30A-3S – Carbon Steel, Class 300; Fuel Gas; Piping Line Specification
11. COLS-1-LS-60A-4S – Carbon Steel, Class 600; Fuel Gas; Piping Line Specification

12. COLS-1-LS-60D-4S – Stainless Steel, Class 600; Fuel Gas; Piping Line Specification

1.2 WORK TO BE PROVIDED BY SELLER

The specification covers equipment items, work, procedures, and other requirements involved in the design, manufacture, test, and shipment of a complete packaged indirect natural gas fired water bath heater. The specification will thus include, but not be limited to the items listed below. The following shall be provided:

1.2.1 Design and manufacture an indirect natural gas fired water bath heater.

1.2.2 All interconnecting piping, vents and drains, valves, relief valves, fittings, and piping specialties necessary to enable the equipment to function properly.

1.2.3 All required instrumentation, junction boxes and controls, Buyer's package interface junction boxes and all associated instrument tubing, piping and wiring. All instrumentation shall be in accordance with COLS-1-TS-16941, Controls and Instrumentation Installation, and COLS-1-TS-17180, Instrumentation Requirements for Packaged Mechanical Equipment.

1.2.4 Accessories as specified and as required for performance in accordance with this specification.

1.2.5 Complete pre-assembly.

1.2.6 Insulation and heat tracing.

1.2.7 All documentation required in Engineering Requisition.

1.2.8 All required cleaning, finishing, packaging, shop testing (including providing documentation of shop testing and inspection), handling, and shipping of all equipment to the jobsite.

1.2.9 Recommended spare parts list with itemized pricing per paragraph 10.1.

1.2.10 Pricing for technical assistance during the installation and field testing of equipment and operations and maintenance training.

1.2.11 One (1) complete set of all special tools as required for installation and maintenance of the equipment.

1.2.12 Detailed skid and equipment drawings to allow design of the equipment foundation by the Buyer. These drawings shall indicate equipment/skid weight, base plate thickness, dimensioned anchor bolt pattern, anchor bolt size and anchor bolt material specification.

1.2.13 A California PE shall stamp the foundation interface drawings and calculations for all skids and equipment.

1.3 WORK TO BE PROVIDED BY BUYER

The following items are not included in the requirements of this specification and will be provided by Others:

1.3.1 Receipt, unloading, rigging, storing, handling and installing of the equipment.

1.3.2 Piping and wiring to Manufacturer's connections.

1.3.3 Foundation design and supply, including anchor bolts and nuts, and grout.

1.3.4 Field inspection and testing.

1.3.5 Field touch-up painting.

1.3.6 Control power supply, 120V, 60 Hz, single phase.

2.0 CODES AND STANDARDS

2.1 The following codes and standards are applicable to the equipment specified herein. The latest edition and published addenda of the following publications in effect on the date of contract award are a part of this section:

2.1.1 American National Standards Institute (ANSI)

2.1.2 American Society of Mechanical Engineers (ASME)

1. ASME Boiler and Pressure Vessel Code (ASME B&PVC), Sections II, V, VIII and IX

2. ASME/ANSI B31.1- Power Piping Code

2.1.3 American Society for Testing and Materials (ASTM)

2.1.4 American Welding Society (AWS)

2.1.5 International Conference of Building Officials (ICBO), "Uniform Building Code."

2.1.6 Instrument Society of America (ISA)

2.1.7 Occupational Safety and Health Standards (OSHA)

2.1.8 National Electrical Manufacturers Association (NEMA)

2.1.9 The Society for Protective Coatings (SSPC)

2.1.10 National Fire Protection Association (NFPA)

1. NFPA 85, "Boiler and Combustion Systems Hazards Code"

2.1.11 US Department of Labor, Code of Federal Regulation (CFR)

1. 29 CFR 1910

2.1.12 Codes and Standards of the applicable state

2.1.13 California Building Code (CBC); 2007

2.1.14 CalOSHA

2.2 In the event of any conflict between codes, or these technical specifications and codes, the more stringent regulation shall apply.

3.0 TECHNICAL REQUIREMENTS

3.1 GENERAL

3.1.1 The performance of the heater shall be in accordance with the Buyer's specifications and Data Sheets.

3.1.2 All components of the package shall be designed for outdoor service and shall be easily accessible for maintenance. Seller shall ensure that all materials and installation methods are suitable for the area classification where those electrical components will be operating.

3.1.3 The Seller shall guarantee the performance of the fuel gas heater at the values per Section 11.0.

3.1.4 The Seller shall provide Low-Emissions boilers and capable of operation at any load between MCR and burner turndown.

3.1.5 The Seller as an option shall provide in-situ continuous emission analyzer providing analog signals (4 to 20 mA) to interface with buyer equipment

3.1.6 The Seller shall provide a fuel gas meter to be used for NOx emission calculations.

3.1.7 The Seller shall assume full responsibility for all engineering design and coordination work required for combining the heater and controls, etc., into a reliable and efficient packaged assembly.

3.1.8 All materials of construction shall be those proven by service in similar designs and suitable for the specified conditions of service, including atmospheric conditions of pressure, temperature, and relative humidity.

3.1.9 Products which contain asbestos are prohibited. This prohibition includes such items as packing or gaskets, even though the item is encapsulated, or the asbestos fibers are impregnated with binder material.

3.1.10 No changes to the materials listed in the Seller's proposal shall be permitted after the contract award, without the prior approval of the Buyer.

3.1.11 Materials shall be identified by reference to appropriate ASTM specification, ANSI type number, etc. When no such appropriate designation is available, the manufacturer's code or trade name may be used. In such cases, the manufacturer shall be identified and the chemical composition and significant physical properties of the material shall be presented.

3.1.12 Design life shall be 30 years excluding expendable items.

3.1.13 The noise level produced by the heater through its full range of operation, including casing, burner and stack outlet radiated noise shall not exceed 85 dBA free-field measured 3 feet horizontally from the base of the equipment and 5 feet above floor level.

3.1.14 Manufacturer shall provide necessary noise abatement equipment, if required, to meet this specification.

3.2 DESIGN CONDITIONS

3.2.1 The heater shall be designed to heat the process fluid under the conditions defined in the Datasheet.

3.2.2 Fuel gas characteristics are as follows:

Fuel:	Natural Gas
Heating Value (HHV):	22,520 Btu/lb (HHV/LLV = 1.109)
Heating Value (LHV):	20,300 Btu/lb
Supply Temperature:	18 – 114°F
Supply Pressure:	525 – 911 PSIG

3.2.3 Electrical power is available as 120 volt, single phase. All electrical components shall be in compliance with the National Electrical Code.

3.2.4 The heater shall have the firetube and the process coil immersed in a water bath.

3.2.5 Burner shall be natural draft.

3.3 ACCESSORIES

The heater shall be furnished complete with, but not limited to, the following accessories:

3.3.1 Removable firetube and coil.

3.3.2 Self-supported stack. The stack may not be equipped with rain hats or other devices that impede the upward flow of the exhaust gases. The stack height shall be 30 feet above grade. The stack shall be provided with factory installed expanded metal for personnel protection. Seller to make every effort to utilize only one (1) stack. Should this become a problem, Seller is to inform Buyer as soon as possible.

3.3.3 Burner assembly complete with burner and temperature control piping.

3.3.4 Burner management system with solid state ultra-violet flame scanner and supervision in compliance with NFPA 85.

3.3.5 Pilot burner assembly with drip leg for condensate.

3.3.6 Electronic Temperature control; (0-150°F range).

3.3.7 Triple redundant bath temperature thermocouples developing shutdown signal from a 2 out of 3 logic used to trip fuel gas control valve.

3.3.8 An expansion chamber with pressure/vacuum hatch and shielded gauge glass assembly which will accommodate expansion between 18°F and water bath temperature.

3.3.9 Dial thermometer for water bath temperature with thermowell.

3.3.10 Main fuel gas regulator system according the piping layout and instrumentation for protection recommended by NFPA 85

3.3.11 Pilot gas regulator, interconnecting piping, and instrumentation for protection recommended by NFPA 85.

3.3.12 Firetube flame arrestor. Pressure drop across arrestor at design or worse conditions shall be indicated by Seller.

3.3.13 FM approved valve train and control system components and design.

3.3.14 High temperature stack switch, with adjustable setting and manual reset, stack thermometer and plugged sample opening.

3.3.15 Insulated and lagged heater shell.

3.3.16 Pilot light safety shutdown.

3.3.17 Screen-type stainless steel spark arrestor for stack.

3.3.18 Automatic pilot light re-igniter.

3.3.19 Electrically operated double block and bleed isolation valves for the fuel gas supply line with close and open limit switches.

3.3.20 Heat tracing and insulation for fuel gas train and instruments.

3.4 PROCESS COIL

3.4.1 The coil shall be removable by bolted disassembly from the shell end opposite from the firebox.

3.4.2 The gas inlet and outlet header connections shall be flanged. The gas inlet shall be on the north side of the heater. The gas outlet shall be on the south side of the heater. The stack and burner shall be at the west end of the heater. The connection for the small bore gas supply to the heater's burners shall be internal to the Seller's design. There should not be a Buyer's connection point for burner supply gas.

3.4.3 The coil shall be constructed of seamless SA-106, Gr. B pipe.

3.4.4 The coil shall be designed, fabricated, hydrotested and stamped in accordance with the ASME Pressure Vessel Code Section VIII, Div. I. Test records shall be submitted to the Buyer before shipment of the heater.

3.4.5 The coil shall be 100% radiographed and a record of inspection is to be supplied to the Buyer prior to shipment of heater.

3.4.6 A supplementary dial thermometer shall be mounted in a thermowell on exit gas pipe.

3.4.7 A 1/8" corrosion allowance shall be provided.

3.5 HEATER SHELL AND FIRETUBE

3.5.1 The firetube shall be of the U-tube type design.

3.5.2 The heater shell shall be constructed of 3/16" minimum thickness carbon steel. It shall be supported by two saddles designed to prevent excessive shell stress. Lifting lugs shall be provided.

3.5.3 The heater shall be provided with a water expansion chamber equipped with a thief hatch to prevent overpressurization of the shell and to accommodate expansion of the water bath. The expansion chamber shall be attached to the heater shell with a flanged connection.

3.5.4 The heater shell shall be insulated with 2-inch thick minimum fiberglass insulation, protected by aluminum jacketing. Insulation shall be removable where access is required.

3.5.5 Maintenance access to the firetube shall be through the flame arrester.

3.5.6 The firetube assembly shall be air tested to check for leaks. The heater shell shall be hydrostatically tested after the coil and firetube have been assembled by filling with water. Test results shall be documented and submitted to the Buyer.

3.5.7 A corrosion allowance of 1/16" shall be provided on the heater shell.

3.6 PIPING REQUIREMENTS

3.6.1 The package piping and valves shall also be in accordance with the referenced specifications.

3.6.2 The Seller's standard pipe and valve materials are acceptable if used in similar systems with pressure and temperature approved equal to and/or exceeding the design conditions of this specification.

3.6.3 The Seller shall supply all necessary piping, isolation valves and fittings for all lines for fuel gas, vents, drains, control air and instruments. All piping connections shall terminate with flanged or socket weld connections at the edge of the package. Each package shall include manual gas isolation valves.

3.6.4 Package piping shall be designed and fabricated to minimize and eliminate the possibility of gas leakage and provide for individual isolation for instruments and downstream piping without causing a system shutdown in order to isolate a leak or make repairs.

3.6.5 Seller shall furnish double manual vent valves and a relief valve.

3.6.6 Ball valves shall be used for gas piping.

3.6.7 Odd sizes (e.g., 1-¼", 2-½", 3-½", 5" or 7") shall not be used for isolation valving, instrument connection, package end connections.

3.6.8 All threaded openings not connected to piping shall be plugged with steel plugs. Threads shall be lubricated. All piping furnished by the Seller shall be installed and supported on the heater package. Piping shall provide proper flexibility and easy accessibility for operator maintenance and cleaning. When a system includes standby components, valves shall be provided and installed as required to allow removal of components for maintenance without draining the system or shutting down the heater.

3.6.9 Piping shall be firmly fixed in a neat and orderly arrangement and shall not obstruct access openings. Piping, tubing, or conduit shall be supported and protected to prevent damage from operation or maintenance. Piping shall be free of rust, slag, welding beads, and other foreign materials.

3.6.10 Instrument pressure take-off points shall be in accordance with COLS-1-TS-16941 and COLS-1-TS-17180. Each instrument take-off point shall have an isolation valve and all instrument air supply lines to control valves or instrument devices shall have isolation valves. Instrument isolation valves and fittings shall be Swagelok.

3.6.11 All instrument pressure connections, level bridle connection, etc., from a gas pressure vessel or piping header to the first instrument isolation block valve shall be welded or socket welded. Threaded joints with seal welded construction are not permitted. Threaded connections on instrument devices like pressure gauges, switches, transmitters, temperature indicators, etc. shall not be seal welded.

3.6.12 Relief valves for all equipment shall meet all Federal, State, and local regulations. The Seller shall furnish and install all relief valves required on each heater vessel within his Scope of Supply. The Seller shall determine sizes and set pressures for relief valves related to the equipment. The relief valve installations shall be complete with all valve vent piping extended to a safe location above the package. Relief valves shall be ASME stamped.

3.6.13 Drain and vent piping 2" and smaller shall be Schedule 80 minimum and not less than 1" O.D. All drains shall be manifolded into a common header with the appropriate check valves. Header size not to be less than 2".

3.6.14 Gas piping shall be radiographed in accordance with applicable code requirements.

3.7 VALVE AND EQUIPMENT TAGGING

3.7.1 The Seller shall provide a preliminary valve and equipment list as per the schedule. The Seller shall be responsible for updating the lists and permanently attaching a stainless steel tag to each valve and piece of equipment with the tag number and other design information imprinted on it. The tag number shall also be used on the Seller's P&ID. The Seller is responsible for updating the drawings as necessary.

4.0 CONTROLS

4.1 BURNER AND FIRING CONTROLS

4.1.1 A complete fuel gas train which meets requirements of the latest edition of NFPA 85, Section 2 or 3, as applicable, and which includes the components listed below shall be furnished. The instrumentation shall be provided with enough redundant instrumentation to assure proper equipment operation and protection from casualty conditions. The instrumentation shall meet the technical specification COLS-1-TS-17180. The base design shall include supplier's standard burner manufacturer.

1. Main fuel shutoff valve.

2. Y-type inlet strainer.

3. Electrically operated safety shutoff valves for fuel and pilot lines with double block and vent arrangement furnished with position limit switches

4. Burner gas pressure regulator and instrumentation required to meet NFPA 85 (i.e. low/ high fuel gas pressure switches).

5. Pilot gas pressure regulator and instrumentation required to meet NFPA 85 (i.e. low/ high pilot fuel gas pressure switches).

6. Pressure gauges on main fuel line, after each regulator, and at inlet to each burner.

7. Fuel gas preheat coil, pressure tested to 1203 psig. Seller must submit successful test results to Buyer.

8. Electrical high bath temperature shutdown.

9. Triple redundant level transmitters used for a 2 out of 3 low bath shutdown.

10. Additionally a float type Low bath level shutdown shall be provided.

4.1.2 All manually operated valves shall have hand-wheels suitable for addition of locking devices.

4.1.3 The heater shall be sized for the range of flow listed in paragraph 3.2.1 above.

4.1.4 A burner management system (BMS), as specified in paragraph 3.3.4, with ultra-violet flame scanner and supervision shall be furnished complete with flame relay, ignition transformer, safety shutdown switches and scanner cooling air blower if required to meet NFPA 8.5.

1. Equipment shall be pre-wired and mounted in a panel attached to the south side of the heater.

2. The BMS shall interface with Buyer plant control system via hardwired signals and through a communication link (Modbus over Ethernet)

3. All spark producing devices shall be rated for Class 1, Division 2, Group D service and wired to terminal strips inside an electrical cabinet.

4. A MFT (Master Fuel trip) relay shall be provided meeting NFPA 85 regulation

5. The BMS shall be provided as a standalone PLC and according to technical Specification COLS-1-TS-16908. The preferred PLC system shall be Allen Bradley 1756 Control Logix family, GE Fanuc or approved equivalent with written permission from the Buyer before design.

6. The hardwired interface, as a minimum, shall include the following:

- Remote Start/Stop
- General Trouble Alarm
- Running Indication
- Emergency Shutdown

4.1.5 A gas temperature controller and temperature control valve shall be provided. The temperature control valve will maintain temperature downstream of the main plant

pressure control valves. Redundant temperature feedback signals, from thermocouples (Type K) provided by others, will be hardwired directly to the temperature controller.

4.1.6 Natural draft burners shall be of the firetube type with a continuous pilot. The air inlet shall be equipped with a flame arrestor to prevent flashbacks to the exterior of the firetube.

1. A draft control device providing air adjustment.

2. The net thermal efficiency should be above of 75%.

4.2 CONTROL PANEL

4.2.1 All the instrumentation shall be factory wired to NEMA 4X enclosure housing burner management system, annunciator, pushbuttons, indicating lights and motor starter as required.

4.2.2 Indicating lights shall be provided for:

1. Power on.

2. Pilot on.

3. Main fuel on.

4.2.3 The control panel shall be equipped with a first-out annunciator system to alarm the following functions:

1. Flame failure.

2. High bath temperature.

3. Low bath water level.

4. High stack temperature.

5. Low combustion air pressure (if required).

4.2.4 Control Panel shall be located on the south side of the heater.

4.2.5 Control Panel shall interface with Plant Control System with stop/start and alarm signals.

5.0 SEISMIC REQUIREMENTS

5.1 Equipment design shall meet seismic design criteria as noted the site specific data section of Engineering Requisition.

6.0 ELECTRICAL REQUIREMENTS

6.1 ELECTRICAL EQUIPMENT

6.1.1 All electrical equipment shall be in full accordance with all specification requirements, including attached specifications.

6.1.2 The equipment shall be rated for installation in a Class 1, Division 2, Group D environment.

7.0 MATERIALS & WELDING

7.1 All welding shall be in accordance with ASME B&PV code, Section VIII or ASME B31.1, as applicable.

8.0 QUALITY ASSURANCE

8.1 CODE COMPLIANCE

8.1.1 It is the Seller's responsibility to obtain copies of all documents referenced in this specification. The referenced documents shall be binding. The Seller of the fuel gas heaters shall certify that the components, where applicable, shall be designed, fabricated, tested, and documented in accordance with applicable portions of ASME BPVC Section VIII, Division 1.

8.2 SOURCE INSPECTION

8.2.1 The Buyer may inspect all fabricated components during fabrication. Notification to the Buyer shall be provided in accordance with contract documents. It is the responsibility of the Seller to see that all requirements of this specification are adhered to. Failure of the Seller's inspector or Buyer's inspector to call for corrections of defects or deviations from specification shall not relieve the Seller of full responsibility for compliance.

9.0 CLEANING AND PAINTING

9.1 INTERNAL SURFACES:

9.1.1 All internal surfaces shall be free of gross contaminants such as heavy deposits of mill or heat-treating scale, oil, oxide films, slag, flux, weld splatter, dirt, metal chips, and abrasive particles. Achievement of this criterion shall be determined by visual inspection.

