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2.1 INTRODUCTION

This SPPE Application is for the construction and operation of the Unit 3 Repower Project (see Figure 2-1, Project Location Map). The Project will be owned and operated by IID ("the Applicant") and will utilize the existing staffing at the El Centro Generating Station (ECGS). IID is an irrigation district established under Division 11 of the California water code, Sections 20500 et seq., that provides electrical power, non-potable water, and farm drainage services to the lower southeastern portion of the California desert, primarily in Imperial County. ECGS Unit 3 will continue to serve the growing electrical load demands of the region.

The Project will replace an existing steam-generating unit and will be constructed wholly within the site of the existing ECGS. Most of the existing ECGS plant systems will continue to be used with only minor modifications. Systems that will continue to be used include the steam turbine generator (STG), circulating water system, water treatment system, water supply system, control room, fire protection system, ammonia system, and El Centro Switching Station. This Project is similar to the ECGS Unit 2 Repower which utilized a steam injected General Electric (GE) Frame 7EA and was reviewed by the CEC as a SPPE in 1991.

The Project consists of replacing the existing Combustion Engineering (CE) boiler with a GE Frame 7EA dry low NO_x CTG and HRSG to supply steam to the existing Westinghouse STG. The generator output from the Unit 3 Repower Project will be stepped-up to transmission voltage and interconnected to the existing IID El Centro Switching Station also located within the ECGS site.

Currently the ECGS has a total capacity of 233 MW from Units 2, 3, and 4. The Unit 3 Repower Project will increase the existing Unit 3 44 MW generating capacity to 128 MW of generating capacity, an increase of 84 MW. Upon completion of the Unit 3 Repower Project, the entire station capacity will be 317 MW. California Code of Regulations (CCR), Section 1936 specifies that the SPPE process is available to projects where "modification to an existing thermal power plant which will add generating capacity not exceeding 100 megawatts." Thus, the SPPE process is appropriate for the Unit 3 Repower Project, because the Project will increase the existing Unit 3 capacity by 84 MW.

The Project is being permitted as a base and intermediate load unit with an annual operation of 8,000 hours with 150 startups.

Independent of the Unit 3 Repower, IID is developing a deep injection well system for disposal of process wastewater for the entire ECGS. The wastewater system will be utilized by the entire ECGS Site, including the Project. ECGS is currently permitted to discharge the plant's wastewater streams to a local canal. As required by the current NPDES permit, the ECGS is required to come in compliance with the California Toxics Rule (CTR) by July 2009. IID has determined that the most feasible method of addressing the CTR requirements is to eliminate the discharge from the entire plant (including the existing Unit 3) and dispose of the wastewater to a deep injection well. For completeness, this disposal system is described in more detail in Section 2.2.7.3, Water Supply and Use.

The Applicant has assessed the potential environmental impacts and has found that there are no significant or unmitigated impacts as a result of the Project. This assessment is presented in this

SPPE Application. The following subsections provide a detailed project description, which was the basis for the environmental assessment.

2.1.1 Affected Project Study Areas

The Project involves the following areas:

1. Project Site – new Unit 3 CTG/HRSG, minor modifications to the existing Unit 3 cooling tower, replacement of the Unit 3 condenser, minor modifications to Unit 3 STG, the 92kV electrical interconnection and modifications to the existing gas interconnection facilities.
2. Temporary Construction Area – construction parking, construction trailers, and construction laydown area.

The disturbed acreage associated with each of these two areas is summarized in Table 2.1-1, ECGS Unit 3 Repower – Disturbed Acreage, and shown on Figures 2-2A and 2-2B, Site Plan and Utility Interface.

TABLE 2.1-1
ECGS UNIT 3 REPOWER – DISTURBED ACREAGE

Project Component	Temporary Disturbance	Permanent Disturbance
Project Site		
CTG/HRSG Power Island	2.8 acres	Previously disturbed
STG	None	Existing STG being retrofitted
Unit 3 Cooling Tower	None	Existing cooling tower
Fuel gas supply	0.2 acre	Previously disturbed
Electrical interconnect	1.0 acre	Previously disturbed
Total Project Site Disturbance	4.0 acres	Previously disturbed
Temporary Construction Area		
Construction laydown, parking and job trailers within ECGS Site	8.5 acres	None
Total Project Disturbance	**12.5 acres**	**None**

Notes:
CTG = combustion turbine generator
ECGS = El Centro Generating Station
HRSG = heat recovery steam generator
STG = steam turbine generator

An acronym used throughout this SPPE Application is the "ECGS Site." The ECGS Site includes the 150-acre generating station including the steam turbine building, existing ponds, warehouse, parking areas, El Centro Switching Station, tank farm area, and existing Units 2, 3, and 4. The boundary of the ECGS Site is fenced. The total Project disturbance will be 12.5 acres all of which is within the ECGS Site.

2.1.2 Project Objectives

As the local electric utility, IID's first obligation is to provide its customers with safe, reliable electric services at competitive rates. Imperial County and Riverside County continue to

experience a steady growth in population, and as such, IID's load demand also continues to increase. This Project will provide several benefits for the electric customers of IID such as:

1. Providing economic, flexible intermediate and base load capacity within the IID transmission system and service territory
2. Providing additional internal generation
3. Improving transmission system reliability
4. Increasing the overall energy and water use efficiency of the IID generation resource portfolio
5. Using a proven worldwide technology for high reliability
6. Using existing linear facilities
7. Using existing electrical generation facility

2.1.3 Location

The Project is located within the existing ECGS Site, which is located at 485 East Villa Avenue, in El Centro, California. The ECGS Site is located on four parcels:

- APN 044-430-008 – North 1/2 of south 1/2 and west 1/2 of east 1/2 of south 1/2 of south 1/2 of tract 47, 15-14.
- APN 044-430-009 – East 1/2 of east 1/2 of south 1/2 of south 1/2 of tract 47, 15-14.
- APN 044-430-010 – Part of southwest 1/4 of south 1/2 of tract 47, 15-14, D.A.F: begin at the northwest corner of the southwest 1/4 of south 1/2 of tract 47; the south alignment west line of SD tract, 5.00 feet to the southwest corner of parcel "c" of R.O.S. (1-30) and the true P.O.B; the east alignment south line of SD parcel "c" and alignment the most northerly south line of parcel "a" of SD survey, 1320.40 feet; the southerly 641.00 feet; the south 89*59'30" west, 1320.17 feet to the west line of tract 47; the northerly alignment the westerly line of SD tract, 641.00 feet to the true P.O.B.
- APN 044-430-011 – Part of southwest 1/4 of south 1/2 of tract 47, 15-14, except the north 5.00 feet thereof; also excepting that portion D.A.F: begin at the northwest corner of the southwest 1/4 of south 1/2 of tract 47; the south alignment west line of SD tract, 5.00 ft to the southwest corner of parcel "c" of R.O.S. (1-30) and the true P.O.B; the east alignment the south line of SD parcel "c" and alignment the most northerly south line of parcel "a" of SD survey, 1320.40 feet; the southerly 641.00 feet; the south 89*59'30" west, 1320.17 feet to the west line of tract 47; the northerly alignment the westerly line of SD tract 641.00 feet to the true P.O.B; also excepting the s 330 feet thereof as conveyed to Southern Pacific Railway Company (El Centro Steam Plant).

The new Unit 3 CTG/HRSG will be located adjacent to and north of the existing Unit 3 boiler on the west side of the existing steam turbine building and south of Unit 2.

The ECGS Site consists of disturbed native soil and is relatively flat at an elevation of approximately 50 feet below sea level.

2.1.4 Schedule

The Project is based upon the following schedule:

Submit SPPE Application	May 2006
Final Initial Study Issued	August 2006
CEC Final Decision Issued	November 2006
Execute EPC and Procure Major Equipment	January 2007
Construction Start	September 2007
Construction/Commissioning Complete	April 2009
Commercial Operation	May 2009

The Project schedule is based on executing an EPC contract after all of the Project permits are obtained, including the SPPE and the Authority to Construct (ATC) from ICAPCD. The schedule also accounts for a lead-time for engineering, equipment procurement, and fabrication prior to initiating Project Site construction activities.

2.1.5 IID Request for Proposal Process

The Project was developed in response to IID's RFP #484, conducted by IID Supply and Trading. IID Supply and Trading initiated RFP #484 to secure resource needs identified in its 10-year resource plan. In RFP #484, IID Supply and Trading requested proposals for up to 150 MW of capacity and associated energy and ancillary services for up to 20 years (or longer). The initial RFP #484 requested that the energy deliveries begin in June of 2008. RFP #484 was open to proposals from bidders planning to supply the capacity and energy from new generation assets as well as standard energy products from credit worthy third party suppliers.

In response to this resource need requested in RFP #484, IID Generation offered a proposal to repower the existing ECGS Unit 3 STG with a CTG and HRSG.

The Unit 3 Repower Project was considered the most economical alternative for serving IID base and intermediate customer load. A primary economic benefit is that the Unit 3 Repower Project utilizes existing infrastructure for gas transportation, electric transmission, wastewater, water supply, and water treatment. This infrastructure and common ECGS facilities will continue to be used to support the addition of the CTG/HRSG. This existing infrastructure supports the Project without infrastructure improvements and new linear facilities. The absence of new linear facilities such as new transmission lines or gas pipelines outside of the ECGS Site reduces environmental impacts associated with the Project to less than significant.

2.2 POWER PLANT DESCRIPTION, DESIGN, AND OPERATION

The Project is being permitted to operate up to a combined total of 8,475 unit-hours per year (which includes 5,000 hours of operation without duct firing, 3,000 hours of operation with duct firing, 150 startups, and 150 shutdowns). Both base load (24 hours per day/7 days a week) and intermediate (16 hours per day/7 days a week) duty operation are possible based on the season of the year and the realization of energy delivery under power purchase agreements dependent on other power development projects.

This section describes the conceptual design and operation of the ECGS Unit 3. A rendering of the Project can be seen in Figure 2-3, Plant Rendering.

2.2.1 Site Plan and Access

The Project Site Plan for the Project is provided in Figure 2-4, General Arrangement New Unit 3. This figure illustrates the location, equipment arrangement, and size of the Project. The Project Site will encompass approximately 4 acres within the ECGS Site. The Temporary Construction Area will be approximately 8.5 acres entirely on the ECGS Site. The Temporary Construction Area will include construction laydown, staff parking, and construction trailers. Each of these areas is shown on Figures 2-2A and 2-2B, Site Plan and Utility Interface.

Main access to the Project Site during construction will be provided via an existing access gate for the ECGS Site off East Villa Avenue west of the main plant entrance and maintenance building. Access to the general vicinity is via US Interstate 8, approximately 2 miles south of the ECGS Site. Main access to ECGS Unit 3 will not change from the existing plant access and will be through the 20-foot wide entrance gate located off of East Villa Avenue. Entrance via the access gate is controlled and monitored, via a security camera, from the existing Control Room.

2.2.1.1 Site Control

IID, a public power utility company located in Imperial County, California, is the sole owner of the ECGS Site. The ECGS has been a primary component of IID's generation resource portfolio supplying internal generation for IID customers since construction of Unit 1 in 1949.

2.2.1.2 Site Arrangement and Current Conditions

The Project is located on a previously disturbed portion of the ECGS Site. The CTG/HRSG will be installed near the former location of the Unit 2 boiler, just north of the Unit 3 boiler and well within the boundaries of the ECGS Site.

2.2.2 Process Description and Operation

The Project consists of one CTG/HRSG in combined cycle configuration that will be fired with natural gas only. The CTG will be equipped with evaporative inlet air cooling to improve capacity and efficiency at high ambient temperatures. The CTG can be turned down to 60% of full load while meeting emissions limitations.

The HRSG is equipped with supplementary firing (duct burners) to take advantage of available STG capacity.

The Project includes automatic generation control (AGC) equipment as necessary to support regulation service to the transmission system.

2.2.2.1 Performance

Table 2.2-1, Plant Performance, summarizes plant performance at the average annual temperature of 73 degrees (º) Fahrenheit (F) and expected seasonal operating ambient temperatures.