9.1.2 The interior surfaces of each vessel shall be cleaned in accordance with the requirements of SSPC SP-6.

9.1.3 The Seller's cleaning plan shall ensure that cleaning materials do not adversely affect the surface or base metal in the cleaning, manufacturing, or operational environments and that once established, the cleanliness level will be maintained during later manufacturing, shipping, and storage operations.

9.1.4 Internal surfaces which rust shall be protected against corrosion during shipment, storage, and installation with a protective coating which shall be removable using a water flush and shall present no disposal problems after removal.

9.2 EXTERNAL SURFACES:

9.2.1 External surfaces shall be smooth and free of gross contaminants such as heavy scale, rust, sand, blisters, weld splatter, metal chips, and heavy deposits of oil or grease.

9.2.2 The external surfaces shall be cleaned in accordance with the requirements of SSPC SP-6 and shop primed with the manufacturer's standard primer.

9.2.3 External surfaces, with the exception of machined surfaces, shall be given a shop coat of corrosion resistant primer suitable for the fluid.

9.2.4 Machined surfaces shall be protected against corrosion during shipment, storage, and installation with the application of one coat of a water soluble, rust-inhibiting coating.

9.2.5 Final painting of external surfaces shall be the Seller's standard for the heated fluid. The Seller shall provide materials and detailed instructions (cleaning, preparation and painting procedures) for field touch-up of the exterior surface coating of all items.

9.2.6 Final color shall be determined by the Buyer at a later date.

10.0 SPARE PARTS

10.1 Seller shall submit in accordance with the Engineering Requisition, a complete listing of recommended spare parts with pricing. The listing shall include the manufacturer of each part, description of each part including material of construction, the assembly or equipment in which each part will be used, and recommended quantities to be stocked.

11.0 GUARANTEES

11.1 The Seller shall guarantee that the equipment is capable of heating the process fluid as specified in section 3.2.1, at a guaranteed net thermal efficiency above 75%. If guaranteed performance is not met, Seller will be responsible for making adjustments to meet specified performance.

The Seller shall provide certified emissions factors based on design fuel flowing at design rate. The maximum emissions requirements are to be submitted to Buyer and Engineer as soon as possible. Seller to supply emission information on COLS-1-DS-096801-0001 and return to Buyer.

12.0 PACKAGING AND SHIPPING

12.1 The equipment shall be adequately protected against possible damage and corrosion during shipping, receiving, storing, and handling.

12.2 Any accessories shall be packed securely in weatherproof crates. If any component is too large for packing in a crate, it shall be placed on a skid and protected with an overwrap.

12.3 Overwrap material shall be moisture-proof, heat sealable, and strong enough to resist tearing, shredding, and piercing.

12.4 Protective guards shall be placed over easily damaged parts. All openings, including pipe ends, shall be provided with temporary closures.

12.5 All bolted openings, such as flanges, shall be covered with a masonite or plywood cover of ½ inch (15mm) minimum thickness. This cover shall be secured by at least two bolts on opposite sides of the opening. After the cover is in place, the closure shall be sealed using plastic wrap and waterproof tape.

12.6 All other openings shall be sealed with plastic caps securely attached with waterproof tape.

12.7 Each package, skid, box, and crate shall be marked on the outside with the following information so that it is readily visible:

Company
Project Identification
Street Address
City, State, and Zip Code

12.7.1 Seller's Purchase Order Number.

12.7.2 Any special instructions for handling.

12.7.3 Shipping weight.

12.7.4 Equipment tag number.

12.8 Each package, skid, box, and crate shall include two complete bills of material.

12.9 The Seller shall prepare and submit to the Buyer written procedures to govern the handling and storage of the equipment to prevent degradation of the supplied equipment. This shall include recommendations for up to six months outdoor storage.

13.0 MARKING AND IDENTIFICATION

13.1 The equipment shall have a permanently affixed data plate made from minimum 24 U.S. Standard gage ASTM 300 series stainless steel, permanently embossed with at least 3/16 inch high letter, and containing the following information:

13.1.1 Manufacturer's name.

13.1.2 Manufacturer's shop order number.

13.1.3 Manufacturer's serial number.

13.1.4 Date of manufacture.

13.1.5 Buyer's purchase order number.

13.1.6 Equipment name.

13.1.7 Equipment tag number.

13.1.8 Design pressure, psi.

13.1.9 Design temperature, °F

13.1.10 Hydrostatic test pressure, psi.

13.1.11 Vessel design code.

13.2 THE DATA PLATE SHALL BE LOCATED WHERE IT IS READILY VISIBLE.

14.0 TESTING

14.1 MATERIAL TESTING & INSPECTION

14.1.1 Tests

1. The Seller shall conduct his standard factory tests for equipment, instruments, controls, and other components supplied; the tests shall include hydrostatic pressure tests in accordance with the requirements of ASME BPVC, Section VIII, and Division 1.

2. The Seller shall fully meet the requirements of this specification and those of the Buyer's Standard Clauses.

3. Factory tests shall include functional testing to verify all instruments and controls are calibrated and operational.

4. The Seller shall submit certified test data to Buyer, and shall obtain Buyer's approval before shipping equipment.

5. The Seller shall provide the Buyer with copies of certified reports of all shop tests.

6. The Seller shall ensure that Buyer receives notice of the tests or inspection at least ten working days in advance of the scheduled date.

7. Buyer's waiving of an inspection, or their acceptance of any test or inspection, does not change in any way the Seller's responsibility to meet all specification requirements.

8. A performance acceptance test will be scheduled and run by Buyer after installation has been completed.

9. If required by the Buyer, the Seller shall provide technical assistance during installation and/or performance test(s) at the site.

14.1.2 Data Reports: See Engineering Requisition.

14.1.3 System of Units

1. All drawings, documents, correspondence, etc. shall be in the English language.

2. The system of units used on all drawings, documents, etc. shall be English.

END OF SPECIFICATION

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2675 Morgantown Road, Reading, PA 19607
(610) 855-2000 • FAX (610) 855-2182

Control No.: File: COLS-1-CO-136501-WMDD-0198 WBS: N/A

TO:	DATE:	ACTION DATE:
Pacific Gas & Electric Company **P.O. Box 770000** **Mail Code N11E** **San Francisco CA 94177-0001** ATTENTION: **Hoc Phung**	**5/7/2008**	

PROJECT: **Colusa Generating Station**

DESCRIPTION OF CONTENTS: **WET SURFACE AIR COOLER ENGINEERING REQUISITION, SPECIFICATION & DATA SHEET**

Issuing Engineer **Steven J. Ruzze** Project Engineering Manager Deanna Witzel

QTY OF SETS SENT TO PRIMARY DESTINATION: **#** All distribution will follow the Distribution Matrix guidelines in the PAM unless stated.

NOTICE OF TRANSMITTAL SENT TO:

Company	Person	Reason / Action	Due Date
Gemma	Curt Brainard		-
Gemma	Joel W. Canino		-
Gemma	Bryan Coleman		-
Gemma	Gary Jones		-
Gemma	Pat Krum		-
Gemma	Glenn Lacey		-
Gemma	Desiree LaTour		-
Gemma	Bob Lynch		-
Gemma	Tom Mastronarde		-
Gemma	Bert Michnowski		-
Gemma	Jon Pearson		-
Gemma	Gene Roy		-
Gemma	Maureen Schaefer		-
Gemma	Norman Smith		-
Gemma	Alan Smithe		-
Gemma	Karen Timbrell		-
Gemma	Charlie Tinacci		-
Gemma	Colin Trebilcock		-
Gemma	Paul West		-
Pacific Gas & Electric Company	Thomas Miller		-
Pacific Gas & Electric Company	Hoc Phung		-
Pacific Gas & Electric Company	Steve Royall		-
WorleyParsons	Steven A. Baker		-
WorleyParsons	Karl R. Bieber		-
WorleyParsons	Robert Breisch		-
WorleyParsons	Mark S. Carter		-
WorleyParsons	Mustafa A. Gencer		-
WorleyParsons	Jason Heer		-
WorleyParsons	Alirio A. Jacome		-
WorleyParsons	Pradip Khan		-
WorleyParsons	Gregory Kishiyama		-
WorleyParsons	Michael F. Kuzio		-
WorleyParsons	Justin (Reading) Martin		-
WorleyParsons	William Smith		-
WorleyParsons	Grzegorz J. Uzar		-
WorleyParsons	Deanna M. Witzel		-

SEE ATTACHED LIST OF TRANSMITTED DRAWINGS AND DOCUMENTS

Please mark VOID or destroy all previous versions of the documents issued as WorleyParsons Deliverables unless the documents are a partial substitution into a larger package as defined in Special Notes or Actions. WorleyParsons' deliverables which have an APPROVED status are considered released for all of the above stated purposes.

FOR GEMMA ENGINEER USE ONLY - TYPE AND PURPOSE OF TRANSMITTAL

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☐ VENDOR DRAWING REVIEW

- ☐ WorleyParsons comments on vendor documents for GEMMA Eng. Review
- ☐ Copy of vendor documents sent by WorleyParsons directly to the vendor
- ☐ Return of created documents submitted for WorleyParsons review
- ☐ Other: _____
- ☐ CBO Review and Comment

☒ WORLEYPARSONS DELIVERABLES SUBMITTAL

- ☐ Issued For Information Only
- ☐ Issued For Review and Comments Return by: _____
- ☐ Issued For Signature Return by: _____
- ☐ Issued for Constructability Review Return by: _____
- ☒ Issued For Bidding Purpose
- ☐ Issued for Ordering Material
- ☐ Issued for Construction
- ☐ Issued for Permitting
- ☐ Issued for Fabrication
- ☐ Issued For Record Purposes
- ☐ Other:
- ☐ CBO Review and Comment

Action by / Due Date	COMMENTS

Issued Document Transmittal List

Transmittal No: COLS-1-CO-136501-WMDD-0198
Date: 5/7/2008
Subject: WET SURFACE AIR COOLER ENGINEERING REQUISITION, SPECIFICATION & DATA SHEET

Status Legend

P Preliminary — Represents acceptable design concept, subject to change. Can be released for bidding purposes but will require approval prior to placing orders.

RB Released for Bid

Issued Document No./ Electronic File Name	Sht	Rev	Titles	Status
COLS-1-DS-136501-0001 COLS-1-DS-136501-0001-RB.XLS	-	B	DATA SHEET WET SURFACE AIR COOLER	P
COLS-1-ER-136501 COLS-1-ER-136501-RB.DOC	-	B	ENGINEERING REQUISITION WET SURFACE AIR COOLER	RB
COLS-1-SP-136501 COLS-1-SP-136501-RB.DOC	-	B	MECHANICAL ENGINEERING SPECIFICATION WET SURFACE AIR COOLER	P

Total: 3 Documents

WET SURFACE AIR COOLER DATA SHEET

PROJECT:	Colusa Generating Station	**DS NO:**	COLS-1-DS-136501-0001		
CUSTOMER:	Gemma	**DESC:**	Wet Surface Air Cooler		
PLANT LOC:	Maxwell, CA	**REV:**	B	**DATE:**	7-May-08
COST CODE:	136501	**EQ TAGs:**	1-464-HX-9002		

DESIGN REQUIREMENTS (TO BE COMPLETED BY PURCHASER)

1	Type	Factory-built	Max Plan Area (L x W)			ft
2	Construction Type	Basin	Galvanized Stl	Plenum	Galvanized Steel	
3	Fan Sizing Criteria:		Max Motor Nameplate			hp
			Max. Air Inlet Face Velocity		800	fpm
			Min. Fan Stack Exit Velocity		1400	fpm
4	**DESIGN THERMAL PERFORMANCE:**					
	Process Fluid			30% propylene glycol/ 70% water		
	Process Fluid Flow				10,780	gpm
	Design Heat Load				52,427,804	MMBTU/hr
	Inlet Process Fluid Temperature				110.2	Deg F
	Outlet Process Fluid Temperature				100	Deg F
	Process Fluid Operating Pressure				100	psig
	Outlet Fluid Temperature Control Range at Part-Load Conditions				+/- 5	Deg F
	AMBIENT CONDITIONS:					
	Design Inlet Wet Bulb Temperature (without recirculation)				**78**	Deg F
	Design Inlet Dry Bulb Temperature				**114**	Deg F
	Design Inlet Humidity				20	%
5	**DRIFT LIMIT:**		% of recirculation flow		0.005	%
6	**MAXIMUM NOISE EMISSIONS**					
	Sound Power Level		Distance from Surface		Height Above Grade	
	85	dB(A)	3	ft	5	ft
7	**MAKEUP WATER ANALYSIS (FILTERED WATER):**					
	PARAMETER		**UNITS**	**WATER DESIGN**		
	Calcium		ppm Ca	25		
	Magnesium		ppm Mg	10		
	Sodium		ppm Na	20		
	Potassium		ppm K	5		
	Total Alkalinity		ppm $CaCO_3$	80-100		
	Free Available Chlorine		ppm FAC	2		
	Chloride		ppm Cl	25		
	Sulfate		ppm SO_4	25		
	Nitrate		ppm NO_3	10		
	Phosphate		ppm PO_4	N/A		
	Silica		ppm SiO2	25		
	COD					
	Total Hardness		ppm CaCO3	125		
	Calcium Hardness		ppm CaCO3	65		
	Total Iron		ppm Fe	<0.1		
	pH			7-8.5		
	Conductivity		µS/cm	300		
	Dissolved Solids		ppm	200		
	Suspended Solids		ppm	<1		
	Turbidity		NTU	NA		
8	Cycles of Concentration		Design	6	Maximum	

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COST CODE:	136501	**EQ TAGs:**	1-464-HX-9002		

9	Tube Material			Carbon Steel	
10	Final Grade Elevation			183	ft
11	**WIND INFORMATION:**				
	Prevailing Wind Direction:	NW and SE	Wind Rose Diagram No:		N/A
	Maximum Coincident Wind Speed				mph
12	**ELECTRICAL REQUIREMENTS:**	hp	Volts	Hertz	
	Fan Motors - Below	By Seller	480	60	
	Fan Motors - Above	By Seller	480	60	
	Two-Speed?	as required to control temp	Type		
	Lighting and Space Heaters	480	Volts	60	Hz
	Control Power	110	Volts AC	60	Hz
13	**VALVE ACTUATION TYPE:**				
	Cell Isolation		Manual		
14	Cell Access Door System and Walkway Required?			Yes	
15	Fan Deck Equipment Removal System Required?			Yes	
16	Process Water System Design				
	Pressure	150 psig	Temperature	150	Deg F
17	Lightning Protection?		By Others		
18	**PERFORMANCE CURVE PROPOSAL REQUIREMENTS:**				
	Guarantee - at design ambient WB/DB				
	78/114 deg F				
	Expected - for three ambients				
	100 deg F (20% RH) & 90 deg F (20% RH)				
	Remarks:				

To Be Completed by Seller	
Bidder/Manufacturer	
Proposal Number	
Construction Type	
Model number	
Tower Type	

PERFORMANCE		
Total Guaranteed Power Consumption		kw
Cold Water Temp		Deg F
FAN DRAFT:		
Resistance of Air Inlet		inches H2O
Resistance of Drift		inches H2O
Resistance of Stack		inches H2O
Total Resistance		inches H2O
Dry Air Through Tower		lb/min
Air Inlet Face Velocity		fpm
Fan Stack Exit Velocity		fpm
Noise (Fill in attached Noise Data Sheets)		

WET SURFACE AIR COOLER DATA SHEET

PROJECT:	Colusa Generating Station	**DS NO:**	COLS-1-DS-136501-0001		
CUSTOMER:	Gemma	**DESC:**	Wet Surface Air Cooler		
PLANT LOC:	Maxwell, CA	**REV:**	B	**DATE:**	7-May-08
COST CODE:	136501	**EQ TAGs:**	1-464-HX-9002		

PROCESS WATER TUBE BUNDLES				
Hot Pipe Connection Type/Diameter				in
Cold Pipe Connection Type/Diameter				in
Height of Connections above Basin Curb				ft
Design Pressure of Tube Bundle				psig
Pressure Loss Through Tubes				psi
Acceptance Interface Connection Nozzle Loads (X/Y/Z)				
Number of Tubes				
Number of Coil Sections				
Effective Surface Area				ft2
Type of Construction				
Spacing Between Tubes				
Tube Diameter				in
Tube Wall Thickness				in
SPRAY WATER DISTRIBUTION SYSTEM				
Total Volume				gal
Max. Capacity of Distribution System (Without Overflow)				gpm
Water Loading (Fill Cross Section)				gpm/ft2
Dift Loss as Percent of Recirculating Water Flow				%
Evaporation Loss				gpm
Qty of spray nozzles				
Nozzle Opening Size				in
Sray Header Piping Nominal Diameter				in
Design Pressure of Distribution System				psig
Cell Isolation Valve Manufacturer				
Cell isolation Valve Model Number				
Distribution Manifold Valve Manufacturer				
Distribution Manifold Valve Model Number				
Recirculation Spray Pump				
Number of pumps/capacity				%
Flow per pump				gpm
Total discharge head				ft H2O
Estimated Recirculation Spray Pump HP				hp
STRUCTURE				
Number of Cells				
Number of Fans per Cell				
Inside Basin Dimensions	L x W x D			
Minimum Basin Freeboard				ft
Basin Normal Water Level Elevation				ft
Live Basin Water Storage Volume				gal
Nominal Cell Dimensions		L x W		
Overall Tower Dimensions		L x W		
Height Basin Curb to Fan Deck				ft
Fan Stack Height				ft
Overall Tower Height				ft

WET SURFACE AIR COOLER DATA SHEET

PROJECT:	Colusa Generating Station	**DS NO:**	COLS-1-DS-136501-0001		
CUSTOMER:	Gemma	**DESC:**	Wet Surface Air Cooler		
PLANT LOC:	Maxwell, CA	**REV:**	B	**DATE:**	7-May-08
COST CODE:	136501	**EQ TAGs:**	1-464-HX-9002		

Stack Diameter at Inlet, Throat and Outlet			ft
Total Weight of Wet Surface Air Cooler Dry and Operating			lbs
Fan Deck Live and Snow Loading			psi
BASIN CONSTRUCTION:			
Estimated Quantity of Concrete			cubic yards
Estimated Quantity of Reinforcement			lbs
Reinforcement Size			in
Reinforcement Spacing			in
Wall Thickness			ft
Floor Thickness			ft
Drawings By			
Fabrication By			
PLENUM DESIGN:			
Construction Type			
Estimated Quantity of Concrete (If applicable)			cubic yards
Wall Thickness			ft
Floor Thickness			ft
Drawings By			
Fabrication By			
MATERIALS OF CONSTRUCTION			
Framework			
Tube Bundles			
Tube Sheets			
Cover Plate			
Nozzles			
Spray Distribution Piping			
Fan Deck			
Stairway			
Access Platforms and Walkways			
Handrail			
Grating and Grating Treads			
Fan Stacks			
Fan Blades			
Fan Hub			
Fan Shafts			
Fan Couplings			
Hardware, Fasteners, and Anchor Bolts			
FANS			
Number of Fans Total/Capacity			%
Manufacturer and Model Number			
Type			
Number of Blades per Fan			
Diameter			in
Maximum Fan Blade Tip Clearance			in

WET SURFACE AIR COOLER DATA SHEET

PROJECT:	Colusa Generating Station	**DS NO:**	COLS-1-DS-136501-0001		
CUSTOMER:	Gemma	**DESC:**	Wet Surface Air Cooler		
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COST CODE:	136501	**EQ TAGs:**	1-464-HX-9002		

	LOW SPEED	**HIGH SPEED**	
Fan Speed			rpm
Blade Tip Speed			fps
Brake Horsepower (Driver output)			hp
Total Static Pressure (at design density)			inches H2O
Velocity Pressure (at design density)			inches H2O
Total Pressure (including vel. recovery at design density)			inches H2O
Air Delivery per Fan			CFM
Fan Static Efficiency			%
Fan Total Efficiency			%
SPEED REDUCER			
Manufacturer and Model Number			
Type			
AGMA Horsepower Rating			hp
Service Factor at Rated HP			
Reduction Ratio			
Anti-Reverse Mechanism Provided?			
RADIAL AND TRUST BEARINGS			
Manufacturer			
Type			
L10 Life			
DRIVE SHAFT			
Manufacturer and Model Number			
Type			
Length			ft
Diameter			in
Rated Horsepower			hp
Service Factor at Rated HP			
Coupling Manufacture and Type			
FAN DRIVER			
Manufacturer and Model Number			
Enclosure Type and Frame Size			
Operating Speeds			rpm
Electric Power	Volts	Phase	Hz
Nameplate and Horsepower Rating			HP
Service Factor and Efficiency			%
Full Load Amps			A
Locked Motor Amps			A
INSTRUMENTATION			
Vibration Switch Manufacturer			
Vibration Switch Model			
Oil Pressure Switch Manufacturer			
Oil Pressure Switch Model			
Oil Differential Pressure Switch Manufacturer			
Oil Differential Pressure Switch Model			

WET SURFACE AIR COOLER DATA SHEET					
PROJECT:	Colusa Generating Station	**DS NO:**	COLS-1-DS-136501-0001		
CUSTOMER:	Gemma	**DESC:**	Wet Surface Air Cooler		
PLANT LOC:	Maxwell, CA	**REV:**	B	**DATE:**	7-May-08
COST CODE:	136501	**EQ TAGs:**	1-464-HX-9002		

ELECTRICAL					
Lighting Fixtures Manfacturer					
Lighting Fixtures Model			Quantity		
Emergency Lighting Fixtures Manufacturer					
Emergency Lighting Fixtures Model			Quantity		
Lightning Protection?					
SITE CONSTRUCTION INFORMATION					
Required Laydown Area		L x W			

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ENGINEERING REQUISITION
SECTION I
DELIVERABLE ITEMS LIST

No Asbestos Containing Materials (ACM - any material containing more than 1% Asbestos) are to be offered or provided as part of this inquiry or order.