TABLE 2.2-1
PLANT PERFORMANCE

Temperature	Relative Humidity	Net Capacity, kW		Net Heat Rate, Btu/kWhr (HHV)	
		Unfired	Fired	Unfired	Fired
40°F[1]	80%	127,010	134,500	8,110	8,153
59°F[2]	60%	123,110	130,600	8,095	8,141
73°F[3]	45%	120,265	127,725	8,093	8,142
115°F[4]	17%	113,130	120,725	8,115	8,211

[1]40°F is the average monthly minimum temperature
[2]59°F is the International Standards Organization (ISO) temperature
[3]73°F is the average annual temperature
[4]115°F is the maximum design temperature
% = percent
Btu/kWhr = British thermal units per kilowatt hour
HHV = higher heating value
kW = kilowatt
°F = degrees Fahrenheit

The Heat and Mass Balance Diagrams (Figures 2-5A through 2-5H) provide further information for each temperature, with and without duct firing.

2.2.2.2 Power Island

The power island consists of one GE PG7121EA dry low NO_x CTG, HRSG, and CTG generator step-up (GSU) transformer integrated with the existing ECGS Unit 3 STG and auxiliaries.

The CTG is nominally rated for 80 MW with dry low NO_x burners, and includes an on-base enclosure, accessory equipment compartment, packaged electrical and electronics control compartment (PEECC), cooling water module, and a Totally Enclosed Water to Air Cooled (TEWAC) generator and controls. The CTG air inlet system is equipped with single stage, self-cleaning air inlet filters, and an evaporative cooling system. The new CTG is similar to the CTG utilized for the Unit 2 repower project. The primary difference between the existing Unit 2 CTG and the new Unit 3 CTG are that Unit 3 utilizes dry low NO_x burners and natural gas as the only fuel.

Exhaust gas waste heat from the CTG is directed to the HRSG to generate steam at approximately 1,250 pounds per square inch gauge (psig). The HRSG is a horizontal flow, vertical tube, drum type, natural circulation single pressure boiler. The HRSG will also include a selective catalyst reduction (SCR) module, and a carbon monoxide (CO) oxidation catalyst reactor for exhaust emissions control. The Project will employ BACT to limit emissions.

The existing Westinghouse STG is nominally rated at 44 MW and the generator is rated for 50 MW. As part of the Project, the STG will be modified to better suit it for combined cycle operation. Four of the existing feedwater heater extraction ports will be closed off, as the feedwater heaters are no longer needed. One extraction port will continue to be used as a source of steam to the deareator. With these changes, the STG output will be increased to approximately 48 MW (to provide an additional 4 MW). Additionally, the original ECGS Unit 3 STG governor system will be replaced with a modern system. The STG will continue to use its existing GSU transformer and interconnection to the El Centro Switching Station.

The existing surface condenser will be replaced due to having reached end-of-life conditions and to support steam bypass for use during STG startup, shutdown, and load rejection conditions under combined cycle operation. The use of this STG bypass system will also reduce make-up water requirements for the plant during startup, shutdown, and load rejections. With steam no longer being extracted from the STG for use in the feedwater heaters, the steam flow to the condenser will be increased. However, the circulating water flow through the condenser will remain unchanged.

The existing ECGS Unit 3 cooling tower will be retrofitted with a Marley TU-12C Drift Eliminator System to reduce PM_{10} emissions. With the current cooling tower drift eliminator configuration, the estimated current cooling tower drift is 0.2%. With the new drift eliminators the estimated cooling tower drift will be reduced to 0.001%.

Additionally, as a part of the Project, the control system and portions of the 480V electrical system for ECGS Unit 3 will be upgraded.

The Project will remove from service the existing Unit 3 CE boiler that was installed in 1957. The boiler will be abandoned in place.

The remaining steam cycle auxiliaries will be reused for the new Unit 3 combined cycle operation.

2.2.2.3 Transmission Interconnection

The Unit 3 Repower Project net electrical output will be 128 MW based on an annual average ambient temperature of 73°F. The new CTG will generate power at 13.8 kV and will utilize a GSU transformer to increase the voltage to 92 kV to interconnect to the El Centro Switching Station. The existing ECGS Unit 3 STG will continue to utilize its existing GSU transformer and overhead connection to the existing El Centro Switching Station. The existing 92-kV system is a robust system with adequate capacity to absorb the additional Unit 3 CTG interconnection.

The new CTG GSU will interconnect with the existing 92-kV portion of the El Centro Switching Station (the 92-kV Yard) via an overhead line at an approximate length of 2,350 feet and height of 50 to 80 feet. The interconnection facilities are entirely within the existing ECGS Site and El Centro Switching Station. At the 92-kV side of the GSU the interconnect route will start at an A-frame structure, route west and then north around an existing maintenance building, route east within the north boundary of ECGS Site, and finally turn south towards the existing El Centro Switching Station. Where the interconnect turns south toward the 92-kV El Centro Switching Station, two 161-kV wood line poles that are close to the currently proposed path will be re-located to the east to maintain required line-to-line clearances (as shown on Figures 2-2A and 2-2B, Site Plan and Utility Interface). The interconnecting 92-kV line will terminate at the spare double-breaker-double-bus position in the 92-kV El Centro Switching Station next to the existing CTG 2-2 position. The new 3-2 position will be isolated by two 92-kV circuit breakers. The 3-2 position protective relays and control instrumentation will be on a panel located within the existing El Centro Switching Station control building.

The System Impact Study (SIS) shows there are no limitations or impacts resulting from the Project's interconnection into the existing El Centro Switching Station (see Appendix A, System Impact Study).

2.2.2.4 Steam Cycle Systems

The Project utilizes the existing ECGS Unit 3 STG, condensate systems, feed water systems (including feed water pumps), cooling water systems, circulating water pumps and cooling tower, and make-up water systems.

The existing ECGS Unit 3 condenser will be replaced with a new modern condenser as part of the Project. The replacement condenser will serve two primary purposes:

1. Replace the existing condenser which is near the end of its useful life
2. Provide a condenser with steam dump capacity that the existing condenser cannot easily accommodate due to its design having been predicated on the use of feedwater heaters. Having the steam dump capacity is very useful for combined cycle operation whereas the feedwater heaters become superfluous with the Unit 3 Repower Project and the use of a HRSG.

2.2.2.5 Exhaust Stack

The HRSG exhaust stack will be approximately 15 feet in diameter, and will be 100 feet tall.

2.2.2.6 Fuel Gas Requirements

The Project fuel consumption at full-load in the summer is 919 MMBtu per hour (MMBtu/hr) (higher heating value [HHV]) without duct firing and 992 MMBtu/hr (HHV) with duct firing. The existing ECGS Unit 3 fuel consumption is 525 MMBtu/hr (HHV). While the fuel use increases by approximately 90%, the power generated increases by 190% consistent with the improved heat rate.

The existing SCGC lateral at a nominal pressure of 375 psig supplies natural gas. The CTG fuel gas inlet pressure requirement ranges between a minimum of 315 psig and a maximum of 375 psig.

2.2.2.7 Electrical Systems

The Unit 3 CTG has an associated turbine generator, generator auxiliary compartment (GAC), GSU transformer, PEECC for the CTG auxiliary systems and other miscellaneous skids. In addition, a Power Distribution and Control Enclosure (PDCE) will be provided to house the balance of plant (BOP) equipment, such as the 4,160 volt (V) Motor Control Center (MCC), 480V Distribution Switchboard, and 480V BOP MCC.

Power is generated at 13.8 kV, 60 hertz (Hz) by the CTG. The turbine generator utilizes 15-kV Non-Segregated Phase Bus to connect to the GSU through a generator breaker located in the GAC. The output from the GSU high side bushings is connected to a 92-kV El Centro Switching Station by overhead line as described in Section 2.2.2.3, Transmission Interconnection.

Auxiliary power for the plant is tapped from the 13.8-kV bus in the GAC via a disconnect link. A 15-kV power cable will be routed from the disconnect link to the primary side of the 4,160V Auxiliary Transformer and then daisy chained to the 480V Auxiliary Transformer.

The Auxiliary Transformers for the 4,160V and 480V systems will be located outside the PDCE and non-segregated phase bus duct will be used to connect the transformers to their associated 4,160V MCC and 480V Distribution Switchboard.

The 4,160V MCC provides power to the CTG cranking motor, which is used to start the unit.

The 480V Distribution Switchboard will power the two 480V CTG MCCs, the one 480V BOP MCC, and re-feed one side of the double-ended 480V STG MCC that is also being replaced as part of the Project. In addition, one spare breaker will be provided.

The PEECC also contains the CTG dedicated 125V direct current (DC) system and 120V alternating current (AC) vital AC system.

The 125 V DC system provides 125 VDC power to the combustion turbine DC system, such as the DC Lube Oil Pump, Fire Protection system, Protective Relay panels, etc., and other miscellaneous CTG loads.

The 120 V AC vital AC system provides 120 VAC power to the gas turbine human machine interface (HMI) station and other critical AC loads.

The existing GSU for the Unit 3 STG and its associated interconnect will continue to be used.

The existing 480V STG MCC will be repowered from the new 480V Distribution system. The 2.4-kV medium voltage loads and non-480V STG generator loads will remain on their respective existing buses, namely they will not be re-powered from the new CTG distribution system.

2.2.2.8 Control System

This section describes control systems for the new CTG, HRSG and BOP systems. The GE CTG will use the standard SPEEDTRONIC Mark VI (TMR) system.

The HRSG and BOP equipment will utilize the following control systems:

- A modern ABB Symphony Enterprise Distributed Control System (DCS) that will be installed as part of the Project.
- New “smart” instruments integrated into the new DCS that will replace the original pneumatic controls and field devices.
- A new digital governor will replace the existing STG governor.

2.2.3 Operations and Emissions

2.2.3.1 Startup and Operating Limits

The proposed startup and operating limits for the Project are outlined as follows:

1. One-Time Startup and Commissioning in 2009
    - 360 hours of uncontrolled emissions for startup and commissioning of the turbine and SCR
2. Annual Operation

- 325 hours associated with 150 startups composed of (a) 20 minutes of HRSG purge, (b) 20 minutes of CTG startup, (c) 30 minutes of CTG load ramp, (d) 45 minutes of HRSG warm-up, and (e) 15 minutes SCR warm-up (linearly decreasing controlled emissions)
- 150 hours associated with 150 shutdowns composed of (a) 30 minutes of CTG load ramp, and (b) 30 minutes of CTG shutdown.
- 20 hours of uncontrolled emissions for annual maintenance and testing (included in the 8,000 total hours)
- 8,000 hours of fully controlled emissions (including 3,000 duct fired hours)
- In total, 8,475 hours

2.2.3.2 Project Maximum Daily Emissions

For purposes of air modeling, the following two scenarios were evaluated to determine maximum daily emissions for the Project:

- 24 hours of operation with fully controlled emissions.
- Two startups and shutdowns in one day coupled with approximately 20 hours of normal full load operation and 2 hours of operating in maintenance mode (uncontrolled)

2.2.3.3 Best Available Control Technology

The expected BACT emission levels for the various pollutants are summarized below:

- NO_x – 2.0 parts per million (ppm) dry volume (ppmvd) @ 15% O_2, 3 hour average
- CO – 4.0 ppmvd @ 15% O_2, 3 hour average
- Volatile organic compound (VOC) – 2.0 ppmvd @ 15% O_2, 3 hour average
- PM_{10} – Pipeline quality natural gas (as currently proposed by the Applicant)
- Sulfur oxide(s) (SO_x) – Natural gas shall not contain more than 0.75 grains of total sulfur compounds per 100 standard cubic feet (scf)
- Ammonia slip – 5.0 ppmvd @ 15% O_2, 3 hour average
- Cooling tower PM_{10} – Highly efficient drift eliminator system (controls to less than 0.001% of circulating water

See Attachment F in Appendix B, Air Quality Data, for a copy of the Letter of Agreement on BACT standards between the ICAPCD and IID.

2.2.3.4 Emission Reduction Credits

The CTG dry low NO_x burners achieve uncontrolled engine emission levels of 9 ppmvd NO_x and 25 ppmvd CO over the range of 60 to 100% load. The HRSG is equipped with an anhydrous ammonia based SCR and CO oxidation catalyst emission control systems to further reduce

emissions down to 2 ppmvd NO_x and 4 ppmvd CO. Anhydrous ammonia will be delivered to the Unit 3 HRSG from the existing ammonia storage tank located adjacent to the existing Unit 2.

Emissions data for the CTGs both before and after post-combustion controls are provided in Appendix B, Air Quality Data.

The BACT emission levels have been applied to the operating limits for the Project.

Startup and shutdown emissions are based upon GE standard International Standards Organization (ISO) conditions of 59ºF. Full-load emissions are based upon annual average ambient temperature of 73ºF. GE has stated that although emissions may increase slightly at lower temperatures, the supplied values are applicable for the range of temperatures where the plant is expected to operate.