Project:	Colusa Generating Station						
Job No:		ER No:	COLS-1-ER-136501	Rev:	B	Date:	5/7/2008
Commodity:	Wet Surface Air Cooler						

Item	Tag or Part No Tag or Part Size	Description	Cost Code	Perf LD	Required At Dest	Promised Ship	Qty	Unit Price	Extended Amount
0001.00	1-464-HX-9002	CLOSED COOLING WET SURFACE AIR COOLER	136501	No			1 EA		

* Indicates revised or added line item.

Sub Total:

Total:

Requisition Comments:

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ENGINEERING REQUISITION
SECTION II
TECHNICAL DOCUMENTS AND ATTACHMENTS

Project:	Colusa Generating Station						
Job No:		ER No:	COLS-1-ER-136501	Rev:	B	Date:	5/7/2008
Commodity:	Wet Surface Air Cooler						

Document / Attachment No	Sheet	Rev	Document / Attachment Title	Reason For Issue
COLS-1-DS-136501-0001*	-	B	DATA SHEET; WET SURFACE AIR COOLER	SCOPE
COLS-1-DW-111-002-002*	-	F	GENERAL ARRANGEMENT; SITE PLAN	REF
COLS-1-SP-136501*	-	B	MECHANICAL ENGINEERING SPECIFICATION; WET SURFACE AIR COOLER	SCOPE
COLS-1-TS-01300*	-	A	TECHNICAL SPECIFICATION; SUPPLIER SUBMITTAL REQUIREMENTS; MECHANICAL	SCOPE
COLS-1-TS-16180	-	A	TECHNICAL SPECIFICATION; ELECTRICAL REQUIREMENTS FOR PACKAGED; MECHANICAL EQUIPMENT	SCOPE
COLS-1-TS-16220	-	B	TECHNICAL SPECIFICATION; LOW VOLTAGE MOTORS	SCOPE
COLS-1-TS-16910*	-	2	TECHNICAL SPECIFICATION; MECHANICAL SYSTEMS; DCS INTERFACE	
COLS-1-TS-17180	-	A	TECHNICAL SPECIFICATION; INSTRUMENTATION REQUIREMENTS FOR PACKAGED; MECHANICAL EQUIPMENT	SCOPE

* Indicates revised or added line item.

ENGINEERING REQUISITION
SECTION III
VENDOR DATA AND INSPECTION REQUIREMENTS

Project:	Colusa Generating Station					
Job No:		ER No:	COLS-1-ER-136501	Rev:	B	Date: 5/7/2008
Commodity:	Wet Surface Air Cooler					

Reqmnt ID	Description	LD	Qty Proposal	Qty Order	Due Code	Review [1]	Applies to Item(s)
A001	Dimensional Outlines, Sections and Details: Dimensional Outline, Sections and Details showing entire equipment with dimensions, maintenance and pull spaces; equipment not-to-exceed foundation loads, liquid volume and liquid weight; size and type of all external connections.				WP	Y	0001.00
A002	Dimensioned Drawings: Dimensioned Drawings of equipment showing interface connections, (Piping, Electrical, etc.) location, size and type of all external connections, supports, clearances, access requirements, sections, weights, foundation requirements, internals and details suitable for detailed design. The Dimensioned Drawings shall also include any special requirements, provisions, or accessories required by Owner for proper installation of Contractor's Equipment.	Y			4 WANOA	Y	0001.00
A010	Assembly Arrangement				WP	Y	0001.00
A012	Customer Connections List (Piping, Electrical, etc.): Customer Connections List (Piping, Electrical, etc.) showing connections to Company's piping, electrical, etc. and shall include location, size, type, rating, design conditions and operating conditions of all external connections.	Y			4 WANOA	Y	0001.00
A015	Foundation Plan/Anchor Bolt Location/Loads	Y			4 WANOA	Y	0001.00
A020	Allowable Piping Flange/Nozzle Loads: Allowable Piping Flange/Nozzle Loads suitable for design of interconnecting piping (within plus or minus 10% of final).	Y			6 WANOA	Y	0001.00
A028	Model No., Parts List, Material Callout					Y	0001.00
A035	Schematic Wiring Diagrams: Elementary or Schematic Wiring Diagrams suitable for Design of Controls, Circuits, Power Supplies and Terminations. Diagrams shall include switch contact development.	Y			6 WANOA	Y	0001.00

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ENGINEERING REQUISITION
SECTION III
VENDOR DATA AND INSPECTION REQUIREMENTS

Project:	Colusa Generating Station						
Job No:		ER No:	COLS-1-ER-136501	Rev:	B	Date:	5/7/2008
Commodity:	Wet Surface Air Cooler						

Reqmnt ID	Description	LD	Qty Proposal	Qty Order	Due Code	Review [1]	Applies to Item(s)
A042	Piping, Instrument Control Diagrams and Flow Diagrams: Preliminary Piping And Instrument Control Diagrams and Flow Diagrams non-physical drawings providing system configuration, design and control information. P & ID's shall include Engineer's tag numbers for equipment, valves and instruments, piping line sizes, piping line numbers, piping material specifications, design and operating conditions, terminal points, interfaces to customer P & ID's, insulation, heat tracing and relief valve set points.	Y			4 WANOA	Y	0001.00
A049	Catalog Cuts: Catalog Cuts for off the shelf standard items identifying manufacturer, model type, options selected and bill of material. Project specific tagging shall be included.				WP	Y	0001.00
A081	Device and Internal Wiring Diagram: Device and Internal Wiring Diagram: Connection Drawings from a similar project suitable for designing terminations. Diagrams shall include switch contact development.				6 WANOA	Y	0001.00
A093	Mechanical Accessories Dimensional Outlines: Mechanical Accessories Dimensional Outlines & Details				4 WANOA	Y	0001.00
A096	Motor List Including Auxiliary Motors	Y			6 WANOA	Y	0001.00
A107	Motor Data Sheets: Submittal of Motor Datasheets, Manufacturer, Horsepower, Voltage, Full Load Current, Locked Rotor Current, Service Factor, Phases, Insulation Class, Frame Size, NEMA Code Suitable for Design of Supporting Systems, Bearing TC's, winding RTD's, space heaters, vibration monitoring if supplied.	Y			6 WANOA	Y	0001.00
B002 *	Manufacturing, Test and Inspection Plan: Manufacturing, Inspection and Test Plan to allow Company and Engineer to identify witness and hold points.	Y			4 WANOA	Y	0001.00

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ENGINEERING REQUISITION
SECTION III
VENDOR DATA AND INSPECTION REQUIREMENTS

Project:	Colusa Generating Station						
Job No:		ER No:	COLS-1-ER-136501	Rev:	B	Date:	5/7/2008
Commodity:	Wet Surface Air Cooler						

Reqmnt ID	Description	LD	Qty Proposal	Qty Order	Due Code	Review [1]	Applies to Item(s)
B004	Factory Acceptance Test (FAT) Procedures: Contractor's Factory Acceptance Test (FAT) Procedures for Seller-supplied control systems to assure compliance with the Contract. FAT procedure shall detail the scope of the test as well as the actual procedure used to document compliance with the requirements of technical Specifications.				AC		0001.00
B005 *	Welding Procedures & Qualification Tests	Y			6 WANOA	Y	0001.00
B007	Hydrostatic Testing: Hydrostatic Testing Procedures to allow Engineer to ensure compliance with the Contract.				4 WANOA	Y	0001.00
B010	Quality Assurance Manual: Quality Assurance Manual to incorporate project specific requirements.				10 WANOA	Y	0001.00
B026	Cleaning, Coating, Painting and Protection Procedures and Specifications: Cleaning, Coating, Painting and Protection Procedures and Specifications to allow Engineer to ensure compliance with the Contract.				4 WANOA	Y	0001.00
B029	Installation Procedures				30 DPFS	Y	0001.00
C003	Notification for Shop Test: Notification for Sellers Standard Shop Test.				14 DPTT	Y	0001.00
C005 *	Pump Performance Characteristics (Standard Curve): Pump Performance Characteristics (Standard Curve).	Y			6 WANOA	Y	0001.00
C012	Manufacturer's Certificate of Compliance: Manufacturer's Certificate of Compliance.				AC		0001.00
C015	Performance Data	Y			3 WANOA	Y	0001.00
C016	Performance Test Results: Performance Test Results.				10 DAT	Y	0001.00
C029	Certified Test Reports: Certified Test Reports.				10 DAT	Y	0001.00

ENGINEERING REQUISITION
SECTION III
VENDOR DATA AND INSPECTION REQUIREMENTS

Project:	Colusa Generating Station						
Job No:		ER No:	COLS-1-ER-136501	Rev:	B	Date:	5/7/2008
Commodity:	Wet Surface Air Cooler						

Reqmnt ID	Description	LD	Qty Proposal	Qty Order	Due Code	Review [1]	Applies to Item(s)
C043 *	Acoustical Data: Acoustical Data including certification that equipment will meet noise criteria	Y			6 WANOA	Y	0001.00
D002 *	Installation, Operating, and Maintenance Instructions: Instructions for Preparation For Service, Operation, Maintenance, Lubrication, Ordering or Replacing Components. Suitable for Plant Operating and Maintenance Personnel.	Y			30 DPFS	Y	0001.00
D010 *	Startup Spare Parts List: Startup Spare Parts List (to provide startup spare parts during plant testing period)	Y			WP	Y	0001.00

* Indicates revised or added line item.

Note 1: Required to submit for review and comment prior to fabrication. Returned documents to have status code as noted below.

Legend for "Due Code". Actual dates to be used based on award date.:

Due Code	Description
AC	At Completion
DAT	Days after test
DPFS	Days prior to first shipment
DPTT	Days prior to test
WANOA	Weeks after notification of award
WP	With Proposal

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ENGINEERING REQUISITION
SECTION IV
REVISION CHANGE LOG

Project:	Colusa Generating Station					
Job No:		ER No:	COLS-1-ER-136501	Rev: B	Date:	5/7/2008
Commodity:	Wet Surface Air Cooler					

Section	Change Type	Change Item	Change Column	Change From	Change To
Documents	Added	COLS-1-DS-136501-0001 - B			
Documents	Added	COLS-1-DW-111-002-002 - F			
Documents	Added	COLS-1-SP-136501 - B			
Documents	Revised	COLS-1-TS-01300 - A	DocTitles	TECHNICAL SPECIFICATION; SUPPLIER SUBMITTAL REQUIREMENTS	TECHNICAL SPECIFICATION; SUPPLIER SUBMITTAL REQUIREMENTS; MECHANICAL
Documents	Added	COLS-1-TS-16910 - 2			
Documents	Deleted	COLS-1-DS-136501-0001 - A			
Documents	Deleted	COLS-1-DW-111-002-002 - E			
Documents	Deleted	COLS-1-SP-136501 - A			
Requirements	Revised	B002 1 0001.00	LD	False	True
Requirements	Revised	B005 1 0001.00	LD	False	True
Requirements	Revised	C005 1 0001.00	LD	False	True
Requirements	Revised	C043 1 0001.00	LD	False	True
Requirements	Revised	D002 1 0001.00	LD	False	True
Requirements	Revised	D010 1 0001.00	LD	False	True

ENGINEERING REQUISITION
GENERAL INFORMATION
SECTION V

A. Buyer will accept the following specified electronic file formats from vendors for drawings. (.dwg and .dgn files will not be accepted without prior evaluation and approval by Buyer.

1. Adobe Acrobat. 5.0 (PDF) or newer

NOTE: Buyer is not limited to above listed file formats; however, these are the preferred formats. Buyer is willing to work with a vendor on an exception basis.

B. MODEL FILES – Electronic 3D Model files. Format of the files would be Microstation (.dgn), Version 7.1 or earlier versions. When the model files are produced using Intergraph PDS software, please submit PDS archive of the model files. This will allow intelligent data to be used during the design and construction phases of the project. PDS version 6.04.01, and Frameworks version 3.02.01 software models are preferred.

C. Buyer prefers the following electronic formats for documents, spreadsheets, and databases:

1. Microsoft Word 2000 or 2003 (Documents)
2. Excel 2000 or 2003 (Spreadsheets)
3. Access 2000 or 2003 (Databases)

D. Electronic files will be submitted to Buyer via the following media:

1. Via the WorleyParsons Website. WorleyParsons shall supply logon, password and instructions upon request.
2. Floppy disk or CD-ROM

E. Buyer will issue the following electronic file format for submitting drawings to vendors. No native files will be issued.

Raster Graphic Formats

1. Adobe Acrobat 5.0 (PDF) or Newer

SITE SPECIFIC DATA

Location:	Maxwell, CA
Ambient Temperature Design Conditions:	
Minimum Dry Bulb	18°F
Maximum Dry Bulb	114°F
Summer Design Wet Bulb Temperature (1%)	75°F
Summer Design Dry Bulb Temperature (1%)	94°F
33 °F, Winter Design Dry Bulb Temperature (for HVAC design)	33°F
Elevation (feet above mean sea level)	183
Rainfall	
Two-year, 24-hour Maximum	2.1 in
10-year, 24-hour Maximum	2.9 in
100-year, 24-hour Maximum	4.3 in
Building Code:	CBC 2007
Wind Loads:	
Basic Wind Speed, V (CBC 2007, Figure 1609)	85 mph
Exposure Category (CBC 2007, Section 1609.4)	C
Occupancy Category (CBC 2007, Table 1604.5)	III
Importance Factor, I (ASCE 7-05, Table 6-1)	1.15
Snow Loads:	
Ground Snow Load, p_g (CBC 2007, Figure 1608.2)	5 psf
Exposure Factor, C_e (ASCE 7-05, Table 7-2)	1.0
Occupancy Category (CBC 2007, Table 1604.5)	III
Importance Factor, I (ASCE 7-05, Table 7-4)	1.1
Seismic Loads:	
Site Class (CBC 2007, Table 1613.5.2)	C
Occupancy Category (CBC 2007, Section 1604.5)	III
Maximum Considered Earthquake Ground Motion, Short Period (CBC 2007)	$S_S = 0.857$ g
Maximum Considered Earthquake Ground Motion, 1 Second Period (CBC 20007)	$S_1 = 0.331$ g
Seismic Design Category (CBC 2007, Tables 1613.5.6(1) and 1613.5.6(2))	D
Importance Factor, I (ASCE 7-05, Table 11.5-1)	1.25[1]

[1] Except for structures related to Fire Safety and Hazardous Materials, Importance Factor should be 1.5

ADDITIONAL REQUIREMENTS / CLARIFICATIONS

WorleyParsons

resources & energy

COLUSA GENERATING STATION

MECHANICAL ENGINEERING SPECIFICATION

COLS-1-SP-136501

REV. B

FOR

WET SURFACE AIR COOLER

MAY 2008

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1.0 SCOPE

1.1 EQUIPMENT AND SERVICES BY SELLER:

1.1.1 Design, furnish, fabricate, assemble, shop clean, shop test and deliver one (1) wet surface air cooler (WSAC) and associated equipment as specified herein and in the Wet Surface Air Cooler Data Sheets.

1.1.2 Support structure, all outer enclosures, stairwells, handrails, ladders, partitions, decks, access doors, and equipment removal system

1.1.3 Fans, fan stacks, fan motors, couplings, gear reducers and lube oil systems.

1.1.4 Drift eliminators, as required.

1.1.5 Instrumentation as specified herein

1.1.6 Initial fill of lubricants, if any.

1.1.7 All required assembly hardware.

1.1.8 All special tools required for installation and maintenance.

1.1.9 A complete set of spare parts required for commissioning and startup.

1.1.10 All submittals as required by Section 3.0 of this specification and the Engineering Requisition.

1.1.11 At the Buyer's option, services of a representative for technical direction of the installation and field testing of the equipment.

1.1.12 At the Buyer's option, services of a qualified field representative for maintenance training including an edited video tape of the training sessions.

1.2 EQUIPMENT AND SERVICES BY BUYER

1.2.1 Foundation & anchor bolts.

1.2.2 Closed cooling water piping, valves, fittings, and instrumentation external to the WSAC, to flanged piping interface points.

1.2.3 Electrical wiring, conduit and fittings, including motor starters and control apparatus up to each motor, lighting, and equipment grounding.

1.2.4 Chemical feed provisions.

1.2.5 Field labor for unloading, hauling, installation and field testing of the equipment at the job site.

1.2.6 Insulation and heat tracing, if required.

2.0 CODES AND STANDARDS

2.1 REFERENCE STANDARDS

The following codes, standards and references shall be used for design, fabrication, and testing of the WSAC. The latest addenda and code cases in effect on the date of purchase order shall apply. Any substitution for codes and standards listed below with equivalent international codes

shall be specifically outlined in the proposal and subject to review and approval by the Buyer. Applicable internationally recognized standards are also permitted.