Given BACT emission levels and annual operating assumptions, ERCs have been provided to offset the Project's annual emissions, as shown in Table 2.2-2, Proposed Project Offset Package.

TABLE 2.2-2
PROPOSED PROJECT OFFSET PACKAGE

Parameter	Tons/Year		
	ROC	PM_{10}	SO_2
ECGS Unit 3 Project Net Emissions Increase	3.05	18.97	7.02
Required Credits Based on 1:1 Ratio[1]	3.05	18.97	7.02
Source(s) of Credits – Banked Credits (Same Pollutant)	None	4.81 tons provided in the form of 9.62 tons of El Toro Export PM_{10} credits (based on a 2:1 ratio for fugitive PM_{10} emission reductions).	7.02 tons of banked SO_2 credits
Source of Credits – Proposed Inter-pollutant Trade[2]	3.05 tons provided in the form of 6.10 tons of banked NO_x credits, based on an inter-pollutant ratio of 2:1	14.16 tons provided in the form of 35.4 tons of banked SO_2 credits (based on an inter-pollutant ratio of 2.5:1)	None

Notes:
[1]Per agreement with ICAPCD, emissions will be offset at a 1:1 ratio because the net increases in emissions for all three pollutants will be less than the offset triggering level of 137 lb/day specified in ICAPCD Rule However, interpollutant offset ratios will be applied.
[2]The calculations shown in this table assume that the El Toro credits from control of fugitive emissions can be used to offset Project, PM_{10} emissions at a 2:1 ratio and that banked SO_2 credits can be used to offset Project PM_{10} emissions at a 2.5:1 ratio per the requirements determined by ICAPCD..
ECGS = El Centro Generating Station
NO_x = nitrogen oxide(s)
PM_{10} = particulate matter less than 10 microns in diameter
ROC = reactive organic compounds
SO_2 = sulfur dioxide

IID reached agreement with ICAPCD on the required Project Offsets as presented in the January 5, 2006 letter included in Appendix B, Air Quality Data, Attachment G. The Project emissions presented to ICAPCD were based on preliminary engine emission calculations. The Project Emission presented in Table 2.2-2, Proposed Project Offset Package, represents more detailed and accurate engine emissions supported by vendor data for startup and shutdown events. While the engine emissions were modified, all offset ratios and other Offset Package assumptions are consistent with the original agreement with ICAPCD as documented in

Appendix B, Air Quality Data. IID will work to advance agreement with ICAPCD on the new engine emission data in the Authority to Construct permit process that will be advanced in parallel with this process. Once a final agreement is reached between ICAPCD and IID, the Applicant will resubmit Table 2.2-2, Proposed Project Offset Package.

2.2.4 Combustion Turbine Generator

The combustion turbine utilized for the Project is a GE 7EA CTG. The nominal net generating capacity of the 7EA is 78 MW at ISO conditions. The 7EA is a large frame industrial combustion turbine designed for high reliability and high availability in a power generation Application.

The 7EA package includes the following major equipment and packages:

- Combustion turbine with dry low NO_x combustion system
- TEWAC generator rated at 13.8 kV
- Inlet filter house with self cleaning filter elements, and inlet air evaporative cooling package
- Accessory compartment containing the lube oil/hydraulic oil reservoir, pump and cooling system
- Fuel gas control system
- Cooling module for turbine and generator lube oil/hydraulic oil cooling, including:
  - Finned Tube Air-to-Water Heat Exchanger
  - Circulating pumps
  - Controls
- PEECC containing:
  - CTG Control and Monitoring System
  - Local Operator Station
  - Motor Control Center
  - Generator Protection Panel
  - Battery and Charger System
- Self Contained Carbon Dioxide (CO_2) Fire Protection System that includes the following equipment:
  - CO_2 tank
  - Fire Detection and Extinguishing System
  - CTG System

2.2.5 Major Electrical Equipment and Systems

The major electrical equipment for the Project is as follows:

a. 7EA CTG (Qty-1)

b. 13.8-92 kV GSU transformer (Qty-1)

c. 13.8-4.16 kV Medium Voltage Transformer (Qty-1)

d. 13.8 kV-480V SAS Transformer (Qty-1)

e. PDCE (Qty-1)

The TEWAC generator is rated at 98.6 MW. The generator assembly includes the generator breaker, generator/turbine controls, protection relaying, metering, etc., associated with the standard GE 7EA package.

The 15-kV switchgear is supplied as a part of the standard GE 7EA package. The switchgear contains the generator breaker, the disconnect link to connect to the medium voltage and station auxiliary service transformers, as well as the CTs and PTs for GE protection package. The generator is synchronized to the El Centro Switching Station via this generator breaker.

For the remaining items, all the ratings are preliminary and are subject to change based on actual design and equipment purchased. The GSU transformer will be rated at 100/133 MVA, 92-13.8 kV, copper windings, three-phase, 60 Hz.

The medium voltage transformer is rated at 1,000 kVA, 13.8-4.16 kV, copper windings, three-phase, 60 Hz. This transformer provides the power to the 4,160V MCC.

The Station Auxiliary Service transformer is rated at 2,500 kVA, 13.8-0.48 kV, copper windings, three-phase, 60 Hz. This transformer provides the power to the 480V Switchboard.

A PDCE is included to house the 4,160V MCC and the 480V Switchboard. The enclosure will be provided with heating, ventilation, and air conditioning (HVAC), normal and emergency lighting, etc.

The new CTG will generate power at 13.8 kV and will utilize a GSU transformer located adjacent to the CTG to increase the voltage to 92 kV. A new 92-kV electrical interconnection (overhead line) will be provided between the GSU and the existing 92-kV El Centro Switching Station within the ECGS.

2.2.6 Natural Gas Fuel System

The Project will interconnect to the existing SCGC high pressure gas metering station located on the existing ECGS Site. SCGC provides natural gas transportation service to the ECGS via two pipelines (10 and 12 inches) running south from the SCGC Niland regulating station to the ECGS. Minor modifications at the ECGS Site will be performed to support the Project including modifications to the metering station to increase the flow of high-pressure (approximately 375 psig) gas through the station to serve the new Unit 3 combustion turbine. No off-site upgrades are necessary.

There is an existing gas transportation agreement between IID and SCGC for 2,157 MMBtu/hr of firm gas transportation capacity during peak periods of the year, which provides adequate natural gas transportation capacity to operate the Unit 3 Repower Project. Appendix J, Natural Gas Supply, summarizes the gas transportation agreement with SCGC.

2.2.6.1 Fuel System Details

Natural gas is the only fuel for the new Unit 3 CTG and HRSG Duct Burners. The existing SCGC high-pressure supply and metering station for the ECGS will be upgraded to support the Project.

The SCGC high pressure meter station will be upgraded with a higher capacity flow meter, flow computer, a new gas chromatograph, lower pressure drop isolation valves, and upgraded digital communications to SCGC and to provide relevant data to IID consistent with it being used to meet the total needs of the ECGS.

The high-pressure transfer point between SCGC and ECGS is located just south of the meter station fence at an aboveground insulating flange that separates the off-site and on-site facilities. This existing SCGC/IID interface flange will be upgraded with an emergency shutoff valve and check flow meter immediately south of the insulating flange.

The SCGC high-pressure gas supply is typically 355 psig. The CTG fuel gas pressure range is between 315 and 375 psig. As a result fuel gas compression on the high-pressure system will not be required. (When Unit 2 was repowered it was provided with a fuel gas compressor that has never been needed.)

Fuel gas must be supplied to the CTG with 50°F of superheat per the CTG fuel gas specification.

The fuel gas system for the Project is comprised of the following major elements:

- SCGC Metering Station (upgrade to existing high pressure supply system)
- High pressure System Emergency Shutoff Valve
- High pressure System Flow Check Meter
- Unit 3 Regulating Station
- Unit 3 CTG Fuel Gas Module (provided by GE)
- Unit 3 HRSG Duct Burner Regulating Station

The fuel gas supplied from the SCGC meter station flows through the cathodic protection insulating flange, emergency shut-off valve and flow check meter before being routed to the equipment associated with the existing Unit 2 CTG and New Unit 3 CTG.

A knock-out drum and scrubber/filter removes any liquid hydrocarbon and moisture load, as well as larger particulates, from the fuel gas stream. The liquids and particulates removed are discharged to a drain tank through automatic level controls.

A pressure regulating station, located downstream of the fuel gas heater, will control the pressure to the CTG fuel gas module and HRSG duct burners. The pressure reducing station is designed to accommodate the existing range of pressures and flows for startup, normal, and train failure conditions through parallel trains pressure control valves, and isolation valves.

The final 100% capacity fuel gas coalescing filter provides the final level of filtration required. The liquids and particulates removed are discharged to the drains tank through automatic level controls.

The drains tank will have a visual level indicator and high-level alarm. A pump out connection is provided to remove contents for off-site disposal.

Equipment and piping upstream of the final fuel gas coalescing filter will be constructed of carbon steel materials. Equipment and piping downstream of the final fuel gas coalescing filter will be constructed of stainless steel materials. Piping installed underground will be coated and cathodically protected. All vessels will be designed in accordance with American Society of Mechanical Engineers (ASME) Section VIII, Division 1 requirements.

2.2.6.2 Alternate Gas Transportation Arrangement

The Project will be supplied with natural gas through the SCGC gas transportation system, which is the sole source of supply into the Imperial Valley. As part of the 10-year planning process performed by IID Supply and Trading, IID executed a Precedent Agreement with North Baja, LLC (a subsidiary of TransCanada) in October 2005, which will, if fully implemented, provide an additional 110,000 MMBtu per day of natural gas transportation capacity for gas supplies to Imperial Valley. This agreement advances terms and conditions under which North Baja LLC would permit, construct, and operate a 46-mile natural gas lateral from the North Baja pipeline that currently transports natural gas from Ehrenberg, Arizona (through an interconnection with El Paso Natural Gas Pipeline), to the Mexican border (interconnection with Baja Norte pipeline), passing through Imperial County. The termination point for the 46-mile lateral will be within the ECGS Site. The 546 mile lateral is being permitted through a separate permitting process led by the Federal Energy Regulatory Commission (FERC) and the California State Lands Commission.

The North Baja gas transportation capacity could become the primary gas transportation supply for the ECGS including the Unit 3 Repower Project if: (1) the lateral project is successfully permitted and constructed, and (2) all conditions precedent under the Precedent Agreement are achieved or waived which results in and IID Supply and Trading takes service under the Firm Transportation Service Agreement with North Baja, LLC.

North Baja will design the lateral to deliver up to 110,000 decatherms per day to the ECGS Site fence line. The North Baja lateral gas interconnection facilities on the ECGS Site will be located on previously disturbed acreage separate from the SCGC meter station.

2.2.6.3 Fuel Pipeline Interconnection

The fuel gas supply to the new CTG and HRSG duct burners will be supplied from the existing high-pressure line feeding the station from SCGC. The trenching distance for the new and rerouted fuel gas lines is approximately 500 feet, all within the ECGS Site. The proposed route is shown on Figures 2-2A and 2-2B, Site Plan and Utility Interface.

2.2.7 Water Supply and Use

Based on permitted operation of 8,000 hours, annual water consumption is conservatively expected to be approximately 1,125 acre-feet. On an equivalent operating hour basis, this quantity is only 96 acre-feet greater as compared to the existing ECGS Unit 3.

Water efficiency will be improved by approximately 60% with implementation of the Project. Based on average ambient conditions, the Project will use approximately 7,400 gallons/MW for

a 24-hour operating day in contrast to the existing use of over 18,500 gallons/MW for the same operating period. The consumption of gallons/kWhr will drop from a maximum of approximately 0.99 gallons/kWhr to between 0.22 to 0.46 gallons/kWhr.

As previously described, the existing Unit 3 cooling system will continue to be used with only minor modifications to reduce cooling tower drift from the existing Unit 3 cooling tower.

Table 2.2-3, Annual Summary of Unit 3 Water Use and Discharge, summarizes and compares the annual water use and wastewater discharge for the Project with the existing Unit 3. Figures 2-6A through 2-6I provide the water balances for the existing Unit 3 STG and the Unit 3 Repower Project at different operating temperatures, with and without duct firing.