2.1.1 American Gear Manufacturer's Association (AGMA)

1. 2005-C96 - Design Manual for Bevel Gears

2. 6010-F97 – Standard for Spur, Helical, Herringbone & Bevel Gears for Enclosed Drives

3. 260.01 – Shafting-Allowance Torisional and Bending Stresses

2.1.2 American National Standards Institute (ANSI)

2.1.3 American Society for Testing and Materials (ASTM)

1. A 105, "Forgings, Carbon Steel, for Piping Components."

2. A123, "Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products"

3. A153, "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"

2.1.4 American Society of Mechanical Engineers (ASME)

1. B16.5, "Pipe Flanges and Flanged Fittings."

2. B31.1, "Power Piping."

3. Boiler and Pressure Vessel Code (B&PVC), Section IX, "Welding and Brazing Qualifications."

4. PTC-23, "Atmospheric Water Cooling Equipment"

5. PTC-19.3, "Performance Test Code for Temperature Measurement"

2.1.5 American Welding Society (AWS)

2.1.6 Cooling Technology Institute (CTI)

1. ATC-105S, "Acceptance Test Code for Closed Circuit Cooling Towers"

2. ATC-128, "Code for Measurement of Sound from Water Cooling Towers"

3. STD-111, "Gear Speed Reducers"

4. STD-136, "PVC Materials Used for Film Fill, Splash Fill, Louvers, and Drift Eliminators"

5. STD-201, "Standard for the Certification of Water Cooling Tower Thermal Performance"

2.1.7 Instrument Society of America (ISA)

1. S5.1, "Instrument Symbols and Identification."

2.1.8 National Electrical Manufacturers Association (NEMA)

1. ICS 1, "Industrial Control and Systems General Requirements."

2. ICS 6, "Industrial Control and Systems Enclosures."

3. NFPA 70, "National Electric Code."

2.1.9 Tubular Exchanger Manufacturers Association (TEMA)

2.1.10 Occupational Safety and Health Administration (OSHA).

2.1.11 California Building Code (CBC), 2007

3.0 SUBMITTALS

Drawings, data sheets, manuals, etc., shall be submitted in accordance with the Seller drawings and document submittal schedule included with the Engineering Requisition and with the Supplier Submittal Requirements Technical Specification, COLS-1-TS-01300. In addition, the proposal shall provide all technical descriptions specified in section III of the Engineering Requisition. The WSAC data sheets shall be submitted completely filled out by Seller. Failure to return the data sheets with the proposal will result in rejection of the proposal.

4.0 TECHNICAL REQUIREMENTS

4.1 GENERAL

4.1.1 Seller is expected to comply fully with the complete requirements of the Engineering Requisition. Seller shall provide all work necessary for the safe, efficient, and convenient operation of the systems specified herein and within the intent of this specification, whether or not such items are specifically referenced. Any deviations to this Engineering Requisition package shall be clearly defined in the proposal.

4.1.2 The WSAC shall be induced draft design with concurrent flow of air and spray water downward over the tube bundles. The air leaving the tube bundles shall make a 180 degree turn into the plenum chamber to remove any entrained water particles.

4.1.3 Vendor shall select materials, equipment, hardware and construction techniques that are compatible with the circulating water chemistry analysis and shall produce a highly reliable structure and system for a useful service life of 30 years.

4.2 PERFORMANCE REQUIREMENTS

4.2.1 The thermal performance rating shall be based on the Cooling Technology Institute certified performance rating adjusted for the thermal properties of the aqueous glycol solution used.

4.2.2 The Seller shall consider the location of the WSAC as shown on the reference drawings and shall pay particular attention to this layout with respect to the location of adjacent structures. The Seller shall be responsible for the proper performance of the WSAC as located, and inform the Buyer of any potential problems.

4.2.3 The wet surface air cooler shall be designed so individual cells can be isolated from water and air flows without short circuiting adjacent operating cells.

4.2.4 The Seller is responsible for selecting the number of cells, number of fans, and appropriate fan speed control option, if any, to meet the performance and temperature control requirements specified in the WSAC data sheets.

4.3 TUBE BUNDLES

4.3.1 Tube bundles shall be designed in accordance with ASME code standards and all materials in contact with the process stream shall have full ASME certification. Tube sheet thickness shall be designed per TEMA standards.

4.3.2 Tubes shall be carbon steel with outside hot-dipped galvanized after fabrication.

4.3.3 Bundles shall be cleanable and designed for drainage of fluid at shutdown.

4.3.4 Tube bundles shall be designed for operating pressure as shown on the Wet Surface Air Cooler data sheet.

4.3.5 Process connections on the tube bundles shall be flanged.

4.3.6 Tube bundles shall be identical construction and interchangeable. Tube bundles shall not be cross-connected in any way.

4.4 SPRAY WATER DISTRIBUTION SYSTEM

4.4.1 The spray water distribution shall be low pressure design with full flooded spray pattern to provide optimum drenching of tube bundles. Drenching rate shall not be less than 5 gpm/ft^2.

4.4.2 Spray piping shall be heavy duty PVC, designed for an operating pressure of 5 psig. All spray inlet connections shall be flanged.

4.4.3 Spray nozzles shall be non-clogging, large orifice type. Spray nozzle outlet shall be at least 12 inches above the top row of tubes and at least 10 inches below the top of tube bundle casing to prevent splash out.

4.4.4 Spray system shall be designed so that all spray nozzles can be inspected and serviced without removing any appurtenances while equipment is in operation. Spray system shall be arranged so that an individual tube bundle spray section may be hydraulically isolated for service or control.

4.5 COLLECTION BASIN & RECIRCULATION PUMPS

4.5.1 The collection basin shall be heavy-gauge galvanized steel. Suction connections shall be equipped with galvanized debris screens. A factory-installed, float-operated, mechanical makeup valve and waste water blowdown line shall be included. A drain and overflow connection shall be provided in each cell of the tower. The basin shall include a depressed section into which accumulated silt can be flushed to permit cleaning. The basin floor adjacent to the depressed section shall slope toward the depressed section to prevent buildup of silt under the coil area.

4.5.2 Seller shall provide two (2) 100% capacity direct-coupled centrifugal recirculation pumps, factory installed and mounted to the collection basin in conjunction with a suction assembly, per Seller's design. The pumps shall have no copper or lead containing materials in direct contact with the water. Pumps shall be provided with inlet strainers and check valves at their discharge.

4.5.3 A blowdown line with metering valve shall be connected directly to the tower overflow.

4.5.4 Electric basin heaters shall be provided, as required, for freeze protection. Heaters shall be automatic and furnished complete with all necessary instrumentation for automatic operation.

4.6 PLENUM WALLS AND FAN DECK

4.6.1 Individual fan plenums shall be isolated with full height walls to facilitate fan speed control and maintenance.

4.6.2 The air velocity of the fan plenum chamber shall not average more than 800 feet per minute.

4.7 FAN ASSEMBLIES

4.7.1 The fan plenum and coil casing panels shall be constructed of heavy gauge steel which is double brake flanged on all four sides and welded in all corners for extreme rigidity. All panels shall be hot dip galvanized after fabrication per ASTM A123 specifications. All panels shall be through bolted with bolts, nuts and washers (no self tapping sheet metal screws shall be permitted). Person size access doors shall be provided for maintenance.

4.7.2 The fans shall be heavy-duty, induced draft vertical discharge, axial type. Blades shall be low noise design and constructed of aluminum or FRP.

4.7.3 The complete fan assembly (fan drive train and mounting) shall be designed for maximum efficiency and long life when handling saturated air at high velocities. The fan blades shall be FRP (fiberglass reinforced plastic) and statically balanced against a master blade.

4.7.4 Fan hubs shall be fabricated from galvanized steel plates and have a ductile iron hub spool. The fan assembly shall be supplied with a fiberglass seal disc design to prevent air recirculation.

4.7.5 Each blade shall be adjustable as to degree of pitch and individually fastened to a common hub. All blades shall be interchangeable.

4.7.6 Fans shall be designed for continuous operation. The air discharge shall serve to disperse the plume and be vertical with a velocity of not less than 1400 fpm at the fan stack exit.

4.7.7 Under no circumstances shall the fans operate at or near their critical speed causing vibration which might result in fatigue failure in structural or mechanical components. Fan full load tip speed shall not exceed 10,000 fpm and shall minimize noise and yet remain consistent with the tower design and operating requirements.

4.7.8 The complete fan assembly shall be statically balanced at the manufacturer's shop. Replaceable portions or each fan blade shall be weighed and marked by Vendor to aid in operational maintenance and replacement.

4.8 FAN STACKS

4.8.1 Each fan stack shall be flared to provide maximum aerodynamic efficiency. The stack shall be circular in plan and concentric with the fan to provide the correct fan blade tip clearance.

4.8.2 The fan stack shall be self-supporting of extremely rigid construction not subject to vibration from fan operation, deformation or ovalling, designed for the wind loadings stated in the Wet Surface Air Cooler data sheets, and shall have a minimum height of 10 feet above the fan deck.

4.8.3 The fan stacks shall be securely bolted to the fan deck with a minimum of three bolts per stack segment.

4.9 SPEED REDUCERS

4.9.1 Each fan shall be driven through a right angle spiral bevel and helical geared speed reduction unit of heavy-duty industrial type especially designed for continuous duty cooling tower service. The

reduction unit shall be rated to continuously transmit the horsepower required to drive the fan with a minimum service factor of 2.0 for the gear reducer in accordance with CTI Bulletin STD-111. The mechanical power rating of the gears shall be in accordance with the standards of AGMA. Gear reducer shall be mounted on a galvanized steel base plate, not less than 3/4 inches thick.

4.9.2 Gear reducer shafts shall be supported by roller bearings to take radial and axial loads as required. Bearings shall have a minimum AFBMA L-10 life equivalent to a minimum of 100,000 hours of operation at the rated speed.

4.9.3 If anti-reversing mechanisms are required to prevent reverse windmilling, Seller shall provide.

4.9.4 The gear reducer, fan, and motor shall be mounted on a rigid unitized support designed to maintain alignment and adjustment and to effectively resist torque and vibration of the motor, fan, and gear reducer. The base and bolting shall be hot dip galvanized after fabrication.

4.9.5 The gear reducer shall be suitable for use with synthetic lubricating oils.

4.10 LUBE OIL SYSTEMS

4.10.1 The design of the speed reducer lubrication system shall incorporate adequate oil pumps or slingers, seals and components which are necessary to provide maximum service life from oil and maximum protection for all moving components of the reducer unit.

4.10.2 Lubrication lines shall be routed to the outside of the fan cylinder to provide facility for oil fill, filter, vent, drain, sampling, and indication of level. Lines shall be adequately supported to preclude damage to the lines from vibration. Filling of the gear reducer through the sight glass is not permissible. Sight glasses shall have pressure equalizing lines.

4.10.3 If a forced lubrication system is provided, the gear reducer shall have a full flow oil filter and differential pressure switch, all located outside the fan stack. The oil pump shall be capable of pumping in both the normal and reverse directions.

4.10.4 An oil level switch shall be mounted on the gear box by the gear reducer manufacturer.

4.11 DRIVE SHAFTS

4.11.1 Drive shafts shall be the full floating and non-lubricating type.

4.11.2 Both shaft ends shall be equipped with keyway and non-lubricated flexible couplings to compensate for operational misalignment.

4.11.3 Each drive shaft and coupling assembly shall be dynamically balanced before shipment.

4.11.4 A heavy duty shaft and coupling guard shall be installed over the motor end of the drive shaft. Service horsepower rating of the drive shaft and couplings shall not be less than the maximum horsepower rating of the motor drive. All rotating parts outside of the fan stack shall have personnel protection guards. Drive shafts shall have retaining collars at both ends to contain the shaft should a coupling fail. Coupling guard shall be stainless steel.

4.11.5 Intermediate bearings are not be permitted.

4.12 EXTERNAL PIPING CONNECTIONS:

4.12.1 The Seller shall provide all piping connections with flanged ends in accordance with ASME B16.5..

4.13 MOTORS

4.13.1 Electric motor drives, ratings, enclosure and accessories shall be in accordance with the specification COLS-1-TS-16220, "Low Voltage Electric Motors" and the Wet Surface Air Cooler data sheets.

4.13.2 The Vendor shall be responsible for fully coordinating the design and construction of these motors with the mounting arrangement, alignment, connection, play, direction of rotation, vibration, and other applicable requirements of the driven equipment for all operating modes.

4.13.3 Fan motor nameplate horsepower shall be not less than 1.05 times the BHP of the driven load.

4.13.4 If two-speed fan motors are required to meet the temperature control requirements in the Wet Surface Air Cooler data sheets, the two forward speeds shall be half speed and full speed.

4.13.5 Fan motors using an oil sump shall be equipped with vertical level sight glasses to determine oil level in the sump.

4.13.6 Pump motors shall be sized to be non-overloading over the entire range of the pump curve.

4.14 ELECTRICAL

4.14.1 Electrical design and equipment shall be furnished and installed in accordance with the specification COLS-1-TS-16180, "Electrical Requirements for Packaged Mechanical Equipment."

4.14.2 Control power voltage shall be as defined in Wet Surface Air Cooler data sheets.

4.14.3 All electrical junction boxes and enclosure types shall be NEMA Type 4X.

4.14.4 Fan control will be provided by the DCS and by manual controls on the motor control center cubicles supplying power to the WSAC unless otherwise noted in the project specification.

4.15 INSTRUMENTATION

4.15.1 Instruments shall be furnished in accordance with the specification COLS-1-TS-17180, "Instrumentation Requirements for Packaged Mechanical Equipment" attached to the Engineering Requisition.

4.15.2 Each speed reducer shall be equipped with a vibration switch with two adjustable set points for alarm and trip. One form C contact for alarm and one form C contact for trip shall be provided for each switch. The setpoints for alarm and trip shall be individually adjustable. Alarm and trip setpoints shall be provided by the Seller.

4.15.3 If a forced lubrication system is used, lubricating oil high level, low level, and filter high differential pressure alarm switches shall be provided.

4.15.4 Seller shall provide instrumentation for automatic operation via the DCS during normal operation and plant startup. Interface wit h DCS shall be furnished in accordance with Specification COLS-1-TS-16910.

4.15.5 Seller shall supply the necessary control descriptions and logic diagrams (SAMA drawings) such that the Buyer's distributed control system (DCS) can be programmed for complete control of the WSAC fans and pumps from start-up to shutdown, minimizing fan power consumption, and protecting the WSAC from freezing.

4.15.6 Seller shall supply the necessary instrumentation and control system philosophy that a single failure does not interrupt the operation of more than one piece of redundant equipment.

4.15.7 The Buyer's DCS shall execute all logic and monitor any process signals. All instruments shall be suitable for the ambient conditions at their intended locations and shall be designed to satisfy the site-specific design requirements specified in the Engineering Requisition.

4.15.8 All instrumentation supplied with the equipment shall be supplied with isolation valves, adequately supported, and tubed/piped by the Seller.

4.15.9 Enclosures, boxes, or housings shall be NEMA 4X unless the area classification requires a more stringent classification.

4.15.10 All instruments shall be provided and installed to the greatest extent practical prior to shipment, complete with connecting tubing, shutoff valves, drain valves. All instruments will be factory calibrated and furnished with a Certificate of Calibration.

4.15.11 Seller shall provide instrumentation for monitoring potential freezing conditions in the WSAC via the DCS, including automatic controls to prevent freezing from occurring.

4.15.12 Seller shall provide all the instrumentation and control logic required to minimize the need of operation personnel during a normal start-up, shutdown, or load changes.

4.15.13 Triple redundant transmitters/switches shall be provided for critical measurements or protections

4.15.14 Seller shall supply Control Narrative Document in additions to logic diagrams to generate overall control logic for Buyer's DCS.

4.16 ACCESS

4.16.1 The Seller's equipment shall be designed to facilitate ease of operation and provide adequate access to all equipment for inspection and maintenance. The Seller shall provide platforms and handrails as required to access all equipment greater than 5 feet from grade. This shall include access to fans, fan motors, tube bundles, and water spray nozzles.

4.16.2 A handrail with knee and toe boards shall be provided on both sides of all walkways, stairways and landings. Handrail posts shall be spaced not more than 8'-0" center-to-center.

4.16.3 Man-size galvanized, hinged steel access door shall be located on both endwalls for entry into the cold water basin and fan plenum areas. Access doors shall be operable from inside as well as outside the tower.

4.16.4 A ladder shall be provided at one end, and a stairway on the opposite end of the tower for access to the top of the tower fan deck from grade. Ladders shall be caged above approximately 7' height above grade. The top of the ladder shall include a spring loaded gate.

4.16.5 An access platform at the base of the WSAC shall extend from the vertical ladder or stairs to the endwall access door. The platform shall be galvanized steel bar grating, supported by galvanized steel framework attached to the wet surface air cooler. The platform shall be surrounded by a handrail, kneerail, and toeboard.

4.16.6 The top of the WSAC shall be equipped with a heavy-gauge galvanized steel platform for access to the fan deck and water distribution system. The platform shall be furnished with a sturdy handrail, kneerail and toeboard.

4.16.7 All platforms, handrails, toe plate, stairs, ladders, cages, gates, etc., shall be in accordance with OSHA Standard Rules and Regulations.

4.17 STRUCTURAL DESIGN

4.17.1 The structure and anchorage shall be designed to withstand a wind load and seismic loadings shown on the Site Specific Data Sheet in the Engineering Requisition.

4.17.2 Factors of Safety

Minimum factors of safety for all structures, tanks, and equipment supports shall be as shown below:

1.	Overturning	1.50
2.	Sliding	1.10 for seismic load 1.50 for wind load
3.	Buoyancy	1.25
4.	Uplift due to wind	1.50

4.17.3 Platforms shall be designed for a minimum live load of 100 psf.

4.17.4 The WSAC shall be designed to withstand shipping and hoisting loads of 2g horizontal or 3g vertical. Handrails, where specified, shall be capable of withstanding a 200 lb concentrated live load in any direction.

4.18 MATERIALS

4.18.1 Except where otherwise specified, all components of the fluid cooler shall be fabricated of heavy-gauge steel, protected against corrosion by galvanizing.

4.18.2 Members and steel assemblies shall be pickled after all fabrication processes have been completed which would damage galvanizing. The pickling shall be done in accordance with the latest accepted practice and shall continue until all scale, rust, grease, and other impurities have been completely removed. The steel shall then be hot-dip galvanized in accordance with ASTM A123.

4.18.3 All hardware and connectors in contact with the circulating water shall be 316 stainless steel. All hardware and connectors not in contact with the water shall be galvanized at minimum.

4.18.4 Wetted components/parts containing copper are not acceptable.

4.18.5 All gaskets shall be non-asbestos.

4.18.6 Based on the water chemistry listed in the Data Sheets, the Seller should advise the maximum cycles of concentration possible without any softening treatment.

4.18.7 The specifications, as written, are intended to indicate those materials that will be capable of withstanding the water quality listed in the WSAC Data Sheets in continuous service, at the loads described in the Data Sheets. They are to be regarded as minimum requirements. Where component materials unique to individual tower designs are not specified, the manufacturers shall

take the water quality and load carrying capabilities into account in the selection of their materials of manufacture.