TABLE 2.2-3
ANNUAL SUMMARY OF UNIT 3 WATER USE AND DISCHARGE

Annual Totals	Repower Cycle	Original Cycle	Increase	% Increase
Operating Hours	8,000	8,000	0	0.00%
Energy Production	956,102,500 kW	379,480,500 kW	576,622,000 kW	151.95%
Raw Water Usage	366,493,500 gallons	335,191,500 gallons	31,302,000 gallons	9.34%
Annual Water Use[1]	1,125 acre feet	1,029 acre feet	NA[1]	NA[1]
Waste Water Discharge	92,293,200 gallons	84,729,000 gallons	7,564,200 gallons	8.93%
Usage Efficiency (gallons/kWhr)	0.38	0.88		60%

Notes:
[1]It should be noted that IID is proposing to cap the amount of water used for the Unit 3 Repower Project to 1,029 acre feet, which is the same amount that would be used for the existing Unit 3. Therefore, there would be no net increase in water usage.
% = percent
gallons/kW = gallons per kilowatt
NA = not applicable
kW = kilowatts

2.2.7.1 Water Supply

The raw water source for the existing ECGS is from IID's Dogwood surface canal Gate 54B. This water is used for cooling tower make-up. Raw water is treated by an existing demineralization system to provide high quality make-up water. The existing raw water and treated water facilities have sufficient capacity to meet the expected water requirements for the Project.

The existing water quality analysis for ECGS is summarized in Table 2.2-4, ECGS Supply Water Quality Analysis.

TABLE 2.2-4
ECGS SUPPLY WATER QUALITY ANALYSIS

Parameter	Units	Concentration[1]
Aluminum	µg/L	240
Ammonia	mg/L	NA
Arsenic	µg/L	2.0
Barium	µg/L	150
Bicarbonate alkalinity	mg/L	190
Boron	µg/L	170

TABLE 2.2-4
ECGS SUPPLY WATER QUALITY ANALYSIS

Parameter	Units	Concentration[1]
Bromide	mg/L	NA
Carbonate alkalinity	mg/L	<5
Calcium	mg/L	91
Chloride (IC)	mg/L	120
Fluoride	mg/L	0.28
Hardness (total) (as $CaCO_3$)	mg/L	360
Hydroxide alkalinity	mg/L	<5
Iron	µg/L	190
Magnesium	mg/L	32
Manganese	µg/L	<20
Nitrate (as NO_3)	mg/L	<2
Nitrite (as N)	µg/L	<400
Ortho Phosphate	mg/L	NA
pH, Field	pH	Not Reported
pH, Lab	pH	8.2
Potassium	mg/L	4.7
Sodium	mg/L	120
Specific conductance	µmhos/cm	1,200
Sulfate	mg/L	320
Temperature, Field	°C	Not Reported
Total Alkalinity (as $CaCO_3$)	mg/L	150
Total Dissolved Solids (TDS)	mg/L	790
Total Organic Carbon (TOC)	mg/L	NA
Turbidity	NTU	NA
Vanadium	µg/L	4.4

Notes:
[1]Analytical test results for a water sample obtained from the Dogwood irrigation canal on October 14, 2005. Water sample analyzed by Clinical Laboratories of San Bernardino.
< = Less than indicated detection limit
ECGS = El Centro Generating Station
mg/L = milligrams per liter
µg/L = micrograms per liter
µmhos/cm = micro-mhos per centimeter
NA = Not analyzed
NTU = nephelometric turbidity units

2.2.7.2 Water Treatment Requirements

There are no changes proposed for the existing water treatment system as part of the Project. This system provides demineralized water for make-up to the steam systems.

2.2.7.3 Wastewater Streams

The existing ECGS Site process wastewater disposal system will not be modified with implementation of the Unit 3 Repower Project. The primary wastewater streams to be gathered include cooling tower blow-down, steam cycle blow-down from the HRSG, and excess condensate from the CTG evaporative cooler. However to increase water utilization, blow-down from the steam cycle (HRSG) continue to directed to the existing cooling tower and used as a source of make-up water to the existing cooling tower basin rather than being discharged as is currently the case.

Equipment drains, such as CTG water wash and fuel gas compressor liquid drains, will be collected in sumps for off-site disposal as is the case for Unit 2. Handling of contact storm water remains unchanged with the water contained within the ECGS Site and allowed to evaporate. Similarly, discharge of sanitary wastes will not change as part of the Project as they will continue to be discharged to the on-site septic system.

The NPDES permit[1] for discharges from the entire ECGS was issued in 2004 and established discharge limitations for toxics as required by the CTR. To address this requirement, IID conducted a regulatory evaluation to determine the most cost effective approach to comply with the discharge limitations. The NPDES permit requires compliance with the toxics discharge limitations by July 1, 2009.

Based on the evaluation, it was determined that the most cost effective approach to comply with the discharge limitations is to eliminate the discharge by installing a deep well injection system for wastewater from the entire ECGS Site. The recommended system consists of two Class I non-hazardous wastewater deep injection wells. With installation of the deep well injection system, cooling tower blow-down and other process wastewater streams will be discharged into a deep well injection system (approximately 2,000 feet below ground surface [bgs]). Since the new deep well injection wastewater disposal system is needed for the entire ECGS Site, the permitting is independent of the Project addressed in this SPPE Application. IID is implementing the system independent of this SPPE.

The Project will generate the following wastewater streams as shown in Table 2.2-5, Summary of Wastewater Streams and Estimated Quality.

TABLE 2.2-5
SUMMARY OF WASTEWATER STREAMS AND ESTIMATED QUALITY

Wastewater Stream	Composition	Flow Rate	Comments
HRSG Blow-down Tank Discharge	Water	~7 gpm	Discharge water reused as Cooling Tower make-up.
CTG Evaporative Cooler Blow-down	Water	~3 gpm	Blow-down water directed to ECGS wastewater system.
Cooling Tower Blow-down	Water	~220 gpm	Blow-down water directed to ECGS wastewater system.

[1] NPDES Permit and Waste Discharge Requirements for IID – ECGS, CA0104248, Board Order No. R7-2004-0086, California Regional Water Quality Control Board (RWQCB), Colorado River Basin Region, July 1, 2004.

TABLE 2.2-5
SUMMARY OF WASTEWATER STREAMS AND ESTIMATED QUALITY

Wastewater Stream	Composition	Flow Rate	Comments
CEMS Equipment	Water	~0 gpm	Minor condensation of water vapor within CTG exhaust recovered through plant wastewater system.
STG and Auxiliary Drains and Containment (Turbine Building)	Water	Intermittent – during startup and shutdown	Contaminated drains routed through oil water separator; any oil spill contained and disposed of off-site. (This is an existing waste stream that will now be recovered.)
CTG Water Wash Drains	Water and heavy hydrocarbons	Intermittent - Based upon maintenance	Collected in dedicated drains tank for periodic off-site disposal. (Unit 3 will utilize existing Unit 2 Water Wash system.)
CTG Accessory Compartment Containment	Wash down water	Intermittent – Based on maintenance	Containment Valve Closed, controlled drainage of wash down water to oil water separator; any oil spill contained and disposed of off-site.
CTG GSU Transformer Containment	Water	Intermittent – Based on Rainfall	Isolated Containment - Contact storm water is allowed to evaporate; any oil spill contained and disposed of off-site.
STG GSU Transformer Containment	Water	Intermittent – Based on Rainfall	Isolated Containment - Contact storm water is allowed to evaporate; any oil spill contained and disposed of off-site. (This is an existing waste stream that will now be contained.)
Auxiliary Transformer Containment	Water	Intermittent – Based on Rainfall	Isolated Containment – Contact storm water is allowed to evaporate; any oil spill contained and disposed of off-site.
Fuel Gas Final Filter Liquid Drains	Water and heavy hydrocarbons	Based upon fuel gas stream impurities	Collected in dedicated drains tank for periodic off-site disposal.

Notes:
CEMS = continuous emissions monitoring system
CTG = combustion turbine generator
gpm = gallons per minute
GSU = generator step-up
HRSG = heat recovery steam generator
STG = steam turbine generator

2.2.8 Plant Cooling Systems

The existing Unit 3 STG exhaust steam is condensed in a surface condenser supplied with circulating cooling water from the Unit 3 evaporative cooling tower. The Unit 3 evaporative cooling tower is a 4-cell, counter flow, mechanical draft cooling tower. As a part of the Project, the cooling tower will be fitted with new drift eliminators.

The existing evaporative cooling tower is supplied with make-up water to replace losses due to evaporation and drift. Circulating water quality is maintained through blow-down of water containing dissolved solids from the circulating water return line. Under worst-case ambient and operating conditions, the make-up water demand will increase by a maximum of 145 gpm as a result of the Project. Blow-down from the cooling tower will be discharged to the new ECGS wastewater system that utilizes a deep injection well system.

As a part of the Project, the existing Unit 3 surface condenser will be replaced with a new surface condenser providing a reliable condensing system. The new condenser will include a steam bypass system to facilitate warmup, startup, and shutdown of the Unit 3 steam plant.

The CTG package is cooled using a closed loop cooling water system with an air-cooled heat exchanger (ACHE). The ACHE is a 4-cell unit with cooling water passing through the exchanger tubes. The cooling water is cooled by drawing ambient air across the exchanger by electric motor driven fans.

The CTG utilizes an evaporative cooler to cool the incoming turbine inlet air for increased performance, particularly on hot days. The evaporative cooler operates by passing the inlet air flow over a media system that has been saturated with water. The inlet air evaporates the water by absorbing heat from the air thus reducing its sensible temperature, approaching the wet bulb temperature of the air. The inlet air is typically saturated to around 85% of complete saturation. The water used in the evaporative cooler is stored in a reservoir and circulated by a pump over the media. Water that has not been evaporated from the media returns to the reservoir. As a result of the recirculation process, solids may have a tendency to accumulate in the reservoir. Solids accumulation is controlled by removing water from the evaporative cooler system through a blow-down line on the pumps discharge. The blow-down is directed to the new ECGS wastewater system that utilizes a deep well injection system.

2.2.9 Management of Industrial Wastes

The Project will generate wastes typical of industrial facilities during both construction and operation. Types of waste will include non-hazardous solid waste, non-hazardous wastewater, and liquid and solid hazardous waste. Typical wastes and volumes generated during construction and operation are summarized in Table 2.2-6, Anticipated Non-Hazardous Waste Management Methods, and in Table 2.2-7, Anticipated Hazardous Waste Management Methods. Operation waste streams will not change from the current quantities and therefore have not been assessed.

TABLE 2.2-6
ANTICIPATED NON-HAZARDOUS WASTE MANAGEMENT METHODS

Waste Stream and Classification	Origin and Composition	Estimated Amount	Estimated Frequency of Generation	On-Site Management	Waste Management Method
Construction Phase					
Construction waste	Scrap wood, steel, glass, plastic, paper	<100 cubic yard per month (average)	Intermittent	Stored in appropriate receptacles	Dispose to landfill
Stormwater from construction area	Surface runoff (water, inert material, dirt and concrete particles)	Variable	Intermittent	Allow to evaporate and percolate	Water will evaporate and percolate into on-site soils as currently takes place
Pipeline pressure testing	Drains from pipe high pressure cleaning and hydrostatic testing	<20,000 gallons	One time at end of construction	None	Test and dispose in Baker tanks for off-site disposal, if necessary
Sanitary waste	Portable chemical toilets sanitary waste	350 gallons/day	Intermittent	None	Every week, or as needed, pump to tanker truck and ship to sanitary water treatment plant
Operations Phase					
Closed chilled water system	Propylene glycol	55 gallons/year	Annual	Pump from closed loop cooling system to 55-gallon drum	Recycled off-site
Oily rags	CTG and other users of hydraulic actuators and lubricants	<1 55-gallon drum per month	Intermittent	Store <90 days	Launder at authorized facility
Used air filters	CTG inlet air house	500 cartridge filters	Every other year	Directly transferred to disposal truck	Transported to off-site landfill

TABLE 2.2-7
ANTICIPATED HAZARDOUS WASTE MANAGEMENT METHODS

Waste Stream and Classification	Origin and Composition	Quantity	Disposal Method
Construction Phase			
Construction waste	Empty hazardous material containers	<10 cubic yards per month	Dispose to hazardous waste disposal facility
Construction waste	Solvents, used oils, paint, oily rags, adhesives, acid and alkaline solutions used to clean piping	<100 gallons per month	Collect in on-site receptacles and dispose to hazardous waste disposal facility or recycle
Drift eliminator panels (replaced)	Existing Unit 3 cooling tower	<80 cubic yards	Dispose to hazardous waste disposal facility
Existing pipe insulation (replaced)	Piping terminal points between new and existing insulated piping system, asbestos	<20 cubic yards	Removed in accordance with IID procedures and disposed to hazardous waste disposal facility
Operation Phase			
Cleaning chemicals and detergents	Cleaning solution waste from combustion turbine water wash	100 gallons per month	Stored in on-site drains tank. Wastes with elevated metals contents will be tested and, if hazardous, disposed of at a RCRA Part B permitted facility in accordance with applicable LORS
Spent SCR and CO oxidation catalyst	SCR, heavy metals	50,000 lbs every 4 years	Recycled to supplier or dispose in Class I landfill
Lubricating oils	Waste oil	Not normally generated	Delivered to an on-site 1,000-gallon waste oil holding tank until sent off-site to an authorized waste recycle facility
Fuel gas system	Liquid drains	50 gallons per year	Liquids from filters flow to drain tanks and the contents pumped to 55-gallon drums and recycled to an authorized waste recycle facility
Used oil filters	Combustion turbine	35 filters per year	Stored in waste oil storage enclosure until sent off-site to an authorized waste recycle facility
Oil water separator	Oily sludge	Not normally generated	Stored in integral equipment holding tank until sent off-site to an authorized waste recycle facility

Notes:
< = less than
CO = carbon monoxide
CTG = combustion turbine generator
LORS = Laws, Ordinances, Regulations, and Standards
RCRA = Resource Conservation and Recovery Act
SCR = selective catalytic reduction

2.2.10 Stormwater Management

The grades in the area where the new CTG/HRSG will be located will not be altered as a result of the new construction. The new equipment will be elevated slightly above the existing grade to allow storm water to flow away from the equipment and to maintain the existing storm water drainage paths.