4.18.8 The Seller may propose alternate materials which in his/her experience are more suited to the intended service. The alternate materials shall be subject to review by the Engineer. All materials shall be in accordance with ASTM standards. The Seller shall advise the Buyer if any specified materials are not suitable for the application.

4.19 CBO SUBMITTAL REQUIREMENTS

The Seller shall submit documentation required by the Chief Building Official (CBO) in accordance with the requirements of the California Energy Commission (CEC). The specific items requiring submittal to the CBO are listed by type of equipment and will be provided LATER. Drawings, calculations, or other documents submitted to the CBO shall be stamped by a California-licensed Professional Engineer of the appropriate engineering discipline.

Design documents for CBO approval shall be submitted to WorleyParsons for submittal to the CBO. The Seller shall finalize/resolve CBO comments. Any schedule impact due to CBO review and approval shall be to Seller's account.

4.20 NOISE EMISSIONS

4.20.1 Unless otherwise specified, the noise emission from equipment furnished by the Seller shall not exceed 85 dB(A) when measured with a standard sound level meter at slow response at 3 feet from the equipment and 5 feet above grade.

4.20.2 If mean sound power levels, as reported by the Seller in the Data Sheets, are higher than specified above, Seller shall state additional cost in proposal for reducing noise to specified levels.

5.0 TESTS AND INSPECTIONS

5.1 GENERAL

5.1.1 Shop inspection and testing will be conducted in accordance with the requirements of applicable codes and standards. Refer to the Engineering Requisition for required tests and inspections in addition to those specified herein.

5.1.2 Seller shall submit an order-specific Inspection and Test Plan (ITP). The ITP shall identify if the activity is at Seller or Seller's sub-supplier's shop. Buyer inspection points shall be discussed and clarified during the Pre-award meeting and shall be included as part of Seller's revised ITP. Seller shall provide 14 days advanced notice prior to any testing.

5.1.3 Test procedures and applicable drawings for specified tests shall be provided by Seller to Buyer at least thirty (30) days prior to start of testing. Calibration data on the test instruments shall be submitted on request.

5.1.4 Buyer may, from time to time, make visual examination of the equipment and the conditions under which it is being manufactured at the manufacturer's facility.

5.2 SHOP TESTS

The Seller shall perform standard mechanical, dynamic and hydraulic examinations and inspections of each system component.

5.2.1 Motor and pump tests shall be performed by Seller per the manufacturer's standard testing procedures, and in accordance with the attached motor specifications.

5.2.2 Shop tests shall be performed to ensure the correctness and completeness of all the electrical equipment. Shop tests shall verify the ability of all electrical equipment to perform its intended functions so that when equipment is correctly installed, the complete system shall operate as intended.

5.2.3 Tube bundles shall be hydrostatically tested before being placed in service. Water will normally be used as the test medium for hydrostatic testing. The water will be clean and will be of such quality as to minimize corrosion of the materials in the piping system. The hydrostatic test pressure will not be less than 1.5 times the design pressure, but will not exceed the maximum allowable test pressure of any non-isolated components, such as pumps or valves. Pneumatic testing will not be used unless approved by the Buyer.

5.2.4 After assembly, piping systems will be given a leak test and assembled equipment will be visually examined.

5.2.5 The Engineer/Buyer reserves the right to witness shop tests. The Seller shall notify the Engineer/Buyer of the tests at least 14 days in advance of the time for tests.

5.3 STARTUP AND INITIAL OPERATION

5.3.1 Seller shall inspect towers after installation and submit report prior to start-up, verifying installation is in accordance with specifications and Seller's recommendations.

5.3.2 Seller shall start-up towers in the presence of and via instructions to the Buyer's operating personnel.

5.3.3 Supplier's standard functional field tests will be performed on the systems and associated components during startup.

5.4 PERFORMANCE GUARANTEE TESTING

5.4.1 Acceptance and guarantee tests to demonstrate the performance of the tower will be made by the Buyer under actual operating conditions, within twelve (12) months after date of commercial operation. A performance test in accordance with CTI Code ATC-105S and a sound test in accordance with CTI Code ATC-128 will be performed The tests will be in accordance with CTI certified instrumentation and supervised by a testing company acceptable to Buyer and Vendor. Results of the test shall be binding on the Vendor in determining the degree of compliance of the WSAC with the design specifications.

5.4.2 The Vendor will be notified of the time a minimum of three (3) weeks in advance of the actual testing to enable a representative of the Vendor to be present at testing. If the Vendor wishes to have a representative or observer present, s/he may do so at the Vendor's own expense.

5.4.3 The WSAC shall be considered accepted if the tests show that the guarantees have been fulfilled and capability is at least 100%.

5.4.4 Should a performance deficiency occur, such deficiency shall be corrected by a method which shall be subject to approval by the Buyer. Increases in the velocity pressure over 10% of that stated in the Wet Surface Air Cooler for the purpose of increasing air flow shall not be used as a method of correcting deficiencies. Vendor may replace initially installed drift eliminators to correct deficiencies, provided that drift losses do not increase above the specified level.

5.4.5 The entire expense of all performance guarantee corrective measures shall be borne by the Vendor including the labor and material costs.

5.4.6 Cost of the original performance test (including services and expenses of accredited observers and instrument rental) will be borne by the Buyer; however, this will not include the expenses of the Vendor's representatives. If the initial performance test results in a capability of less than 100%, the Vendor shall pay the cost of any subsequent retest.

5.5 TEST REPORTS

5.5.1 Certified pump performance curves will be supplied for each pump based on previous tests conducted by the vendors.

6.0 SPARE PARTS

Along with the specified equipment, Seller is required to provide a list of recommended spare parts with individual prices required for start-up and the first two year operating period.

7.0 PERFORMANCE GUARANTEE AND WARRANTY

7.1 PERFORMANCE GUARANTEE

7.1.1 The Vendor shall guarantee that the WSAC will meet the specified performance for the heat loads and flow rates at the ambient conditions specified in the WSAC Data Sheets. Performance curves shall be guaranteed over the full range of operation. Design conditions shall be clearly indicated on the Seller's performance curve. Performance guarantee shall be based on the following:

1. Testing shall be in accordance with CTI Code ATC-105S.

2. The equipment shall be operated during the test in accordance with the Vendor's operating instructions.

3. The distribution header static pressure shall be measured at centerline of horizontal hot water inlet.

4. Fan power shall be measured at the motor substation with cable and motor losses calculated.

7.1.2 The Vendor shall guarantee that the drift shall not exceed the value specified in Wet Surface Air Cooler data sheets at the ambient conditions specified when tested under the agreed test procedures.

7.2 ACOUSTICAL GUARANTEE

7.2.1 The Seller shall guarantee that the maximum continuous A-weighted sound level from the installed wet surface air cooler operating at full water flow rate, with all fans on, shall not exceed the sound levels specified in Wet Surface Air Cooler data sheets, measured in accordance with CTI Code ATC-128.

8.0 OTHER REQUIREMENTS

8.1 CLEANING AND PAINTING

8.1.1 Cleaning and painting shall be the Seller's standard unless specified otherwise on the Data Sheets. The Seller shall provide a minimum of one quart of paint suitable for touchup of surfaces damaged during installation.

8.1.2 All surfaces of equipment, both internal and external, shall be cleaned of grease, chips, dirt, and other foreign material. Machined surfaces such as flange faces, shafting, etc., shall be coated with a suitable rust preventative material which can be readily removed but which will withstand weather elements in shipment.

8.2 PAINTING

8.2.1 The gear reducer, motor and all other equipment and galvanized structural surfaces located in the wet air stream subject to corrosion, which are not bronze, stainless steel or monel shall be coated with two coats of coal tar epoxy.

8.2.2 For applications where the chlorides in the makeup water is greater than 1,000 ppm (mg/l), all remaining galvanized structural surfaces located outside of the wet air stream shall also be coated with two coats of coal tar epoxy.

8.3 QUALITY ASSURANCE

8.3.1 The Seller shall follow their standard procedures for quality assurance and control. Seller's standard QA Manual shall be submitted in both electronic and hard copy in accordance with the Engineering Requisition to the Buyer for review and should be in such a form as to enable an assessment to be made of the manufacturing sequence and inspection set up and other control procedures.

8.3.2 During the execution of the purchase order, manufacturing and quality control procedures shall be available for reference by the Owner or its representative at the site.

8.3.3 Inspection release for work at site does not relieve the Seller of the responsibility from complying completely with the requirements of this specification, except for deviations specifically brought to the Owner's attention and specifically waived in writing.

8.3.4 Records of welder's qualifications, welding procedures, repair procedures, heat treatment charts, materials certifications and test results shall be placed in the Seller's files and be available for examination by the Buyer.

8.3.5 It is the Seller's responsibility to obtain copies of all documents referenced in this specification. Unless specific exception is requested formally by the Seller and formally granted by the Buyer, these referenced documents shall be binding.

8.4 WELDING AND REPAIR WELDING:

8.4.1 All welding and repair welding shall be performed in accordance with the Seller's written procedures. These procedures shall include welding method, inspection method, and criteria for acceptance of a welded member.

8.4.2 All welding shall be performed by qualified welders and shall comply with the requirements of AWS D1.1 and ASME B31.1, as applicable.

8.5 SHIPPING AND HANDLING

8.5.1 The Seller shall be responsible for packaging, handling, and shipping of all equipment and shall protect them from damage in transit and storage. The Seller shall be responsible for and make good any and all damages due to improper preparation or loading for shipment.

8.5.2 Boxes and crates shall be marked and have a packing list enclosed showing the parts contained therein. The list shall include the applicable part name and contract number.

8.5.3 All rotating parts shall be properly blocked to prevent damage during loading, transport, and storage. All blocking materials shall be brightly colored for ease of identification for removal before placing the equipment in service.

8.5.4 The component parts of each piece of equipment shall be completely assembled in the shop. Insofar as practicable, equipment shall be shipped completely assembled, unless specified otherwise.

8.5.5 All bolted openings such as flanges shall be covered by a Masonite, plywood or hard plastic cover of ½" minimum thickness. This cover shall be secured by at least two bolts on opposite sides of the opening. After this cover is bolted in place, the closure shall be sealed using waterproof tape.

8.5.6 All threaded openings shall be closed with threaded pipe plugs or caps of the same material as the component part containing the opening. Pipe plugs and caps shall be sealed with Teflon tape.

8.5.7 All other openings shall be closed with a suitable metal, plastic, or wooden closure. Metallic caps or plugs, when used, shall be of the same type of material as the opening. In addition, the closures shall be sealed with waterproof tape.

8.5.8 Waterproof materials used for sealing austenitic stainless steel parts shall contain less than 100 ppm leachable chlorides.

8.5.9 All parts which, of necessity due to physical size or arrangement, may be exposed to the weather shall be adequately protected by suitable weatherproofing. It shall be the responsibility of the Seller to take any other precautions required to reasonably ensure arrival at the jobsite of the equipment in an undamaged and satisfactory working condition.

8.5.10 Unless the Buyer and the Seller agreed otherwise, storage of the equipment and accessories shall be outdoors. The Seller shall inform the Buyer of any special storage requirement sufficiently in advance of shipment.

8.6 MARKING AND IDENTIFICATION

8.6.1 Each package, skid, box, and crate shall be marked on the outside with the following information so that it is readily visible:

1. Buyer's Name
   Project Identification
   Job Site Address

2. The Buyer's purchase order number.

3. Manufacturers Name, Address and Telephone No.

4. Any special instructions for handling.

5. Shipping weight, weight lift points, and the center of gravity.

6. The Buyer's equipment tag number.

8.6.2 All mechanical equipment shall include a permanently attached stainless steel nameplate including, as a minimum, the following information:

1. Name of equipment

2. Seller's name, model number, shop order number, and serial number

3. Buyer's equipment tag number.

4. Important equipment design information including service, capacities, pressures, temperatures, brake horsepower and rotating speed.

5. Electric motor information including enclosure type, frame size, horsepower rating, rotating speed, voltage and service factor.

Note: Units shall be compatible to those in the specification data sheet.

8.6.3 Each piping specialty shall be fitted with a stainless steel tag on which shall be stamped the tag number, shop order number, and item number.

END OF SPECIFICATION

APPENDIX 3.1-1

Revised Air Quality Data

Colusa Generating Station
Gas Turbine, WSAC, and Water Bath Heater Emission Calculations

Gas Turbine Operating Conditions

Ambient Temperature	Winter Minimum - 18°F				Yearly Average- 59°F				Summer Maximum - 114°F			
CTG Load Level	100%	100%	75%	50%	100%	100%	75%	50%	100%	100%	75%	50%
Evap Cooling Status	No	No	No	No	No	No	No	No	Yes	Yes	No	No
Duct Burner Status	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No
Duct Burner Heat Input (MMBTU/hr)	674.3	0	0	0	674.3	0	0	0	688	0	0	0
Stack Outlet Temperature (°F)	162	193	181	175	161	193	181	175	186	202	188	167

Average Emission Rates from each Gas Turbine (lbs/hr/turbine) - Normal Operation

(Reference: Bechtel/GE Turbine/Site Specific Information)

Fuel Flow (MMBTU/hr)	2591.5	1917.2	1558.3	1239.1	2451.8	1777.5	1452.1	1161.4	2376.9	1688.9	1387.6	1096.4
Oxygen		521673.93	424757.01	357310.32		497689.43	410862.14	348178.86	408696.46	482923.2	407802.23	344825.33
CO_2		220308.62	176785.75	139937.33		212642.73	171014.8	135719.25	258123.89	207100.51	166835.56	132522.16
H_2O		183061.64	146725.44	116360.93		192960.1	155426.98	124160.74	364883.68	204618.06	156940.6	125444.27
N_2		2727457.18	2206708.6	1815624.57		2612518.03	2135777.56	1767434.81	2539067	2538099.63	2106329.34	1740758.87
Ar		46298.62	37023.19	30766.85		45189.72	36918.52	30506.33	43547.857	43258.59	36092.28	29449.37
NO_x (@ 2.0 ppm)	20.7	15.3	12.3	9.7	19.6	14.2	11.5	9.1	19	13.50	11	8.6
CO (@ 3.0 ppm)	18.9	14	11.3	8.9	17.9	13	10.5	8.3	17.4	12.3	10	7.8
VOC (@ 2.0 ppm)	7.2	3.4	2.7	2.2	6.8	3.1	2.5	2.1	6.6	3	2.5	2.1
SO_2	7.25	5.36	4.36	3.47	6.86	4.97	4.06	3.25	6.65	4.73	3.88	3.07
PM10	13.5	10	10	10	13.5	10	10	10	13.5	10	10	10
NH_3 (@ 5 ppm slip)	19.2	14.2	11.4	9	18.2	13.1	10.6	8.4	17.6	12.5	10.2	7.9
Stack Exit Velocity (fps)	68.6	71	55.1	44.3	63.7	66	52.3	42.8	63.1	63.7	51.5	42
Total Inerts		3698999.99	2991999.99	2460000		3561000.01	2910000	2405999.99	3614318.887	3475999.99	2874000.01	2373000
Total		3692566	2992052.05	2460043.267		3561058.384	2910049.163	2405941.14	3614399.638	3476056.016	2874047.593	2373039.468
Total Inerts (lbmol/hr/turbine)		130052.316	105178.529	86423.74337		125539.5479	102561.7071	84748.26671	130679.1927	122893.7299	101382.814	83662.97884
Total Inerts(1atm;outlet T) (cfm)		1033052.235	820118.3401	667562.8345		997205.6978	799706.3474	654620.9518	1026899.181	989649.5655	799150.9441	638092.4362
sulfur content in gas:		0.2	gr total S / 100 scf									

(a) Maximum Capability of Duct Burner

Startup / Shutdown Emissions from Turbine (1CT)

Cold Startup			Warm Startup			Hot Startup			Shutdown		
270 minutes	Max 1-hr.	Total	180 min.	Max 1-hr.	Total	90 min.	Max 1-hr.	Total	30 min.	Max 1-hr.	Total
	lb/hr	lb/270 min		lb/hr	lb/180 min		lb/hr	lb/90 min		lb/hr	lb/30 min
NO_x	333.3	779.1	NOx	152	456	NOx	249.90	259.90	NOx	115.00	115.00
CO	373.60	1681.20	CO	370.3	1110.9	CO	429.60	644.40	CO	967.00	483.50
VOC	27.70	124.65	VOC	27.70	83.10	VOC	27.70	41.55	VOC	47.80	23.90
SO_2	0.40	1.80	SO2	0.40	1.20	SO2	0.4	0.6	SO2	0.4	0.2
PM10	10	45	PM	10	30	PM	10	15	PM	10	5

Assumptions:
Startup and Shutdown Emissions from data provided by Client.
Spreadsheet "Colusa Startup Emissions Summary 07-13-06" and email 07/17/06 for shutdown (used higher, 30 min. assumed)
SO_2 emissions assume complete conversion of all sulfur to SO_2. SO2 emissions above based on annual average total sulfur in fuel of 1.0 gr/100scf

Emissions from WSAC

Total Hours of Operation	8,760	hr/yr
Stack Air Temp.	90	F
Exhaust Air Flow (total)	712,000	cfm

Hours per Qtr			
Q1	Q2	Q3	Q4
2190	2190	2190	2190

	Emissions				
Pollutant	lb/MMBtu	lb/hr	lb/yr	ton/qtr	ton/yr
NOx					
CO					
SO2					
VOC					
PM10		0.24	2,102.4	0.263	1.051

Emissions from Water Bath Heater

Total Hours of Operation	8,760	hr/yr
Combustor Duty	10	MMBtu/hr
Flue Gas Flow	2,500	cfm

Hours per Qtr			
Q1	Q2	Q3	Q4
2190	2190	2190	2190

	Emissions				
Pollutant	lb/MMBtu	lb/hr	lb/yr	ton/qtr	ton/yr
NOx @ 3% O2, 70 F	0.039	0.391	3,425.5	0.428	1.713
CO @ 3% O2, 70 F	0.079	0.793	6,945.2	0.868	3.473
SO2 @ (1.0 gr/100scf)	0.003	0.028	245.1	0.031	0.123
VOC	0.003	0.027	240.5	0.030	0.120
PM10	0.003	0.029	257.6	0.032	0.129

Peak SO2 based on 1.0 gr/100 scf

Colusa Generating Station
Gas Turbine, WSAC, and Water Bath Heater Emission Calculations

Average Annual Emissions

Duct Burner Emission Rates are based on the maximum duct burner capability scenario (59°F; 100% load; no evaporative cooling; duct burner duty = 598.3 MMBTU/hr)
Average Operation Emission Rates are based on the average operation scenario (59°F; 100% load; no overpressure; no power augmentation)
SO2 emissions assume complete conversion of all sulfur to SO2. SO2 emissions above based on annual average total sulfur in fuel of 0.3 gr/100scf

		Base Operation patterned after CCPP8	Annual	Turbine Emissions	Emissions for Both Turbines	Sum of four individual quarters below	Higher
Total Hours of Operation	8760						
Total Number of Cold Starts	14.0			lb/yr/CT	ton/yr/2CT	ton/yr/2CT	ton/yr/2CT
Cold Start Duration (hr)	4.50		NO_X	172932.40	172.9	183.0	183.0
Total Number of Warm Starts	0		CO	209939.60	209.9	268.8	268.8
Warm Start Duration (hr)	3.00		VOC	46899.20	46.9	48.4	48.4
Total Number of Hot Starts	42.0		SO_2	15214.33	15.2	15.5	15.5
Hot Start Duration (hr)	1.50		PM	102160.00	102.2	102.2	102.2
Total Number of Shutdowns	56.0		from Duct Burner				
Shutdown Duration (hr)	0.50						
Duct Burner Operation (hr)	4160	6 h/d for 5 d/wk					
Average Operation (hr)	4446						
Half Load Operation	0						

First Quarter Emissions (Jan, Feb, Mar)

Duct Burner Emission Rates are based on the maximum duct burner capability scenario (18°F; 100% load; no evaporative cooler; duct burner duty = 598.3 MMBTU/hr)
Average Operation Emission Rates are based on the average operation scenario (18°F; 100% load; no evaporative cooler).
Actual average temperatures during this quarter are higher. Therefore, this produces a conservatively high emission estimate.

			Base Qtr, actual days, minimum temp.	First Quarter		Turbine Emissions	Emissions for Both Turbines	
Total Hours of Operation		2160						
Total Number of Cold Starts		3.5				lb/qtr/CT	ton/qtr/2CT	g/s
Cold Start Duration (hr)		4.50		NO_X		45140.75	45.1	2.58
Total Number of Warm Starts		0		CO		54216.40	54.2	3.10
Warm Start Duration (hr)		3.00		VOC		12372.25	12.4	0.71
Total Number of Hot Starts		10.5		SO_2		4007.61	4.0	0.23
Hot Start Duration (hr)		1.50		PM		25240.00	25.2	1.44
Total Number of Shutdowns		14.0						
Shutdown Duration (hr)		0.50						
Duct Burner Operation (hr)		1040						
Average Operation (hr)		1082						
Half Load Operation (hr)		0.00						

Second Quarter Emissions (Apr, May, Jun)

Duct Burner Emission Rates are based on the maximum duct burner capability scenario (59°F; 100% load; no evaporative cooler; duct burner duty = 598.3 MMBTU/hr)
Average Operation Emission Rates are based on the average operation scenario (59°F; 100% load, no evaporative cooler).
Actual average temperatures during this quarter are higher. Therefore, this produces a conservatively high emission estimate.

			Base Qtr, actual days, average temp.	Second Quarter		Turbine Emissions	Emissions for Both Turbines	
Total Hours of Operation		2184						
Total Number of Cold Starts		3.5				lb/qtr/CT	ton/qtr/2CT	g/s
Cold Start Duration (hr)		4.50		NO_X		43147.90	43.1	2.46
Total Number of Warm Starts		0		CO		52406.90	52.4	2.99
Warm Start Duration (hr)		3.00		VOC		11706.20	11.7	0.67
Total Number of Hot Starts		10.5		SO_2		3794.63	3.8	0.22
Hot Start Duration (hr)		1.50		PM		25480.00	25.5	1.46
Total Number of Shutdowns		14.0						
Shutdown Duration (hr)		0.50						
Duct Burner Operation (hr)		1040						
Average Operation (hr)		1106						
Half Load Operation (hr)		0.00						

Colusa Generating Station
Gas Turbine, WSAC, and Water Bath Heater Emission Calculations

Third Quarter Emissions (Jul, Aug, Sep)

Duct Burner Emission Rates are based on the maximum duct burner capability scenario (59°F; 100% load; no evaporative cooler; duct burner duty = 598.3 MMBTU/hr)
Average Operation Emission Rates are based on the average operation scenario (59°F; 100% load; no evaporative cooler).
Actual average temperatures during this quarter are higher. Therefore, this produces a conservatively high emission estimate.

	Base	Cyclical	PG&E 8/8/06 PG&E 8/8/06 email worst quarter cycling case
Total Hours of Operation	2208	1208	
Total Number of Cold Starts	3.5	1.0	start of qtr
Cold Start Duration (hr)	4.50	4.50	
Total Number of Warm Starts	0	12	1 each week
Warm Start Duration (hr)	3.00	3.00	
Total Number of Hot Starts	10.5	60.7	4.67 each week
Hot Start Duration (hr)	1.50	1.50	
Total Number of Shutdowns	14.0	73.7	
Shutdown Duration (hr)	0.50	0.50	
Duct Burner Operation (hr)	1040	1040	16x5
Average Operation (hr)	1130	0	
Half Load Operation (hr)	0.00	0.00	

Third Quarter		Turbine Emissions	Emissions for Both Turbines	
		lb/qtr/CT	ton/qtr/2CT	g/s
NO_x	Cyclical	50868.70	50.9	2.91
CO	Cyclical	108325.55	108.3	
VOC	Cyclical	12473.64	12.5	
SO_2	Base	3830.44	3.8	
PM	Base	25720.00	25.7	

Fourth Quarter Emissions (Oct, Nov, Dec)

Duct Burner Emission Rates are based on the maximum duct burner capability scenario (59°F; 100% load; no evaporative cooler; duct burner duty = 598.3 MMBTU/hr)
Average Operation Emission Rates are based on the average operation scenario (59°F; 100% load; no evaporative cooler).
Actual average temperatures during this quarter are higher. Therefore, this produces a conservatively high emission estimate.

			Base Qtr, actual days, average temp.
Total Hours of Operation		2208	
Total Number of Cold Starts		3.5	
Cold Start Duration (hr)		4.50	
Total Number of Warm Starts		0	
Warm Start Duration (hr)		3.00	
Total Number of Hot Starts		11.5	
Hot Start Duration (hr)		1.50	
Total Number of Shutdowns		15.0	
Shutdown Duration (hr)		0.50	
Duct Burner Operation (hr)		1040	16x5
Average Operation (hr)		1128	
Half Load Operation (hr)		0.00	

Fourth Quarter		Turbine Emissions	Emissions for Both Turbines	
		lb/qtr/CT	ton/qtr/2CT	g/s
NO_x		43835.20	43.8	2.50
CO		53820.80	53.8	
VOC		11839.85	11.8	
SO_2		3827.70	3.8	
PM		25720.00	25.7	

Worst-Case 1-Hour Emissions per Turbine

Worst-Case 1-Hour Emissions for NO_2 and CO are equal to Cold Startup and Shutdown emission rates, respectively.
Worst-Case 1-Hour Emissions for SO_2 are equal to 18°F, 100% load, duct firing emission rates

(lb/hr/turbine)		
NO_2	333.30	
CO	967.00	
SO_2	7.25	based on 1.0 gr/100 scf
(g/sec/turbine)		
NO_2	41.99	
CO	121.84	
SO_2	0.91	

Worst-Case 3 Hour Emission Rate per Turbine

Only SO_2 is considered for an average 3-hour Ambient Air Quality Standard. Emission rates are equal to 18°F; 100% load, duct firing emission rates

(lb/hr/turbine)		
SO_2 (lb/hr/CT)	7.25	based on 1.0 gr/100 scf
SO_2 (g/sec/CT)	0.91	

Worst-Case 8-Hour Emission Rates

Only CO is considered for an average 8-hour Ambient Air Quality Standard.
Worst-case 8-Hour Scenario includes five hours at Startup and Shutdown rate. Remainder of 8 hours is at 18°F; 100% load, duct firing emission rates.

(lb/hr/turbine)			
Total Hours of Operation	8	lb/hr	lbs
Startup Duration (hours)	4.50		1681.20
Shutdown (hours)	0.50		483.50
Hours of Baseline Operation (hr)	3.00	18.90	56.70
	Total for 8 hrs		2221.40

CO (lb/hr/CT)	277.68
CO (g/s/CT)	34.99

Colusa Generating Station
Gas Turbine, WSAC, and Water Bath Heater Emission Calculations

Worst-Case 24 Hour Emission Rate

Only SO_2 and PM_{10} are considered for an average 24-hour Ambient Air Quality Standard
Extreme low temperature, 100% operating load is conservatively assumed for the entirety of the 24 hours.

SO_2 (lb/hr/CT)	7.25	based on 1.0 gr/100 scf
SO_2 (g/s/CT)	0.91	
PM_{10} (lb/hr/CT)	13.50	
PM_{10} (g/s/CT)	1.70	

Worst-Case Daily Emissions per Turbine

For NO_x, CO and VOC assume 6 hours at startup and shutdown emission rate (approx. 3 hot startups and 3 shutdowns), remainder at extreme low temperature, 100% full load.
For SO_2 and PM_{10} assume extreme low temperature, 100% operating load for 24 hours.

(lbs)	start/stop amount	3 start/stop	full load hourly rate	18 or 24 hours of full load	Daily Total	
NO_x	374.90	1124.70	20.70	372.60	1497.30	
CO	1127.90	3383.70	18.90	340.20	3723.90	
VOC	65.45	196.35	7.20	129.60	325.95	
SO_2			7.25	174.03	174.03	based on 1.0 gr/100 scf
PM_{10}			13.50	324.00	324.00	

Worst-Case Emissions Turbine - Commissioning

(lbs)	Plant Total	
NO_x	194,000	
CO	608,000	
VOC	27,000	
SO_2	2,225	scaled from pm10
PM_{10}	28,000	

bechtel 10/27

Quarterly and Annual Estimated Emissions From CGS+WSAC+ Water Bath Heater

Pollutant	1st Quarter Emissions (tons)	2nd Quarter Emissions (tons)	3rd Quarter Emissions (tons)	4th Quarter Emissions (tons)	Annual Emissions (tons)
NO_X	45.57	43.58	51.30	44.26	184.71
CO	55.08	53.28	109.19	54.69	272.24
VOC	12.40	11.74	12.50	11.87	48.51
PM10	25.54	25.76	26.02	26.02	103.34
SO_2	4.04	3.83	3.86	3.86	15.49

Notes:
Includes emissions from two turbines, duct burners, WSAC and Water Bath Heater.
engines.

Quarterly and Annual Estimated Emissions From CGS alone

Pollutant	1st Quarter Emissions (tons)	2nd Quarter Emissions (tons)	3rd Quarter Emissions (tons)	4th Quarter Emissions (tons)	Annual Emissions (tons)
NO_x	45.14	43.15	50.87	43.84	182.99
CO	54.22	52.41	108.33	53.82	268.77
VOC	12.37	11.71	12.47	11.84	48.39
SO_2	25.24	25.48	25.72	25.72	102.16
PM10	4.01	3.79	3.83	3.83	15.46

Includes emissions from two turbines, duct burners, WSAC and Gas Bath Heater.

APPENDIX 3.12

Hazardous Materials MSDS

Rust Bullet®

MATERIAL SAFETY DATA SHEET Updated July 18, 2006

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Rust Bullet® CAS Number: Mixture
Chemical Name & Synonyms: Metallic Pigmented Polyurethane Coating
Trade Names & Synonyms: Rust Bullet – Automotive, Metallic Pigmented

Company Identification: **Rust Bullet®**
300 Brinkby Avenue; Suite 200
Reno, NV 89509
775-829-5606 (For product information) 800-424-9300 or 202-483-7616 (CHEMTREC: For emergencies)

2. COMPOSITION / INFORMATION ON INGREDIENTS:

Chemical Name	Amount (optional)	CAS Number	TLV
Diisocyanate (MDI)	1-5%	26447-40-5	ACGIH: not established
MDI Based Polyisocyanate	40-65%		OSHA: not established
			ACGIH: not established
4.4'-Diphenylmethane	5-15%	101-68-8	OSHA: not established
			ACGIH: not established
Aluminum	10-25%	7429-90-5	10mg/m^3
Aromatic Solvent Blend	10-25%	1330-20-7	434 mg/m^3
Isobutyl Acetate	10-25%	110-19-0	713mg/m^3

Non Isomer specific DAS number includes 2.2'MDI and 2.4' MDI
Specific chemical identity is withheld as a trade secret.

California Prop 65: This product does NOT contain ingredients which are known to the state of California to cause cancer, birth defects, or other reproductive harm.

HAZARDS DISCLOSURE: This product contains known hazardous materials as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200. As defined under Sara 311 and 312, this product contains known hazardous materials.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW - WARNING! FLAMMABLE LIQUID AND VAPOR. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

HMIS Rating: Health – 3, Flammability - 2, Reactivity - 1 Personal Protection Index - E
NFPA Rating: Health - 3, Flammability - 2, Reactivity - 1
NFPA/HMIS Definitions: (0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme).
Protective Equipment: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

Rust Bullet®

Potential Health Effects

Acute Inhalation: Inhalation can cause severe irritation of mucous membranes and upper respiratory tract. Symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea and vomiting. High concentrations may cause lung damage. An irritant to the nose, throat, and upper respiratory tract. Exposure to high concentrations have a narcotic effect and may cause liver and kidney damage. Persons with a preexisting, nonspecific bronchial hyperactivity can respond to concentrations below the TLV with similar symptoms as well as an asthma attack. Exposure well above the TLV may lead to bronchitis, bronchial spasm and pulmonary edema (fluid in lungs). These effects are usually reversible. Chemical or hypersensitive pneumonitis, with flu-like symptoms (e.g. fever, chills) has also been reported.

Chronic Inhalation: As a result of previous repeated overexposures or a single large dose, certain individuals may develop isocyanate sensitization (chemical asthma) which will cause them to react to later exposure to isocyanate at levels well below the TLV. These symptoms, which include: chest tightness, wheezing, cough, shortness of breath or asthmatic attack, could be immediate or delayed up to several hours after exposure. Similar to many non-specific asthmatic responses, there are reports that once sensitized; an individual can experience these symptoms upon exposure to dust, cold air or other irritants. This increased lung sensitivity can persist for weeks and in severe cases for several years. Chronic overexposure to isocyanates has also been reported to cause lung damage, including decrease in lung function, which may be permanent. Chronic exposure to organic solvents has been associated with various neurotoxic effects including permanent brain and nervous system damage. Symptoms include loss of memory, loss of intellectual ability and loss of coordination.

Ingestion: Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea.

Skin Contact: Causes irritation to skin. Symptoms include redness, itching, and pain. Repeated or prolonged contact with the skin has a defatting effect and may cause dryness, cracking, and possibly dermatitis.

Eye Contact: Causes irritation, redness, and pain.

Chronic Exposure: Chronic overexposure may cause anemia with leukocytosis (transient increase in the white blood cell count) and damage to the liver and kidneys.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

Carcinogenicity: None of the components of this product are listed by the NTP, IARC, or regulated by OSHA as carcinogens.

Medical Conditions Aggravated by Exposure: Asthma and other respiratory disorders (bronchitis, emphysema, hyper reactivity), skin allergies, eczema.

Exposure Limits: Not established for product as a whole. Refer to Section II for exposure limits of hazardous constituents

Rust Bullet®

4. FIRST AID MEASURES

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Do not induce vomiting. Give large amounts of milk or water to drink. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact: Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

NOTE TO PHYSICIAN
Eyes: Stain for evidence of corneal injury. If cornea is burned, instill antibiotic/steroid preparation frequently. Workplace vapors could produce reversible corneal epithelial edema impairing vision.

Ingestion: Treat symptomatically. There is no specific antidote. Inducing vomiting is contraindicated because of the irritating nature of the product.

Inhalation: This product is a known pulmonary sensitizer. Treatment is essentially symptomatic. An individual having a dermal or pulmonary sensitization reaction to this material must be removed from any further exposure to any isocyanate.

5. FIRE FIGHTING MEASURES

Fire: Flash point: 123 F

Autoignition temperature: **~426C (~799F).**
Flammable limits in air % by volume: LEL: 0.9% UEL: 7.0%

Flammable Liquid and Vapor! Contact with strong oxidizers may cause fire.

Explosion: Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Sealed containers may rupture when heated. Sensitive to static discharge.

Fire Extinguishing Media: Water spray, dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool.

Dry chemical (e.g. monoammonium phosphate, potassium sulfate, and potassium chloride), carbon dioxide, high expansion (proteinic) chemical foam.

Special Fire Fighting Procedures: Full emergency equipment with self-contained breathing apparatus and full protective clothing should be worn by fire fighters. During a fire, MDI vapors and other irritating, highly toxic gases may be generated by thermal decomposition or combustion. At temperatures greater than 400° F, (204° C.) polymeric MDI can polymerize and decompose which can cause pressure build up in closed containers. Explosive rupture is possible.

Rust Bullet®

Special Information: In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face-piece operated in the pressure demand or other positive pressure mode. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures. Vapors can flow along surfaces to distant ignition source and flash back.

6. ACCIDENTAL RELEASE MEASURES

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures.

7. HANDLING AND STORAGE

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

Vigorous stirring and flow thought the piping and equipment might cause the formation and accumulation of electrostatic charge due to the low conductivity of the product. In order to avoid the risk of fire outbreak and explosion never use compressed air during movement.

Storage Temperature (min/max): 32°F. (0°C.)/121°F. (50°C)
Shelf Life: 24 months at 77°F. When unopened.

HANDLING (PERSONNEL): Handle in accordance with good hygiene and safety procedures. Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling. When transferring materials ground and bond containers, use spark proof tools and explosion proof equipment. Since empty containers contain product residue, follow all hazard warnings and precautions even after container is emptied. Keep away from sources of ignition.

STORAGE PRECAUTIONS: Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Avoid dust dispersal. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

Rust Bullet®

MATERIAL SAFETY DATA SHEET Updated July 18, 2006

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Airborne Exposure Limits: See Section 2

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with organic vapor cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection: Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection: Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. PHYSICAL AND CHEMICAL PROPERTIES

FORM: Liquid
ODOR: Solvent
SOLUBILITY IN WATER: Insoluble
PH: N/A
MELTING/FREEZING POINT: N/D
EVAPORATION RATE (BuAc=1): Slower than ether
AUTOIGNITION TEMPERATURE: ~426C (~799F)
% VOLATILES BY VOLUME @ 21°C (70°F): <30

COLOR: Metalilic alminum
FLAMMABLE LIMITS: LEL: 0.9% UEL: 7.0%
VISCOSITY: 200-500 CPS @ 25°C (77°F)
BOILING POINT:180- 200°C (356 - 392°F)
FLASH POINT: 123°F
VAPOR DENSITY (Air=1): Heavier than air
VAPOR PRESSURE (mm Hg): <10mm @ 25°C

SPECIFIC GRAVITY: 1.104 Kg/l (8.012 #/gallon)
VOLATILE ORGANIC COMPOUNDS (VOC #/gal): 286 g./liter

10. STABILITY AND REACTIVITY

Stability: Stable under ordinary conditions of use and storage. Heat will contribute to instability. Slowly decomposed by moisture.

Hazardous Decomposition Products: Carbon dioxide and carbon monoxide may form when heated to decomposition.

Rust Bullet®

Hazardous Polymerization: May occur. Contact with moisture and other materials which react with isocyanates or temperatures over 400oF. (204oC.) may cause polymerization..

Incompatibilities: Avoid heat, flame and other sources of ignition. Contact with nitrates, strong oxidizers, strong alkalis, or strong acids may cause fire and explosions. Water may react to form carbon dioxide. Will attack some forms of plastic, rubber, and coatings.

Conditions to Avoid: Avoid contact with water Can cause some corrosion to copper alloys and aluminum.

11. TOXICOLOGICAL INFORMATION

Acute effects: stinging eyes. Symptoms may include: rubescence, edema, pain and lachrymation. Vapor inhalation may moderately irritate the upper respiratory trait. Contract with skin may cause slight irritation. Ingestion may cause health problems including stomach pain and sting, nausea and sickness.