The existing ECGS Site is generally flat, and some areas of the facility retain water until evaporation occurs. When enough precipitation occurs to generate runoff, it drains to one of five impound areas. These five areas are described in the Storm Water Pollution Prevention Plan (SWPPP) for the ECGS, Appendix L, Water Resources Information. The Project is located in Drainage Area D as described in the SWPPP. The discharge point for Drainage Area D is a manhole and control gate northwest of ECGS Unit 1. This outlet consists of an 18-inch pipe draining to a 24-inch pipe that discharges to Central Drain No. 5. The grading in the Project Site will be designed to direct non-contact storm water runoff by surface flow to the existing discharge point in Drainage Area D.

The discharge locations located throughout the ECGS have control gates, which allow plant personnel to visually inspect and test storm water prior to release to Central Drain No. 5. If the impounded water appears unacceptable for discharge, it is pumped by vacuum truck and disposed of properly off-site.

2.2.11 Management and Disposal of Hazardous Materials

A variety of chemicals will be stored and used by for ECGS Unit 3 during both construction and operation, including natural gas, anhydrous ammonia, lube oil, and transformer insulating oil. Storage, handling, and use of all chemicals will be in accordance with applicable LORS. No new chemical storage and handling areas are proposed for the Project however; existing chemical storage areas are designed with appropriate containment to collect any potentially contaminated wastes and to avoid cross contamination of other systems or areas. Berm and drain piping design will allow a full-tank capacity spill with appropriate margin, without overflowing the containment berms.

Spill containment structures are provided for all chemical injection, unloading, and storage areas. Basins are provided around transformers and other equipment, which contain oil in case of rupture, spill, or leak and are designed per National Fire Protection Association (NFPA) 850. Absorbent materials are stored on-site in quantities adequate for spill containment and cleanup.

Personnel are trained in the proper handling of new chemicals stored and used on-site, and instructed in proper protocol to be followed in the event of a spill or accidental release.

The quantities of hazardous materials that will be on the Project Site and Temporary Construction Area during construction are relatively small. They will be limited to gasoline, diesel fuel, motor oil, hydraulic fluid, solvents, cleaners, sealants, welding flux, various lubricants, paint, and paint thinner. There are no feasible alternatives to vehicle fuels and oils for operating construction equipment. The types of paint required are dictated by the types of equipment and structures that must be coated and by the manufacturers' requirements for coating.

A list of the chemicals anticipated to be used during operation of ECGS Unit 3 is provided in Table 2.2-8, Hazardous Materials Use and Storage. Table 2.2-8 identifies each chemical by type and intended use and the estimated quantities to be stored on-site.

TABLE 2.2-8
HAZARDOUS MATERIALS USE AND STORAGE

Chemical	Use	Storage	Location	Delivery	Notes
Anhydrous Ammonia (EXISTING)	~25 lbs/hr (Unit 3 only)	10,200 gallons (12,000 gross tank capacity)	Existing Outdoor Tank	6 additional deliveries per year	~ 7,000 gallon (~36,000 lbs) delivery quantity (Anticipate monthly deliveries after Project completion based upon historic capacity factor of Units 2 and 4.)
Transformer Mineral Insulating Oil	Transformer oil	~8,175 gallons	Equipment	One-time	<7,000 gallons per GSU transformer (1-total) <500 gallons per auxiliary transformer (2-total) <50 gallons per metering unit (3-total) <25 gallons per voltage transformer (1-total)
SF6 Gas	N/A	180 pounds	Equipment	N/A	<60 lbs per circuit breaker (3-total)
CTG Mineral Lubricating Oil	Lubricating oil	~2,500 gallons	Equipment	100 gallons/year	Common system for both combustion turbine and generator
Corrosion Inhibitor Chemicals for Closed Cooling Water Loop	N/A	~50 gallons	Equipment Skid Area	As needed	Small periodic use based upon sample tests

Notes:
~ = approximately
< = less than
CTG = combustion turbine generator
lbs/hr = pounds per hour
N/A = not applicable

2.2.12 Emission Control and Monitoring

Air emissions control and monitoring equipment will be installed to reduce, control, and measure NO_x, CO, and VOC emissions. This equipment is described in the following sections.

2.2.12.1 Combustion Turbine/HRSG

Air emissions from the combustion of natural gas in the CTG and HRSG will be controlled using a SCR and CO oxidation catalyst. These state-of-the-art systems will allow the unit to meet a wide range of electrical system operating scenarios while complying with applicable LORS, including ICAPCD requirements for emissions of CO, NO_x, PM_{10}, and VOC. A Continuous

Emissions Monitoring System (CEMS) will be installed to monitor the stack emissions of NO_x and CO.

The emission control system for each CTG/HRSG consists of the following major components:

- CO oxidation catalyst to control CO and VOCs
- SCR to control NO_x
- Natural gas fuel

The gas turbine combustors control the CTG exhaust CO emissions to approximately 25 ppmvd, and NO_x emissions to approximately 9 ppmvd over the range of operating loads (60-100% power).

The HRSG will be equipped with duct burners for supplementary firing during peak power demand periods. The duct burner emissions are mixed with the CTG exhaust and the resulting combined gas flow is processed by the SCR system incorporated as a part of the HRSG. The SCR system will control NO_x concentrations in the exhaust gas emitted to the atmosphere. The SCR process uses anhydrous ammonia (from an existing storage tank) as a reducing agent to catalytically convert NO_x present in CTG exhaust to molecular nitrogen (N_2) and water vapor. Ammonia slip, or the concentration of un-reacted ammonia in the exiting exhaust gas, will be limited.

The SCR system includes:

- Catalyst bed with housing and internal insulation
- Catalyst loading/unloading facilities
- Integral gas distribution system
- Ammonia injection grid
- Ammonia flow control skid, include vaporization equipment

Anhydrous ammonia will be delivered periodically to the ECGS Site via tank truck to an existing storage tank. It is expected that six additional deliveries per year will be required as part of the Project. The trucks include vapor recovery systems to prevent the discharge of ammonia vapors into the atmosphere while the storage tank is being filled. Anhydrous ammonia flows from the existing storage tank, is vaporized, and is then injected into the duct upstream of the SCR catalyst.

A CO oxidation catalyst will be provided to further reduce CO emissions. The CO oxidation catalyst will also reduce the VOC emissions. This catalytic system will promote the oxidation of CO to CO_2 and VOC to CO_2 and water without the need for additional reagents.

Natural gas is the sole fuel that will be used for the Unit 3 Repower Project to limit PM_{10} emissions. With the Project, Unit 3 will no longer have the ability to operate on liquid fuel.

The design and performance characteristics of the SCR and CO oxidization system are summarized as detailed in Table 2.2-9, SCR and CO Oxidation System Characteristics.

TABLE 2.2-9
SCR AND CO OXIDATION SYSTEM CHARACTERISTICS

Stack Height	100 feet (15 foot inner dimension [ID] and ~75 F/S Exit Velocity at Base Load)
SCR Catalyst Type	Ceramic honeycomb
CO Oxidation Catalyst Type	Precious metal carrier on alumina
Ammonia Concentration	Anhydrous Aqueous

Notes:
~ = approximately
CO = carbon monoxide
F/S = full strength
SCR = selective catalytic reduction

Particulate matter emissions will be controlled by inlet air filtration and by the use of pipeline quality natural gas fuel, which contains minimal particulate matter.

Sulfur dioxide (SO_2) emissions will also be controlled by the use of pipeline quality natural gas fuel.

2.2.12.2 Anhydrous Ammonia System

Ammonia is stored in an existing horizontal, 12,000-gallon (gross) carbon steel tank (9 feet outer diameter [OD] by 23.5 feet straight length). In compliance with American National Standards Institute (ANSI) K61.1, the tank will not be filled beyond 85% capacity, or 10,200 gallons maximum. Tank pressures will vary according to the temperature of the ammonia in the tank from about 45 psig at 30ºF to about 250 psig at 115ºF.

The tank is equipped with two vaporizers that evaporate liquid ammonia to maintain adequate vapor pressure in the tank during cold weather. Each vaporizer is comprised of an electrically heated element encased in a carbon steel vessel. Only one vaporizer is in service at any time.

Ammonia for the Unit 3 Repower Project will leave the tank as a vapor and flow through a new 610-foot 2-inch carbon steel vapor double-contained piping system to the ammonia flow control skid. There, a flow control valve regulates the flow of ammonia to a mixing tee, where the vapor is diluted and injected into the exhaust stream upstream of the SCR catalyst. The feed line will use a pair of flow measurements, one at the upstream end and one at the downstream end of the pipeline, along with isolation valves every 150 feet. If an ammonia release is sensed, either by the gas detectors or a sustained flow mismatch, an isolation signal will be sent to all of the isolation valves closing them and limiting the release of ammonia to at most the contents of 150 feet of pipe.

The Project will require the storage tank to be fitted with an additional feed tap. The new Unit 3 Repower Project ammonia feed line will be routed from the storage tank through the existing overhead structure to the steam turbine building, along the wall of the steam turbine building and then along the catwalk to the to the new Unit 3 Repower Project ammonia flow control skid.

Anhydrous ammonia is delivered to the station in bulk delivery trucks with an average capacity of 36,000 pounds, or approximately 6,500 gallons. Ammonia is transferred from the delivery trucks by a small pump at the rear of the truck. Ammonia flows through an internal isolation valve and excess flow valve to the pump suction.

The delivery trucks come from the Anaheim area. The delivery route is: Interstate 10 east, Highway 86 south, left on Adams Avenue, left on East Commercial Avenue, Left on North 3rd Street, right on East Villa Avenue, and right into ECGS. The pressure in the delivery truck tank will be between 100 and 200 psig (depending on ambient temperature).

Ammonia is transferred from the delivery truck into the storage tank through an approximately 25-feet long 2-inch hose connected to the top of the tank. Pressure between the truck and tank is equalized through a 2-inch vapor return hose connected to the top of the ammonia truck tank.

The ammonia system is carefully located to minimize pipe length, vehicle hazards, and personnel exposure in the event of a spill. The ammonia delivery truck is parked adjacent to the ammonia storage tank, minimizing the length of the fill hose. All piping containing liquid ammonia is located within a containment area around the ammonia storage tank. Accidental releases from ammonia trucks are stopped with excess flow valves, emergency cut-off switches, and back-pressure control valves. The internal isolation valve is automatically closed if the pressure in the fill hose drops to zero.

In the event that an unloading hose bursts and releases ammonia, emergency air-operated isolation valves located on the liquid loading and vapor return lines can be closed by means of an emergency-stop switch located at the front of the delivery truck.

Excess flow valves are installed on all truck and storage tank connections. These valves automatically close when flow through the line exceeds a given value. These valves are sized to allow normal flow, and prevent large flow resulting from breaks in the external line.