This product may have a degreasing action on the skin, producing dryness and chapped skin after repeated exposure.

This product contains highly volatile substances, which may cause serious depression of the central nervous system (CNS) and have negative effects, such as drowsiness, dizziness, slow reflexes, and narcosis.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Diisocyanate (MDI) (26447-40-5)	No	No	None
MDI Based Polyisocyanate	No	No	None
4.4'-Diphenylmethane (101-68-8)	No	No	None
Aluminum (7429-90-5)	No	No	None
Aromatic Solvent Blend (1330-20-7)	No	No	None
Isobutyl Acetate (110-19-0)	No	No	None

12. ECOLOGICAL INFORMATION

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent.

When released to water, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life of less than 1 day. This material has a log octanol-water partition coefficient of less than 3.0. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals.

When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to have a half-life between 1 and 10 days.

Environmental Toxicity: No Data Available.

Rust Bullet®

13. DISPOSAL CONSIDERATIONS

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. TRANSPORTATION INFORMATION

These goods must be transported by vehicles authorized to the carriage of dangerous goods according to the provisions set out in the current edition of the Code of International Carriage of Dangerous Goods by Road (ADR) and in all the applicable national regulations. These goods must be packed in their original packaging or in packaging made of materials resistant to their content and not reacting dangerously with it. People loading and unloading dangerous goods must be trained on all the risks deriving from these substances and on all actions that must be taken in case of emergency situations.

Domestic (Land, D.O.T.) – Not Regulated Material

ADR:	N/A
PRODUCT LABEL:	Rust Bullet
UN NUMBER:	N/A
D.O.T. HAZARD CLASS:	N/A
PACKING GROUP:	N/A
D.O.T. SHIPPING NAME:	Paint
SPECIAL PROVISIONS:	640E

Domestic (AIR) – Not Regulated Material (Containers less than 5-Liters)

International (Water, I.M.O.)

IMO CLASS:	3
PRODUCT LABEL:	Rust Bullet
UN NUMBER:	1263
D.O.T. HAZARD CLASS:	3
PACKING GROUP:	III
D.O.T. SHIPPING NAME:	Paint
PRODUCT RQ (LBS):	N/A
EMS:	F-E, S-E

International (Air, I.C.A.O.)

IATA:	3
PRODUCT LABEL:	Rust Bullet
UN NUMBER:	1263
D.O.T. HAZARD CLASS:	3
PACKING GROUP:	III
D.O.T. SHIPPING NAME:	Paint

CARGO:	Packing Instructions:	310	Maximum Quantity:	220L
PASS.:	Packing Instructions:	309	Maximum Quantity:	60L
	Special Instructions:	--		

Rust Bullet®

15. REGULATORY INFORMATION

FEDERAL REGULATORY STATUS: OSHA Classification: Product is hazardous according to the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Chemical Weapons Convention: No **TSCA 12(b)**: No **CDTA**: No
SARA 311/312: Acute: No Chronic: YES Fire: YES Pressure: No
Reactivity: No (Mixture / Liquid)
Australian Hazchem Code: 3[Y]
Poison Schedule: None allocated.

WHMIS: This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

This material or all of its components are listed on the Inventory of Existing Chemical Substances under the Toxic Substance Control Act (TSCA). This material or all of its components are listed on the Canadian Domestic Substances List (DSL). This material or all of its components are listed (or considered as having been notified) on the European Inventory of Existing Chemical Substances (EINECS). Other inventory lists: ENCS (Japan), Korea, Australia, China (Draft), PICCS (Philippines), Japan (ENCS).

Component Name/CAS#	Concentration	State Code
Diphenylmethane Diisocyanate	Less than 1.5%	NJ4

The following chemicals are specifically listed by individual states; other products specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

Component Name/CAS#	Concentration	State Code
Diphenylmethane Diisocyanate (MDI) (2.2;2.4) 26447-40-5	Less than 1.5%	NJ 4
Polyisocyanate Based on MDI	Less than 70%	PA 3, NJ 4
NJTSRN (31765300002)-5317P	Less than 15%	PA1, FL, IL, MA, RI, NJ1, NJ4, CN2
FL	Florida Substance List	
IL	Illinois Toxic Substances List	
MA	Massachusetts Hazardous Substance List	
NJ1	New Jersey Hazardous Substance	
NJ4	New Jersey Other – Included in 5 predominant ingredients >1%	
PA3	Pennsylvania Non-Hazardous present at 3% or greater	
RI	Rhode Island List of Designated Substances	
CN2	Canada WHMIS Ingredient Disclosure List over 0.1%	

Rust Bullet®

MATERIAL SAFETY DATA SHEET Updated July 18, 2006

16. OTHER INFORMATION

Label Hazard Warning: DANGER! FLAMMABLE LIQUID AND VAPOR. HARMFUL OR FATAL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

Label Precautions: Keep away from heat, sparks and flame. Avoid breathing vapor. Keep container closed. Use only with adequate ventilation. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Label First Aid: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person. In all cases, get medical attention.

Prepared By: Donato Polignone
Approval Date: July 18, 2006

Part Number: N/A (Official Copy)
Supersedes Date: February 9, 2005

ADDITIONAL INFORMATION:

The data in this Material Safety Data Sheet relates only to the specific material designated herein. It does not relate to use in combination with any other material or in any process. This Material Safety Data Sheet (MSDS) has been reviewed to fully comply with the guidance contained in the ANSI MSDS standard (ANSI Z400.1-1998).

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END OF MSDS

NALCO

MATERIAL SAFETY DATA SHEET

PRODUCT

SODIUM HYPOCHLORITE

EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : **SODIUM HYPOCHLORITE**

APPLICATION : INDUSTRIAL WATER TREATMENT

COMPANY IDENTIFICATION : Nalco Company
1601 W. Diehl Road
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 3 / 3 FLAMMABILITY : 0 / 0 INSTABILITY : 0 / 0 OTHER : OXY
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)
Sodium Hypochlorite	7681-52-9	10.0 - 30.0

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
Corrosive. May cause tissue damage. May cause sensitization by skin contact.
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Keep container tightly closed and in a well-ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. After contact with skin, wash immediately with plenty of water.
Wear a face shield. Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots.
May evolve chlorine under fire conditions. Hypochlorous acid HCl

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin, Inhalation

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Corrosive. Will cause eye burns and permanent tissue damage.

SKIN CONTACT :
May cause severe irritation or tissue damage depending on the length of exposure and the type of first aid administered. Repeated or prolonged contact may cause skin sensitization.

INGESTION :
Corrosive; causes chemical burns to the mouth, throat and stomach. May cause nausea and vomiting. May cause diarrhea.

INHALATION :
Corrosive to respiratory system.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

4. FIRST AID MEASURES

EYE CONTACT :
PROMPT ACTION IS ESSENTIAL IN CASE OF CONTACT. Immediately flush eye with water for at least 15 minutes while holding eyelids open. Get immediate medical attention.

SKIN CONTACT :
Immediately flush with plenty of water for at least 15 minutes. For a large splash, flood body under a shower. Remove contaminated clothing. Wash off affected area immediately with plenty of water. Get immediate medical attention. Contaminated clothing, shoes, and leather goods must be discarded or cleaned before re-use.

INGESTION :
DO NOT INDUCE VOMITING. If conscious, washout mouth and give water to drink. Get immediate medical attention.

INHALATION :
Remove to fresh air, treat symptomatically. Get medical attention.

NOTE TO PHYSICIAN :
Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsions may be needed.

5. FIRE FIGHTING MEASURES

FLASH POINT : Not flammable

FLASH POINT : None

EXTINGUISHING MEDIA :
Not expected to burn. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve chlorine under fire conditions. Hypochlorous acid HCl

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection).

METHODS FOR CLEANING UP :
SMALL SPILLS: Flush to drain or sewer with excess water. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material.

ENVIRONMENTAL PRECAUTIONS :
Do not contaminate surface water.

7. HANDLING AND STORAGE

HANDLING :
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Avoid generating aerosols and mists. Do not mix with acids. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available.

STORAGE CONDITIONS :
Store in a cool well ventilated area away from direct sunlight. Store the containers tightly closed. Store separately from acids. Store in suitable labelled containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :

ACGIH/TLV :

Substance(s)	
Chlorine	TWA: 0.5 ppm , 1.5 mg/m3 STEL: 1 ppm , 2.9 mg/m3

OSHA/PEL :

Substance(s)	
Chlorine	TWA: 0.5 ppm , 1.5 mg/m3 STEL: 1 ppm , 3 mg/m3

ENGINEERING MEASURES :
General ventilation is recommended. Use local exhaust ventilation if necessary to control airborne mist and vapor.

RESPIRATORY PROTECTION :
If significant mists, vapors or aerosols are generated an approved respirator is recommended. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :
Neoprene gloves, Nitrile gloves, Butyl gloves

SKIN PROTECTION :
Wear chemical resistant apron, chemical splash goggles, impervious gloves and boots. A full slicker suit is recommended if gross exposure is possible.

EYE PROTECTION :
Wear a face shield with chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Eye wash station and safety shower are necessary. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
APPEARANCE	Clear Yellow
ODOR	Chlorine

SPECIFIC GRAVITY	1.168 - 1.268 @ 77 °F / 25 °C
SOLUBILITY IN WATER	Complete
pH (100 %)	11.3 - 13.3
FREEZING POINT	/ 0 °C
BOILING POINT	Decomposes
VAPOR PRESSURE	Same as water
VAPOR DENSITY	1.3 (Air = 1)

Note: These physical properties are typical values for this product and are subject to change.

10. STABILITY AND REACTIVITY

STABILITY :
Decomposes slowly.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Direct sunlight Sodium hypochlorite releases chlorine when heated above 95 degrees F. If this should occur, the drum should be properly vented. Protective equipment should be utilized to prevent eye and skin contact or exposures above the regulated level for chlorine gas.
Keep at temperature not exceeding 40 °C

MATERIALS TO AVOID :
Contact with strong acids (e.g. sulfuric, phosphoric, nitric, hydrochloric, chromic, sulfonic) may generate heat, splattering or boiling and toxic vapors. Amines Organic materials and reducing agents Metals

HAZARDOUS DECOMPOSITION PRODUCTS :
Under acidic conditions: Chlorine gas, Hypochlorous acid, HCl

11. TOXICOLOGICAL INFORMATION

No toxicity studies have been conducted on this product.

ACUTE ORAL TOXICITY :

Species	LD50	Test Descriptor
Rat	5,000 mg/kg	Similar Product

Rating : Non-Hazardous

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Rainbow Trout	96 hrs	1.94 mg/l	Product
Bluegill Sunfish	96 hrs	5.3 mg/l	Product

Rating : Toxic

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	1.57 mg/l		Product

Rating : Toxic

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: D002

Hazardous wastes must be transported by a licensed hazardous waste transporter and disposed of or treated in a properly licensed hazardous waste treatment, storage, disposal or recycling facility. Consult local, state, and federal regulations for specific requirements.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

Proper Shipping Name :	HYPOCHLORITE SOLUTION
Technical Name(s) :	
UN/ID No :	UN 1791
Hazard Class - Primary :	8
Packing Group :	II
Flash Point :	Not flammable None
DOT Reportable Quantity (per package) :	800 lbs
DOT RQ Component :	SODIUM HYPOCHLORITE

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name :	HYPOCHLORITE SOLUTION
Technical Name(s) :	
UN/ID No :	UN 1791
Hazard Class - Primary :	8
Packing Group :	II
IATA Cargo Packing Instructions :	821
IATA Cargo Aircraft Limit :	60 L (Max net quantity per package)

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name :	HYPOCHLORITE SOLUTION
Technical Name(s) :	
UN/ID No :	UN 1791

Hazard Class - Primary :	8
Packing Group :	II

15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Sodium Hypochlorite : Corrosive, Oxidizer

CERCLA/SUPERFUND, 40 CFR 117, 302 :
This product contains the following Reportable Quantity (RQ) Substance. Also listed is the RQ for the product. If a reportable quantity of product is released, it requires notification to the NATIONAL RESPONSE CENTER, WASHINGTON, D.C. (1-800-424-8802).

RQ Substance	RQ
Sodium Hypochlorite	800 lbs

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

X	Immediate (Acute) Health Hazard
-	Delayed (Chronic) Health Hazard
-	Fire Hazard
-	Sudden Release of Pressure Hazard
-	Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
This product contains the following substances listed in the regulation:

Substance(s)	Citations
• Sodium Hypochlorite	Sec. 311

CLEAN AIR ACT, Sec. 111 (40 CFR 60, Volatile Organic Compounds), Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
This product contains the following substances listed in the regulation:

Sodium Hypochlorite

STATE RIGHT TO KNOW LAWS :
This product is a registered biocide and is exempt from State Right to Know Labelling Laws.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
E - Corrosive Material

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

16. OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 02/28/2004
Version Number : 1.2

MATERIAL SAFETY DATA SHEET

NALCO

PRODUCT

RAW MATERIAL R-895

Emergency Telephone Number
Medical (800) 462-5378 (24 hours) (800) I-M-ALERT

SECTION 01 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

TRADE NAME: RAW MATERIAL R-895
DESCRIPTION: Sulfuric acid

NFPA 704M/HMIS RATING: 3/3 HEALTH 0/0 FLAMMABILITY
2/2 REACTIVITY 0 WATER REACTIVE
0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

SECTION 02 COMPOSITION AND INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical ingredient(s) as hazardous under OSHA's Hazard Communication Rule, 29 CFR 1910.1200. Consult Section 15 for the nature of the hazard(s).

INGREDIENT(S)	CAS #	APPROX.%
Sulfuric acid	7664-93-9	93

SECTION 03 HAZARD IDENTIFICATION

EMERGENCY OVERVIEW:
DANGER! Contains sulfuric acid. Reacts violently with water and organic materials. Causes severe burns to skin and eyes and respiratory tract. Do not get in eyes, on skin, or on clothing. Wear goggles, face shield, and protective clothing when handling. Do not take internally.

Empty containers may contain residual product. Do not reuse container unless properly reconditioned.

PRIMARY ROUTE(S) OF EXPOSURE: Eye, Skin

EYE CONTACT: Corrosive to the eyes with possible permanent damage depending on the length of exposure and on the first aid action given.
SKIN CONTACT: Corrosive to the skin with possible permanent damage depending on the length of exposure and on the first aid action given.
INGESTION: Can be harmful or fatal. Corrosive to tissue.

SYMPTOMS OF EXPOSURE:
ACUTE: Burns, destruction of all contacted tissue, coughing, choking, headaches and dizziness.

AGGRAVATION OF EXISTING CONDITIONS: A review of available data does not identify any worsening of existing conditions not previously mentioned.

SECTION 04 FIRST AID INFORMATION

EYES: Immediately flush for at least 15 minutes while holding eyelids open. Call a physician at once.
SKIN: Immediately flush with water for at least 15 minutes. For a large splash, flood body under a shower. Call a

NALCO CHEMICAL COMPANY ONE NALCO CENTER • NAPERVILLE, ILLINOIS 60563-1198
AREA (630) 305-1000

physician at once.

INGESTION: Do not induce vomiting. Give water. Call a physician at once.

INHALATION: Remove to fresh air. Treat symptoms. If breathing has stopped, give cardiopulmonary resuscitation (CPR). Administer oxygen. Call a physician at once.

NOTE TO PHYSICIAN: Based on the individual reactions of the patient, the physician's judgment should be used to control symptoms and clinical condition.

CAUTION: If unconscious, having trouble breathing or in convulsions, do not induce vomiting or give water.

NOTE TO PHYSICIAN: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression and convulsions may be needed.

SECTION 05 FIRE FIGHTING MEASURES

FLASH POINT: Not applicable

EXTINGUISHING MEDIA: Explosive concentrations of hydrogen gas can accumulate inside metal tank.

UNUSUAL FIRE AND EXPLOSION HAZARD: Contact with reactive metals may result in the generation of flammable hydrogen gas. Use NIOSH/MSHA approved self-contained breathing apparatus.

SECTION 06 ACCIDENTAL RELEASE MEASURES

IN CASE OF TRANSPORTATION ACCIDENTS, CALL THE FOLLOWING 24-HOUR TELEPHONE NUMBER (800) I-M-ALERT or (800) 462-5378.

SPILL CONTROL AND RECOVERY:

Small liquid spills: Contain with absorbent material, such as clay, soil or any commercially available absorbent. Shovel reclaimed liquid and absorbent into recovery or salvage drums for disposal. Refer to CERCLA in Section 15.

Large liquid spills: Dike to prevent further movement and reclaim into recovery or salvage drums or tank truck for disposal. Refer to CERCLA in Section 15.

SECTION 07 HANDLING AND STORAGE

Storage : Keep container closed when not in use.

SECTION 08 EXPOSURE CONTROLS AND PERSONAL PROTECTION

RESPIRATORY PROTECTION: If it is possible to generate significant levels of vapors or mists, a NIOSH approved or equivalent respirator is recommended.

For large spills, entry into large tanks, vessels or enclosed small spaces with inadequate ventilation, a positive pressure, self-contained

breathing apparatus is recommended.

VENTILATION: General ventilation is recommended. Additionally, local exhaust ventilation is recommended where mists or aerosols may be released.

PROTECTIVE EQUIPMENT: Wear impermeable gloves, boots, apron and a face shield with chemical splash goggles. Examples of impermeable gloves available on the market are neoprene, nitrile, PVC, natural rubber, viton and butyl (compatibility studies have not been performed). A full slicker suit is recommended if gross exposure is possible.

The availability of an eye wash fountain and safety shower is recommended.

If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse.

SECTION 09 PHYSICAL AND CHEMICAL PROPERTIES

COLOR:	Clear colorless	FORM:	Liquid
ODOR:	None		
SOLUBILITY IN WATER:	Completely		
SPECIFIC GRAVITY:	1.8		ASTM D-1298
pH (NEAT) =	Less than 1		ASTM E-70
BOILING POINT:	529 Degrees F @ 760 mm Hg		ASTM D-86
FLASH POINT:	Not applicable		
VAPOR PRESSURE:	Less than 1 mm Hg @ 100 Degrees F		ASTM D-323

NOTE: These physical properties are typical values for this product.

SECTION 10 STABLILITY AND REACTIVITY

INCOMPATIBILITY: Avoid alkaline materials (eg. ammonia and its solutions, carbonates, sodium hydroxide (caustic), potassium hydroxide, calcium hydroxide (lime), cyanides, sulfides, hypochlorites, chlorites) which can generate heat with splattering or boiling and the release of toxic fumes.

THERMAL DECOMPOSITION PRODUCTS: In the event of combustion SOx may be formed. Do not breathe smoke or fumes. Wear suitable protective equipment.

SECTION 11 TOXICOLOGICAL INFORMATION

TOXICITY STUDIES: Toxicity studies have not been conducted on this product, but acute studies have been conducted on a similar product. The results are shown below.

ACUTE ORAL TOXICITY (ALBINO RATS): LD50 = 2,140 mg/kg

ACUTE INHALATION TOXICITY (GUINEA PIGS): LC50 = 50 mg/m3 (8-hour exposure)

PRIMARY SKIN IRRITATION TEST (ALBINO RABBITS):
SKIN IRRITATION INDEX DRAIZE RATING: 8.0/8.0 Corrosive

PRIMARY EYE IRRITATION TEST (ALBINO RABBITS):
EYE IRRITATION INDEX DRAIZE RATING: 110.0/110.0 Corrosive

HUMAN HAZARD CHARACTERIZATION: Based on our hazard characterization, the potential human hazard is: HIGH.