The ammonia system piping and vessels are designed to withstand a pressure of 265 psig. Reflective white coating is applied to the ammonia tank to prevent over-pressurization in the event of fires. To prevent over-pressurization of the system, relief valves are installed on all vessels or piping containing liquid ammonia. These relief valves are set to open at 265 psig. The ammonia storage tank is protected by two relief valves isolated from the tank by a two-way valve, allowing only one relief valve to be isolated at any time. Relief valves are sized to prevent excessive ammonia pressure in the event of a fire, as set forth in ANSI K61.1.

The ammonia tank is protected by a water fog system consisting of a local alarm system, ambient ammonia monitors, piping, and fog nozzles. This system is a dry pipe deluge type system designed per NFPA standards 13 and 14. The fogging system is automatically activated by an ammonia release, tank over-pressurization, or fire event. The water fog can absorb the ammonia release, cool down the tank, and help shield the tank from a fire event. The ECGS Control Room also monitors the automated system.

Worker protection features include the containment area, fogging system, local emergency eyewash and shower, along with an ammonia detection system with local horn and warning lights. Ammonia detectors are set to activate at 75 ppm.

The containment structure located around the ammonia tank is designed to contain 12,000 gallons of ammonia, 5,000 gallons of water projected by the water fogging system, and 2-inches of storm water, with 4-inches of freeboard remaining.

The ammonia system currently feeds Units 2 and 4. The station currently averages about six deliveries per year. The delivery frequency is dependent upon unit operating hours and load. The estimated demand for the Unit 3 Repower Project is 25 pounds per hour (lbs/hr). Based upon annual steady-state operating hours of approximately 8,000 hours, Unit 3 ammonia demand

will require an additional six deliveries per year, or 12 total (twice the current delivery frequency), assuming the operating practices for Units 2 and 4 remain historically consistent.

2.2.12.3 Continuous Emissions Monitoring Systems

A CEMS will be installed to monitor emissions from the HRSG exhaust stack. The proposed CEMS utilizes extractive sampling technology to monitor outlet NO_x, CO, and O_2 concentrations. The system will also be used to predict ammonia slip emissions. Stack flow rates will be calculated based upon measured fuel consumption rates and will be used to determine hourly mass emissions in accordance with ICAPCD and U.S. Environmental Protection Act (USEPA) regulations. A common data acquisition system (DAS) will be located in the control room. The CEMS will generate a log of emissions data for compliance documentation and will activate an alarm in the plant control room if stack emissions exceed specified limits. The DAS will calculate all average emission rates and will be the source of historic CEMS output data. The CEMS and DAS will be certified for operation and maintained in accordance with ICAPCD and USEPA regulations.

2.2.13 Fire Protection System

The Project will build upon the existing fire protection and alarm systems common to the ECGS. As part of the Project, an additional fire hydrant will be provided to the south of the Unit 3 CTG. In addition, a fire main will be added within the Turbine Building on the east side. This new fire main will supply hose reels on both the ground floor and turbine operating level.

The new CTG enclosures are protected by a CO_2 based fire suppression system as supplied by the manufacturer. This system includes heat and gas detection devices to provide reliable and safe operation. The new oil-filled transformers are isolated from adjacent equipment and structures using physical separation and/or separation walls. The new auxiliary transformers are supplied with approved less-hazardous dielectric fluids. Additionally, each new transformer will reside within a concrete containment that serves to:

- Contain any spills
- Retain direct contact storm water that may potentially come in contact with transformer oil
- Retain fire water that would have come in contact with transformer oil

The fire protection system is summarized in Table 2.2-10, Fire Protection Systems Design Conditions.

TABLE 2.2-10
FIRE PROTECTION SYSTEMS DESIGN CONDITIONS

Location	Type of System
Buildings (Existing)	Hose stations will be provided in the east side of the turbine building as an upgrade. The fixed fire systems will be provided as required by local jurisdiction or Uniform Building Code (UBC).
Combustion Turbine/ Generators	CO_2 System as defined per NFPA will be provided for the combustion turbine/generators by GE.
Transformers (New)	Separation.
Outside Areas	A new wet barrel type fire hydrant will be designed, and installed south of the new CTG/HRSG as developed in conjunction with the City of El Centro Fire Marshall.

Notes:
CO_2 = carbon dioxide
GE = General Electric
NFPA = National Fire Protection Association

2.2.14 Plant Auxiliaries

The Project utilizes many of the existing ECGS plant auxiliary systems including potable water, raw water, fire water, demineralized water, anhydrous ammonia, fuel gas, compressed air, and sanitary sewer systems common to the ECGS.

- Potable Water – No new sources of potable water are needed.
- Sanitary Sewer – No new sanitary facilities are planned, as the existing plant infrastructure is sufficient.
- Raw Water – Raw water for Unit 3 will continue to be supplied from the Dogwood Canal.
- Process Wastewater – Process wastewater will be gathered, and as appropriate, processed through an existing oil water separator. The resulting clean process wastewater stream will be mixed with the brine resulting from the ECGS demineralized water processing plant and discharged to the new deep well injection system.
- Fire Water – Fire water will continue to be supplied by the existing plant fire protection system. An additional fire hydrant will be added south of the Unit 3 CTG as well as a new fire main within the Turbine Building.
- Demineralized Water – The existing plant demineralized water system will be used for make-up to the steam cycle beyond what recycling of process wastewater can supply.
- Anhydrous Ammonia – The existing Unit 2 anhydrous ammonia storage tank will also be used for Unit 3.
- Fuel Gas – The existing SCGC high pressure supply and metering station for the entire ECGS will be utilized for the Project. Some modifications to the metering station will be made to increase the flow of high pressure (approximately 375 psig) gas through the ECGS to serve the Unit 3 CTG. From the metering station, a gas line will be run to connect to the Unit 3 CTG.

- Compressed Air – The existing plant compressed air system will be utilized.
- The Unit 2 CTG water wash skid will be shared with the new Unit 3 CTG.

2.2.14.1 Lighting

The existing lighting system provides personnel with illumination for plant operation under normal conditions, and egress under emergency conditions. The existing lighting system will be reused to the greatest extent possible and the new or Project system will be integrated into this system as required. New Project lighting will be designed and installed to meet Occupational Safety and Health Administration (OSHA) minimum standards. New Project indoor lighting will be per current minimum average maintained foot-candle (fc) levels as published by the Illuminating Engineering Society.

Two basic outdoor lighting systems for the Project will be provided as follows:

1. System No. 1 – Roadways with the Project Site and parking area lighting with a minimum illumination level of 1 fc
2. System No. 2 – Power block platform, operation and maintenance lighting with a minimum illumination level of 10 fc

Each outdoor lighting system will be 277V and use high-pressure sodium (HPS) type fixtures ranging from 70 to 400 watts. The quantity, location, and wattage will be determined by the final lighting design. Each outdoor lighting system will be provided with its own manual and automatic control system. A Hand-Off-Auto selector switch with contactor and photoelectric (PE) cell will be used. In the hand position the outdoor system lights will be on continuously. In the off position the lights will be off. In the auto position the PE light sensor will turn the lights on at dusk and off at dawn.

The emergency lighting system (egress lighting, “exit” signs, etc.) will use 90-minute battery packs as required in the manned area, including PDCE, etc.

The GE 7EA standard package includes an AC (normal) and DC (emergency) lighting for gas turbine unit interior lighting that will be provided as an integral part of packaged power plants.

Light fixtures will be shielded and/or pointed inward to eliminate potential impacts to local residents. Typically, ground level area lighting, which is controlled by photocells, will always remain on at night for safety and security purposes, and will have “dark sky” compliant shielding. Elevated equipment lighting on structures is generally controlled by switches, and will only be on when needed for operations. In general, new Project lighting will not be detectable when compared to the existing plant lighting.

2.2.14.2 Grounding

The electrical system will be susceptible to ground faults, lightning, and switching surges that can result in high voltage. The existing ECGS grounding system will provide an adequate path to permit the dissipation of current created by these events — protecting personnel and equipment. The Project will include a new grounding system to ensure safety to personnel and equipment in case of electrical equipment failures and to prevent fires and damage from lightning and/or static electricity. The installation will be in accordance with Institute of

Electrical & Electronics Engineers (IEEE) Standard Publications Nos. 80 and 142. Maximum resistance to ground will be established in accordance with the referenced IEEE standards and determined in detailed engineering after electrical fault levels, soil resistivity, etc., has been determined. The new grounding system will have a minimum of two connections to the existing ECSG grounding system.

Project structural steel, equipment enclosures, and/or electrical equipment ground buses will be grounded to the ECGS grounding system. The Project grounding system will consist of buried bare copper cables with driven ground rods located strategically throughout. The minimum conductor size for the ground grid, major equipment grounding, and structure grounding will be 4/0 American Wire Gauge (AWG).

2.2.14.3 Cathodic and Freeze Protection

Cathodic Protection System

Buried steel pipe will be protected by coating and wrapping the pipe with suitable corrosion resistant materials. A passive cathodic protection system will be used, unless the soil resistivity testing indicates that an active cathodic protection system is required. The cathodic protection system design will take the existing ECGS plant and El Centro Switching Station grounding systems into consideration to prevent deterioration of the ground grid or other metallic objects within or near the plant.

The ECGS cathodic protection system is isolated from the SCGC natural gas pipeline cathodic protection system. For the high-pressure supply to the plant, there is a short above ground loop with an insulating flange in it immediately next to the SCGC metering station.

Freeze Protection System

No electric freeze protection is required for the Project. However, equipment and piping systems potentially susceptible to freezing will be insulated.

2.2.14.4 Distributed Control System

The primary control of the CTGs will be accomplished by GE's turbine control panel consisting of the SPEEDTRONIC Mark VI control system. The turbine control panel is located in the PEECC, associated with the CTG. This system will be supplied with its own operator interface, which is located in the turbine control panel. The GE control system will also include remote operator interface workstation, which will be located in the existing ECGS control room. This remote workstation will allow the operators to view and utilize the native GE control screens from the control room.

As part of the Project, the following control system upgrades will be incorporated:

- Upgrade the existing plant controls to a DCS based system
- Replace the existing mechanical turbine governor with a digital governor
- Replace all pneumatic transmitters with "smart" electronic transmitters

The existing Unit 3 BOP control system will be upgraded to a DCS similar to the existing Unit 2 DCS and the more recent DCS procured for the Unit 4 controls upgrade project. The Unit 3 plant controls and DCS will be located in Control Room 2, which currently houses the control systems for Unit 4.

The operators will normally monitor and control the plant from the DCS Human System Interfaces (HSI) located in the control room. The "day-to-day" control interface with the CTG will be accomplished from these HSIs using custom CTG supervisory control screens. For detailed information regarding the CTG, the remote turbine control panel workstation will be available to the operators in the control room. The cabinets housing the DCS controllers and local input/output (I/O) will be located in the control room. The DCS will include an engineering workstation (EWS) and historical workstation (HWS). The Unit 3 DCS data highway network will be tied to the Units 2 and four DCS network via a local gateway.

The plant packaged systems such as water treatment will have stand-alone control systems provided by the equipment manufacturer. The DCS will be able to monitor and control these stand-alone control systems, along with specialty control equipment such as the Woodward governor, Bently Nevada equipment monitor, and CEMS, through bi-directional serial data links. The serial signals are non-redundant hence all critical control and monitoring signals associated with the stand-alone controls will be hardwired to the DCS. The CEMS system will be isolated from the other plant control systems and be provided with a stand-alone data acquisition and reporting workstation located in the control room.

All dials, gauges, and control switches (except the control switches associated with electrical switchgear in the control room) are going to be removed. All electrical switchgear for Unit 3 will be controlled from the DCS even though the hardwired switch controls are going to be retained. The current governor controls for the STG will be replaced with a new digital system.

The existing boiler feedwater and the condensate pumps will continue in use for the Project. The local control stations with start/stop buttons for these pumps are going to be retained even though the primary control for these pumps will be from the DCS screens. All new pumps for the Project will not have the local control stations but will be controlled from the DCS screens. All Unit 3 pneumatic controls will be replaced with "smart" transmitters as part of the Project.

The Project will be dispatched from the IID System Operation Center (SOC). Limited start/stop and load set point adjustment from the SOC will be provided over a fiber optic link by way of the existing Applied Control Systems (ACS) equipment. The loading commands from the ACS will be hardwired to the DCS. In addition to the hardwired signals, the ACS will be connected to the DCS via a bi-directional serial link.

2.2.14.5 Facility Civil Structural Features

Power Block

The power block for the Project will consist of one CTG and a HRSG with associated SCR and exhaust stack. One GSU transformer will be provided for the CTG. Corresponding new BOP mechanical and electrical equipment will be located adjacent to the CTG and HRSG.

The types of foundations and pilings will be as recommended by the Geotechnical Engineer in accordance with the Final Geotechnical Report (see Appendix C, Geotechnical Report). Pilings

will be used for the CTG and HRSG foundations. Design of foundations will be in accordance with American Concrete Institute (ACI) 318, the Uniform Building Code (UBC), and California Building Code (CBC).

Stack

The CTG will be provided with a self-supporting steel stack. The stack will be 15 feet in diameter, 100 feet tall, and will include associated appurtenances, such as sampling ports, exterior ladders, and side-step platforms.

Site Security

ECGS is currently fenced with an 8-foot high chain link fence with three strands of barbwire on top around the perimeter. Entrance to the plant will be via the existing 20-foot wide motorized gate equipped with a security monitoring system remotely controlled from the Control Room. Separate access is provided to the administration building and parking area. The Project is not proposing any changes to the existing site security.

Site Grading and Drainage

Grades to construct the facilities will also be established to minimize the amount of earthwork. All areas disturbed during construction will be graded to a smooth surface and covered with appropriate material as design conditions require (e.g., asphalt concrete for road base and gravel for other surfaces). Finish grading will be performed to conform to the finished design elevations for surface drainage and to prepare the areas for the specified surface finishes.

2.3 PROJECT CONSTRUCTION

Major construction activities will be concentrated to the west side of the existing steam turbine building. There will be additional construction to the north and east — all associated with constructing the overhead 92-kV interconnect from the CTG GSU to the El Centro Switching Station. All construction activities will be within the ECGS property boundary.

Project Site preparation includes removing the existing Unit 2 fuel tanks and rerouting various above and underground piping along with surface grading. Deep foundations (driven piles) will be required beneath the CTG and HRSG to address settlement (see Section 6.5, Geotechnical Resources).

The construction period is expected to last 20 months from September 2007 through April 2009. Initial construction efforts will be focused on station infrastructure modifications during a winter outage window lasting approximately 7 months. During this time period, electrical interconnection and fuel gas delivery systems will be constructed and/or modified to allow summer operation of the existing Unit 3 while at the same time clearing space and access for construction of the Unit 3 CTG and HRSG. The foundation and erection work associated with the new Unit 3 CTG and HRSG will be accomplished during a 7-month period from June 2008 to December 2008. Replacement of the condenser and any modifications to the existing Unit 3 STG will be performed beginning in September 2008 after Unit 3 can be shutdown following the summer peak demand season. System commissioning will begin in fourth quarter 2008 with first

fire anticipated around the end of the year. Commissioning activities will continue through the first part of 2009 with the commercial operation date (COD) scheduled for May of 2009.

The construction workforce is estimated to average 73 workers, peaking to 98 workers during months 10 and 11 of the Project schedule. The daily work schedule may be adjusted to avoid the hottest hours of the day.

Due to worker health and safety considerations associated with high daytime temperatures, early work hours (prior to daybreak) may be adopted. Additionally, construction activities may need to occur during nighttime hours but would be limited to work inside the steam turbine building, quiet work outdoors, and critical work to accelerate the Project schedule.

Some activities during construction are continuous in nature (such as concrete pours or performance and emissions testing) and will require extension of work hours based on inherent process requirements or material driven work characteristics. These continuous construction and commissioning activities are considered nonrecurring events. All work conducted outside of the City of El Centro General Plan work hours will be conducted with proper prior approvals.

2.3.1 Power Plant Facility

Construction of the Project is expected to take approximately 20 months from site preparation and grading to start of commercial operation.

2.3.1.1 Existing ECGS Equipment Relocation, Replacement, Removal, or Abandonment

As part of the Project, some existing equipment will be relocated, replaced, and removed. The Unit 3 CTG and HRSG will be located in an unused area of the ECGS Site west of the existing turbine building to minimize demolition and relocation of existing facilities.

Relocation of existing equipment and facilities includes:

- Relocation of two electrical duct banks that currently cross the Project Site.
- Reconfiguration of the on-site natural gas fuel system by:
    1. Isolating the feed from the SCGC low pressure meter station
    2. Extending the high pressure line that serves Unit 2 so that it may also serve Unit 3
    3. Relocation and upgrading of the IID low-pressure natural gas regulating station so that it is fed from the on-site high pressure natural gas line and serves both the Unit 3 HRSG duct burners and the Unit 4 boiler.
- Relocation of the Unit 2 fuel oil transfer pumps to where the existing Unit 3 fuel oil transfer pumps are located. This will allow the relocated Unit 2 pumps to draw suction from the Unit 2 fuel oil tank (converted from the existing Unit 3 fuel oil tank) and supply Unit 2. The relocated Unit 2 pumps will still be powered from Unit 2.
- Relocation of two 161-kV transmission line poles to allow adequate separation between their 161-kV circuits and the new 92-kV circuit being run between the new Unit 3 CTG GSU and the El Centro Switching Station.

Replacement of existing equipment and facilities includes:

- The existing main steam, feedwater, and condensate lines will be rerouted to interconnect with the new HRSG systems.
- The Unit 3 condenser will be replaced. The existing condenser is near the end of its useful life.
- The exiting Unit 3 control system will be replaced with a modern DCS.
- The existing pneumatic instrumentation (transmitters) will be replaced with "smart" electronic transmitters.
- The existing STG governor controls will be replaced with a new digital governor controller.
- Portions of the original in-plant electrical distribution system will be replaced.
- Replace the existing Unit 3 cooling tower drift eliminators with more efficient drift eliminators to meet ICAPCD requirements.

The removal of existing equipment and facilities will include:

- Removing two existing Unit 2 fuel oil tanks. The existing Unit 3 fuel oil tank will be retained and renamed for use by Unit 2 in the future.
- Removing the existing Unit 3 fuel oil transfer pumps to make room for the relocated Unit 2 fuel oil transfer pumps.
- The existing Unit 1 circulating water lines running between the condenser and cooling tower will be removed from service.

The existing Unit 3 boiler will be abandoned in place in accordance with applicable LORS.

2.3.2 Heavy Equipment Delivery

Major freeway access is available within 2 miles of the Project Site. Primary equipment such as the CTGs and transformers and other equipment will be delivered to the Project Site by special conveyance due to their weight and/or size. Typically, deliveries of material and equipment to the Project Site will be made by truck.

2.3.3 Construction Workforce

The projected monthly construction labor is presented in Table 2.3-1, Construction Labor Projected Monthly Manpower (By Craft), for the 20-month construction period. The size of the workforce on-site is estimated to range from 15 workers during month 1 to a peak of 98 workers during month 10 and 11.

2.3.4 Construction Traffic

There will be a dedicated Project specific entrance to the generation facility to keep the normal traffic and construction traffic segregated, at least within the Temporary Construction Area. Construction parking and laydown areas will be located on the existing ECGS Site. Access to the Temporary Construction Area will be from an existing ECGS Site entrance west of the maintenance building. During certain periods of the day, such as the beginning and ending of

construction shifts, pedestrian and traffic management may be required at the construction entrance location.

The following is a forecast of the number of trips that will be made to or from the Project as a result of the construction activities. It is generally equal to the traffic volume expected at the construction entrance. It is expected that construction traffic will primarily use Dogwood Road as the main artery to the Project Site. On average, there will be approximately 73 construction workers on the Project Site and peaking to approximately 98 workers during the peak construction period. Table 6.9-6, Workforce Vehicle Distribution and Trip Generation, summarizes the peak workforce distribution and resultant trip generation during the construction period. Parking for construction personnel and visitors will be provided in a designated area within the Temporary Construction Area on the ECGS Site. It is assumed that workers will commute from Imperial and adjoining counties (San Diego and Riverside counties).

TABLE 2.3-1
CONSTRUCTION LABOR
PROJECTED MONTHLY MANPOWER (BY CRAFT)

	Months After Notice to Proceed																			
Job Category	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Boilermakers								4	8	12	12	12	12	8	4					
Carpenters	4	4		4	8	12	12	12	12	12	8	8	4	2	2	2	2	2		
Cement Finishers	2	2				4	8	12	12	8	4	4								
Electricians				2	4	6	6	4	4	8	12	12	12	12	8	6	4	4	2	2
Insulation Workers												2	4	8	12	12	8	4	2	2
Iron Workers	2	2		4	8	12	12	12	12	12	12	12	12	8	6	4	2	2		
Laborers	2	2	2	4	8	12	12	12	12	12	12	12	12	12	12	8	4	2	2	2
Millwrights				2	4	4	2	2	4	8	8	4	4							
Operators	2	2	2	4	4	6	8	8	8	4	4	4	2	4	4	4	4	2	2	2
Painters															2	8	12	12	8	4
Pipefitters				4	8	8	4	4	8	8	12	12	12	8	8	8	4	2	2	2
Lineman		8	8	2																
Craft Subtotal	12	20	12	26	44	64	64	70	80	84	84	82	74	62	58	52	40	30	18	14
Management	1	1	1	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	2	2
Engineering	1	1	1	4	4	6	6	6	6	8	8	8	8	8	6	6	4	4	2	2
Document Control	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Commissioning													2	4	8	8	8	8	8	4
Staff Subtotal	3	3	3	8	8	12	12	12	12	14	14	14	16	18	20	20	18	18	14	10
Project Total	15	23	15	34	52	76	76	82	92	98	98	96	90	80	78	72	58	48	32	24

Construction of the Project will require the use of heavy equipment for site preparation and erection of structures. In addition to deliveries of heavy equipment, construction materials such as concrete, wire, pipe, cable, fuels, reinforcing steel, and consumables will be delivered to the Project Site by truck. It is estimated that there will be an average of five light delivery trucks on a daily basis and approximately three heavy delivery vehicle and trucks on a weekly basis accessing the Project Site during the Project construction period. Some truck deliveries will include hazardous materials to be used during Project construction, as described in Section 6.14, Hazardous Materials. No acutely hazardous materials would be delivered to or used by the Project. Most deliveries will occur during daytime hours on weekdays.

In some cases, large, heavy equipment may be shipped by rail or by specialized vehicles. During project construction, major foundation pours could require up to 50 concrete mix truck deliveries per day. Each major foundation pour would be limited to one day. Since these activities are non-recurring events occurring only during a few days throughout the construction period, concrete truck deliveries are considered a non-critical project trip generation factor.

The estimated construction traffic is summarized in Table 2.3-2, Vehicle Types and Daily Trips.

TABLE 2.3-2
VEHICLE TYPES AND DAILY TRIPS

Vehicle Type	Average Daily Trips[1]	Peak Daily Trips[1]
Construction Personnel	73	98
Light Delivery Trucks[2]	5 (10 PCE)	10 (20 PCE)
Heavy Vehicles & Trucks	0.5 (2.5 per week) (2 PCE)	5 to 10 (30 PCE)
TOTAL	85	148

Notes:
[1]One-way trip.
[2]Light delivery trucks times 2 passenger car equivalents (PCE)
[3]Heavy Vehicles & Trucks times 3 passenger car equivalents (PCE)

2.3.5 Materials and Equipment Staging Area

The 8.5-acre Temporary Construction Area will be used for equipment staging and storage, construction staff parking, and job trailers. The Temporary Construction Area will be located on the existing ECGS Site as shown on Figures 2-2A and 2-2B, Site Plan and Utility Interface. An existing ECGS Site access gate will be used to access the Temporary Construction Area.

The Temporary Construction Area will be graded and crushed aggregate will be added prior to use. Best management practices (BMPs) such as track out and silt fencing will be used to limit the amount of construction storm water impacts.

2.3.6 Construction Equipment Requirements

During construction, a variety of equipment will be required. Estimates of the types of, and timing of use of, construction equipment are provided in Table 2.3-3, Projected Monthly Construction Equipment Use.