SECTION 12 ECOLOGICAL INFORMATION

If released into the environment, see CERCLA in Section 15.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION: Based on our Hazard Characterization, the potential environmental hazard is: MODERATE.

SECTION 13 DISPOSAL CONSIDERATIONS

DISPOSAL: If this product becomes a waste, it meets the criteria of a hazardous waste as defined under the Resources Conservation and Recovery Act (RCRA) 40 CFR 261. Hazardous Waste D002.

As a hazardous liquid waste, it must be solidified with stabilizing agents (such as sand, fly ash, or cement) so that no free liquid remains before disposal to a licensed industrial waste landfill (Hazardous Waste Treatment, Storage and Disposal facility). A hazardous liquid waste can also be deep-well injected in accordance with local, state, and federal regulations.

SECTION 14 TRANSPORTATION INFORMATION

PROPER SHIPPING NAME/HAZARD CLASS MAY VARY BY PACKAGING, PROPERTIES, AND MODE OF TRANSPORTATION. TYPICAL PROPER SHIPPING NAMES FOR THIS PRODUCT ARE:

ALL TRANSPORTATION MODES (UNLESS SPECIFIED BELOW)	:	SULFURIC ACID
AIR TRANSPORTATION	:	SULPHURIC ACID
MARINE TRANSPORTATION	:	SULPHURIC ACID
UN/ID NO	:	UN 1830
HAZARD CLASS - PRIMARY	:	8 - CORROSIVE
PACKING GROUP	:	II
IMDG PAGE NO	:	8230
IATA PACKING INSTRUCTION	:	CARGO: 813
IATA CARGO AIRCRAFT LIMIT	:	30 L (MAX NET QUANTITY PER PACKAGE)
FLASH POINT	:	NONE
TECHNICAL NAME(S)	:	NONE
RQ LBS (PER PACKAGE)	:	1,000
RQ COMPONENT(S)	:	SULFURIC ACID

SECTION 15 REGULATORY INFORMATION

The following regulations apply to this product.

FEDERAL REGULATIONS:

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200:
Based on our hazard evaluation, the following ingredient in this product is hazardous and the reason is shown below.

Sulfuric acid - Corrosive

Sulfuric acid = TWA 1 mg/m3, STEL 3 mg/m3 ACGIH/TLV

Sulfuric acid = TWA 1 mg/m3 OSHA/PEL

CERCLA/SUPERFUND, 40 CFR 117, 302:
This product contains sulfuric acid, a Reportable Quantity (RQ) substance and if 1,000 pounds of product are released, it requires notification to the NATIONAL RESPONSE CENTER, WASHINGTON, D. C. (1-800-424-8802).

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986
(TITLE III) - SECTIONS 302, 311, 312 AND 313:

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355):
This product contains sulfuric acid, which is listed in Appendix A and B as an Extremely Hazardous Substance. The statuatory threshold planning quantity for this substance is 1,000 pounds.

A release of 1,000 pounds of product will require a notification to your State Emergency Response Commission.

You may also be required to notify the NATIONAL RESPONSE CENTER - See CERCLA/SUPERFUND, above.

SECTIONS 311 and 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370):
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following EPA hazard categories:

XX Immediate (acute) health hazard
-- Delayed (chronic) health hazard
-- Fire hazard
-- Sudden release of pressure hazard
-- Reactive hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372):
This product contains the following ingredient(s), (with CAS # and % range) which appear(s) on the List of Toxic Chemicals.

Sulfuric acid	7664-93-9	93

TOXIC SUBSTANCES CONTROL ACT (TSCA):
The chemical ingredients in this product are on the 8(b) Inventory List (40 CFR 710).

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA), 40 CFR 261 SUBPART C & D:
Consult Section 13 for RCRA classification.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15/
formerly Sec. 307, 40 CFR 116/formerly Sec. 311:
This product contains the following ingredient covered by the Clean Water Act:

Sulfuric acid - Section 311

CLEAN AIR ACT, Sec. 111 (40 CFR 60), Sec. 112 (40 CFR 61, 1990 Amendments),
Sec. 611 (40 CFR 82, CLASS I and II Ozone depleting substances):
This product does not contain ingredients covered by the Clean Air Act.

STATE REGULATIONS:

CALIFORNIA PROPOSITION 65:
This product does not contain any chemicals which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS:
This product does not contain ingredients listed on the Michigan Critical Materials Register.

STATE RIGHT TO KNOW LAWS:
Regulated in those states using the TLV for sulfuric acid as a criteria for listing.

INTERNATIONAL REGULATIONS:

This is a WHMIS controlled product under The House of Commons of Canada Bill C-70 (Class E). The product contains the following substance(s), from the Ingredient Disclosure List or has been evaluated based on its toxicological properties, to contain the following hazardous ingredients(s):

Chemical Name	CAS #	% Concentration Range
Sulfuric acid	7664-93-9	93

SECTION 16 OTHER INFORMATION

The International Agency for Research on Cancer (IARC) has concluded that there is sufficient evidence that occupational exposure to strong-inorganic-acid mist containing sulfuric acid is carcinogenic to human (Group I carcinogen), based on epidemiology studies demonstrating excess pharyngeal and lung cancer in chronically exposed workers.

SECTION 17 USER'S RESPONSIBILITY

Our Risk Characterization is being determined.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access

to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

SECTION 18 REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (CD-ROM version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (CD-ROM version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA).

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, Ohio (CD-ROM version), Micromedex, Inc., Englewood, CO.

Shepard's Catalog of Teratogenic Agents (CD-ROM version), Micromedex, Inc., Englewood, CO.

Suspect Chemicals Sourcebook (a guide to industrial chemicals covered under major regulatory and advisory programs), Roytech Publications (a Division of Ariel Corporation), Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, Washington (CD-ROM version), Micromedex, Inc., Englewood, CO.

PREPARED BY: William S. Utley, PhD., DABT, Manager, Product Safety
DATE CHANGED: 12/13/1996 DATE PRINTED: 03/28/1999

APPENDIX 4

Proposed Amendments to the Conditions of Certification

AQ-8 Stack gas testing, using EPA, ARB, or other APCO approved methods shall be required on an annual basis for NOx, VOC, and CO on the HRSG stacks~~ and the auxiliary boiler stack~~. The HRSG stacks ~~and the auxiliary boiler stack~~ shall also be tested for SOx and PM10 emissions during the first year and if requested by the APCO, in subsequent years. ~~The emergency generator and firewater pump engines shall be tested for NOx, SOx, VOC, CO, and PM10 during the first year and thereafter only as requested by the APCO.~~

Verification: The results and field data collected during source tests shall be submitted to the CPM and the District within 60 days of testing.

AQ-10 The gas turbines, duct burners, and water bath heater~~auxiliary boiler~~ shall be fired exclusively on pipeline quality natural gas.

Verification: The project owner shall submit information on the quality and type of fuel used for the gas turbines, duct burners, and ~~auxiliary boiler~~water bath heater to the CPM and the APCO in the Quarterly Operation Reports (**AQ-22**).

AQ-12 The sulfur content limit in diesel fuel used in the construction equipment~~ and emergency generator and firewater pump engines~~ shall be no more than 15 ppm. ~~Emissions from the two stationary engines mentioned above shall not exceed Ringelmann 0.5 or 10 percent opacity for an aggregate of three minutes in a one-hour period.~~

Verification: The project owner shall compile the required data on the sulfur content of the diesel fuel~~ and emissions from the emergency generator and firewater pump engines~~ and submit the information to the CPM and the APCO in the Quarterly Operation Reports (**AQ-22**). The project owner shall make the site available for inspection by representatives of the District, ARB, and the Energy Commission.

AQ-17 Condition Deleted~~The auxiliary boiler shall meet a NOx limit of 15.0 ppmvd @ 3% O_2 over one hour.~~

~~**Verification:** The project owner shall submit to the CPM and APCO auxiliary boiler source test emissions data demonstrating compliance with this condition as required in condition **AQ-8** and shall provide confirmation of normal operations of the boiler as part of the Quarterly Operation Reports (**AQ-22**).~~

~~**AQ-23** The emissions from the emergency generator and firewater pump engines shall not exceed the hourly limits established in the table below. Total annual operating hours shall not exceed 50 per engine. Testing of these two engines shall~~

~~not be allowed during gas turbine commissioning and facility startup operations. The generator and firewater pump engines must comply with the Tier rating emissions for their model years.~~

~~One-Hour Maximum Emissions (lbs)~~		
~~Source~~	~~Generator~~	~~Fire Pump~~
~~NOx~~	~~13.88~~	~~1.98~~
~~CO~~	~~0.32~~	~~1.72~~
~~VOC~~	~~0.15~~	~~Incl. in NOx~~
~~PM10~~	~~0.09~~	~~0.10~~
~~SO_2~~	~~0.01~~	~~<0.01~~

~~**Verification:** The project owner shall submit to the CPM and APCO for approval the emergency generator and firewater pump selected manufacturer emissions data and engines specifications demonstrating compliance with this condition at least 30 days prior to installation. The project owner shall provide 12-month rolling engine operating hours data to show compliance with the operating hours restriction limits in this condition as part of the Quarterly Operation Reports (**AQ-22**).~~

~~**AQ-24** The emission rates from the auxiliary boiler shall not exceed the hourly limits established in the table below. The boiler shall not operate more than 3,744 hours per year.~~

~~One-Hour Maximum Emissions (lbs)~~	
~~Source~~	~~Auxiliary Boiler~~
~~NOx~~	~~0.79~~
~~CO~~	~~1.61~~
~~VOC~~	~~0.18~~
~~PM10~~	~~0.33~~
~~SO_2~~	~~1.13~~

~~**Verification:** The project owner shall submit to the CPM and APCO for approval the auxiliary boiler selected manufacturer emissions data and specifications demonstrating compliance with this condition and condition **AQ-17** at least 30 days prior to installation. The project owner shall submit to the CPM and APCO auxiliary boiler source test emissions data required under condition **AQ-8** demonstrating compliance with the emission limits for the pollutants included in the source test.~~

AQ-25 The total emissions from the CTGs and HRSGs shall not exceed those established below for hourly and daily operations.

Maximum Emissions Both Turbines (lbs)		
Pollutant	1-Hour Emissions	24-Hour Emissions
NOx	666.60	2,994.60
CO	967.00	7,659.00
VOC	55.40	630.60
PM10	27.00~~40.20~~	648.00~~964.80~~
SO_2	14.80	355.20

Verification: The project owner shall submit to the CPM and APCO CTG and HRSG emissions data demonstrating compliance with this condition as part of the Quarterly Operation Reports (**AQ-22**).

AQ-26 The total emissions from the Colusa Power Plant shall not exceed the limits established below.

~~Quarterly and Annual Estimated Combustion Emissions from CGS Facility~~					
~~Pollutant~~	~~1st Quarter Emissions (tons)~~	~~2nd Quarter Emissions (tons)~~	~~3rd Quarter Emissions (tons)~~	~~4th Quarter Emissions (tons)~~	~~Annual Emissions (tons)~~
~~NOx~~	~~45.60~~	~~43.62~~	~~51.34~~	~~44.31~~	~~184.87~~
~~CO~~	~~54.20~~	~~52.40~~	~~107.06~~	~~53.86~~	~~267.52~~
~~VOCs~~	~~12.36~~	~~11.69~~	~~11.90~~	~~11.82~~	~~47.77~~
~~PM10~~	~~35.29~~	~~35.39~~	~~35.70~~	~~35.69~~	~~142.08~~
~~SO_2~~	~~4.05~~	~~3.83~~	~~3.87~~	~~3.87~~	~~15.62~~

Quarterly and Annual Estimated Combustion Emissions from CGS Facility					
Pollutant	1st Quarter Emissions (tons)	2nd Quarter Emissions (tons)	3rd Quarter Emissions (tons)	4th Quarter Emissions (tons)	Annual Emissions (tons)
NOx	45.56	43.58	51.30	44.27	184.70
CO	54.27	52.41	107.07	53.87	267.63
VOCs	12.36	11.69	11.90	11.82	47.79
PM10	35.28	35.43	35.74	35.68	142.13
SO_2	4.19	3.97	4.01	4.01	16.18

Verification: The project owner shall submit to the CPM and APCO plant emissions data demonstrating compliance with this condition as part of the Quarterly Operation Reports (**AQ-22**).

GEN-2 Prior to submittal of the initial engineering designs for CBO review, the project owner shall furnish to the CPM and to the CBO a schedule of facility design submittals, master drawing list and a master specifications list. The schedule shall contain a list of proposed submittal packages of designs, calculations, and specifications for major structures and equipment. To facilitate audits by Energy Commission staff, the project owner shall provide specific packages to the CPM when requested.

Verification: At least 60 days (or project owner-and CBO-approved alternative timeframe) prior to the start of rough grading, the project owner shall submit to the CBO and to the CPM the schedule, the master drawing list and the master specifications list of documents to be submitted to the CBO for review and approval. These documents shall be the pertinent design documents for the major structures and equipment listed in **FACILITY DESIGN Table 1** below. Major structures and equipment shall be added to or deleted from the table only with CPM approval. The project owner shall provide schedule updates in the monthly compliance report.

FACILITY DESIGN TABLE 1

Major Structures and Equipment List

Equipment/system	Quantity (Plant)
Combustion Turbine & Generator (CTG) Foundation and Connections	2
Steam Turbine & Generator (STG) Foundation and Connections	1
Heat Recovery Steam Generator (HRSG) & Stack Structure, Foundation and Connections	2
CTG Main Transformer Foundation and Connections	2
STG Main Transformer Foundation and Connections	1
Electrical Auxiliary Transformers Foundation and Connections	5
CTG Air Inlet Structure, Foundation and Connections	2
CEMS Enclosure Structure, Foundation and Connections	2
Air Cooled Condenser Structure, Foundation and Connections	1
~~Auxiliary Boiler~~ Wet Surface Air Cooler Structure, Foundation and Connections	1
Boiler Feed Water Pump Foundation and Connections	2
Fuel Gas Separator, Water Bath Heater, and Heating Foundation and Connections	2
CTG Support Skid Foundation and Connections	2
Power Distribution Center Foundation and Connections	5
Demineralized Water Storage Tank Structure, Foundation and Connections	1
~~Fire Water Pump Skid Foundation and Connections~~	~~1~~
HRSG Blowdown Tank and Sump Structure, Foundation and Connections	2
Gas Metering and Regulating with Fuel Gas Filter/Separators Foundation and Connections	2
Water Treatment Area Structure, Foundation and Connections	1

FACILITY DESIGN TABLE 1

Major Structures and Equipment List

Equipment/system	Quantity (Plant)
Ammonia Transfer Pumps Foundation and Connections	3
Raw/Firewater Tank Structure, Foundation and Connections	1
Septic Tank Structure, Foundation and Connections	1
Storage Building Structure Foundation and Connections	2
Condensate Tank and Pumps Foundation and Connections	1
Fin Fan Coolers Structure, Foundation and Connections	1
Ammonia Dilution Skid Foundation and Connections	2
STG Electrical Equipment Foundation and Connections	1
Switch gear Building Structure, Foundation and Connections	1
Unit Auxiliary Transformer Foundation and Connections	2
Generator Breaker Foundation and Connections	2
~~Emergency Diesel Generator Foundation and Connections~~	~~1~~
Hydrogen Storage Area Tank Structure, Foundation and Connections	1
Phosphate Feed Skid Foundation and Connections	2
Sample Panel Foundation and Connections	2
Auxiliary Cooling Water Pumps & Heat Exchanger Foundation and Connections	1
Oil/Water Separator Foundation and Connections	1
Control Room/Administration Building Structure, Foundations and Connections	1
STG Lube Oil Skid Foundation and Connections	1
Switchyard Control House Structure, Foundation and Connections	1
Drainage Systems (including sanitary drain and waste)	1 Lot
High Pressure and Large Diameter Piping and Pipe Racks	1 Lot
HVAC and Refrigeration Systems	1 Lot
Temperature Control and Ventilations Systems (including water and sewer connections)	1 Lot
Building Energy Conservation Systems	1 Lot
Switchyard, Buses and Towers	1 Lot
Electrical Duct Banks	1 Lot
Glenn-Colusa Canal Bridge Replacement Structure, Foundation and Connections	1
Teresa Creek Bridge Replacement Structure, Foundation and Connections	1

APPENDIX 6

List of Property Owners within 1,000 Feet of the Project Site and 500 Feet from the Project Linear Routes

ASSESSOR'S PARCEL NUMBERS/OWNERSHIP INFORMATION
PROPERTY WITHIN 1,000 FEET OF THE PROPOSED PROJECT

APN	Owner Contact Information
Within 1,000 Feet of Power Plant Site	
011-040-013	Pacific Gas & Electric
011-040-016	Logan Land & Stock Co., P.O. Box 426, Willows, CA 95988
011-040-017	United States of America, Dept. of Interior (Canal)
011-040-018	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-020	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-024	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-026	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-140-004	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-140-014	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-007	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-019	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-021	United States of America
011-140-002	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-140-013	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
Within 500 Feet of Area Potentially Affected by Electrical Transmission Lines	
011-040-024	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-026	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-140-004	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-140-014	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
Within 500 Feet of Area Potentially Affected by New Road	
011-040-013	Pacific Gas & Electric
011-040-024	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-026	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-140-004	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-140-014	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
Within 500 Feet of Area Potentially Affected by Natural Gas Pipeline	
011-040-013	Pacific Gas & Electric
011-040-026	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-024	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
Within 500 Feet of Area Potentially Affected by Water Supply Pipeline Connection	
011-040-013	Pacific Gas & Electric
011-040-024	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-026	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702

APN	Owner Contact Information
011-140-014	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-140-004	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
Within 500 Feet of Teresa Creek Bridge to be Replaced	
011-220-001	Frances M. Etchepare, P.O. Box 658, Maxwell, CA 95955
011-220-003	Marlene J Story, P.O. Box 156, Maxwell, CA 95955
Within 500 Feet of Glenn-Colusa Canal Bridge to be Replaced	
011-140-004	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-040-026	Leo M. and Diane Holthouse, 25039 Highway 395 South Canyon City, OR 97820-9702
011-140-021	Allen E and Mary Anne Azevedo, P.O. Box 629, Maxwell, CA 95955
011-040-011	William Dirks Jr., P.O. Box 9, Maxwell, CA 95955
011-040-029	Allen E and Mary Anne Azevedo, P.O. Box 629, Maxwell, CA 95955
011-140-019	Jack L Barrett Jr., P.O. Box 99, Maxwell, CA 95955
Within 500 Feet of Intersection to be Widened	
011-220-001	Frances M. Etchepare, P.O. Box 658, Maxwell, CA 95955
011-220-017	Lorraine E. Corbin, Trustee, 4789 Highway 99W, Delevan, CA 95988
011-220-080	Ross F. Pearson, 740 Northgate Drive, Willows, CA 95988
011-220-084	Ross F. Pearson, 740 Northgate Drive, Willows, CA 95988

Note:
APN = Assessor's Parcel Number