TABLE 2.3-3
PROJECTED MONTHLY CONSTRUCTION EQUIPMENT USE

Equipment	Number of Units	Days of Use Per Month																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Truck Crane - Greater than 300 ton	1								5	5	10	10	5								
Truck Crane - Greater than 200 ton	1								5	5	10	10	5								
Crane - Mobile 65 ton	1																				
Cranes - Mobile 45 ton	1		5	5	5	5	5	5	10	20	20	20	20	10	5	5	5				
Cranes - Mobile 35 ton	1																				
Bulldozer D10R	1																				
Bulldozer D4C	1			5	10	10	5														
Excavator - Trencher (CAT320)	1	5	5	10	10	10	10	5	5												
Excavator - Earth Scraper 623	2																				
Excavator - Motor Grader (CAT140H)	1			5	10	10	5														
Excavator - Backhoe/loader	2	5	5	10	10	10	10	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Excavator - loader	1			10	20	20	10														
Vibratory Roller Ingersol-Rand 20 ton	1																				
Portable Compaction Roller	1			5	10	10	5	5													
Truck - Water	1			10	20	20	10	10	10	10	10	10	10	10	10	10	5	5	5	5	5
Forklift	2				5	10	20	20	20	20	20	20	20	10	10	10	5	5	5	5	5
Dump Truck	1	5	10	20	20	20	20	10	5												
Service Truck - 1 ton	1																				
Truck - Fuel/Lube	1			5	5	5	5	2	2	2	2	2	2	2	2	2	1	1	1	1	1
Concrete Pumper Truck	1							5	10	10	5										
Tractor Truck 5th Wheel	1			5			5														
Trucks - Pickup 3/4 ton	4	10	10	10	10	20	20	20	20	20	20	20	20	20	20	20	20	20	20	10	10

TABLE 2.3-3
PROJECTED MONTHLY CONSTRUCTION EQUIPMENT USE

Equipment	Number of Units	Days of Use Per Month																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Trucks - 3 ton	2	10	10	10	10	10	10	10	10	10	10										
Diesel Powered Welder	4	5	5	5	5	5	5														
Light Plants	1																				
Portable Compaction - Vibratory Plate	1					10	10	10	10												
Portable Compaction - Vibratory Ram	1					10	10	10	10												
Articulating Boom Platform	2								10	10	20	20	20	20	20	20	20	20	20	10	10
Pumps	2				10	10	10	10													
Air Compressor 185 CFM	1	5	5	5	5	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Air Compressor 750 CFM	1																				
Concrete Vibrators	1							5	10	10	5										
Concrete Trowel Machine	1							5	10	10	5										
Fusion Welder	1																				
Portable Power Generators	2	5	5	5	5	5	5														
Pile Driver Truck	1				10	15															

2.4 FACILITY SAFETY DESIGN

2.4.1 Natural Hazards

The primary natural hazards at this Project Site are seismic, flooding, wind, blowing dust, and heat.

2.4.1.1 Seismic Hazards

The site is located in Seismic Risk Zone 4. Structures and their foundations and equipment anchors will be designed according to the 1997 UBC, 2001 CBC, and the Imperial County Building Code. Should there be a conflict in code requirements, the more conservative requirements will govern. In addition, all El Centro Switching Station equipment will meet requirements of IEEE 693-1997 Recommended Practice for Seismic Design of Substations.

2.4.1.2 Wind and Dust Hazards

All buildings will be designed for wind loads stated in the current edition of the CBC and the Imperial County Building Code. In addition, particular care will be taken to minimize sand and grit intrusion for areas that will be occupied by personnel and for the main equipment locations.

If needed during construction, techniques to control windblown dust may include the use of water over the surface to enhance dust control, constructing temporary enclosures to reduce wind effect, and timely revegetation of barren construction areas.

2.4.2 Emergency Systems and Safety Precautions

No changes will be required to the emergency systems as part of the Unit 3 Repower Project.

2.4.2.1 Safety Precautions

The Project will be constructed in full compliance with all federal and state occupational safety and health program requirements. Compliance with these programs will minimize Project effects on employee safety risk.

2.4.2.2 Fire Systems

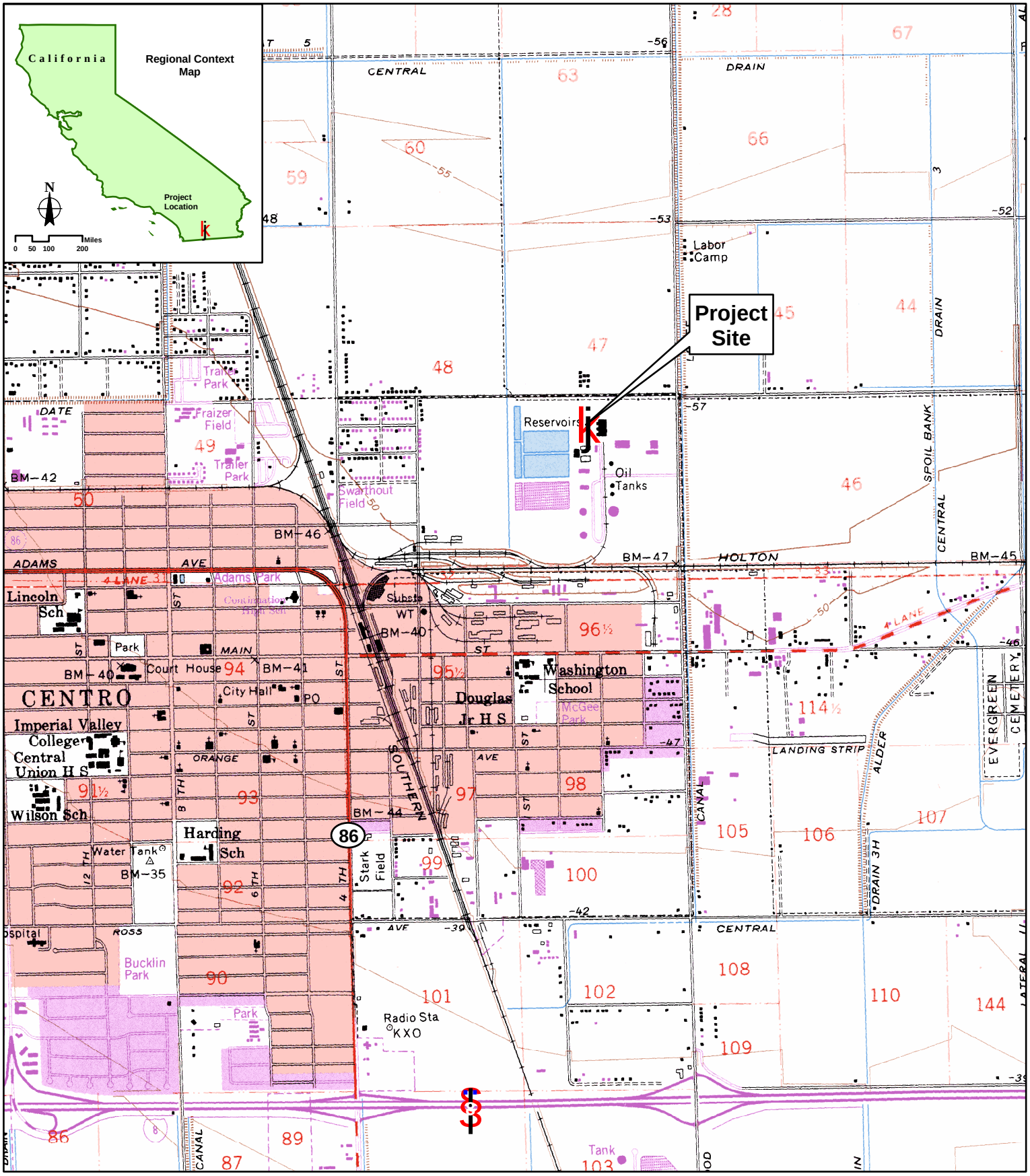
The existing ECGS fire system was recently reviewed by the local fire department. The Fire Marshall has concurred with the Project Applicant to add additional fire hydrant to the south of the new Unit 3 CTG. This new hydrant will provide additional coverage for the Unit 3 CTG and HRSG. In addition, a new fire main and hose stations will be added along the eastern interior of the Turbine Building.

2.5 FACILITY RELIABILITY

The Unit 3 Repower Project will provide an efficient and reliable source of power for IID. The reliability of Unit 3 will be improved through several actions:

1. The original boiler will be replaced with a new CTG and HRSG to generate steam.
2. The original condenser will be replaced.
3. The original pneumatic controls will be replaced with a modern DCS system.
4. The steam turbine governor will be replaced with a modern digital unit.

While these actions taken together will significantly increase the reliability of Unit 3, it should be noted that the increase in reliability comes not only from replacing 50 year old components with new components, but also through the use of well proven technology and equipment. The GE Frame 7EA CTG is a well-proven engine that has been in service for many years. Additionally, the heat transfer equipment to be used for Unit 3, such as the HRSG and condenser, benefit from advances in materials and fabrication as well as many years of operational experience and lessons learned (e.g., the HRSG User's Group).



Project Location Map

El Centro Unit 3 Repower Project
Imperial Irrigation District

0 800 1600 Feet

N

SOURCES:
USGS 1:24,000 Scale Quads, various dates

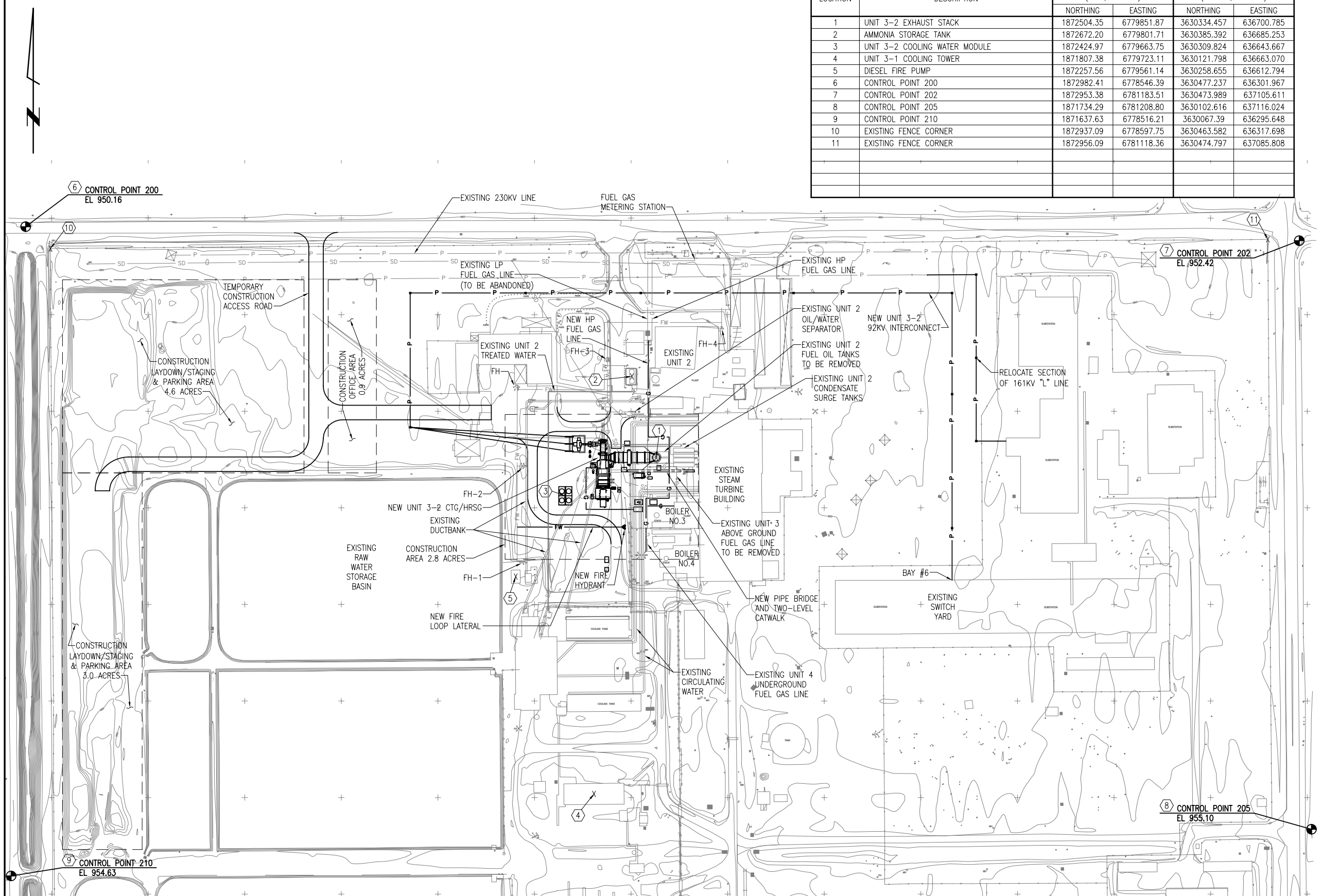
URS

FIGURE 2-1

LOCATION	DESCRIPTION	STATE PLANE COORDINATE (FEET, NAD 83)		UTM COORDINATE (METERS, NAD 83)	
		NORTHING	EASTING	NORTHING	EASTING
1	UNIT 3–2 EXHAUST STACK	1872504.35	6779851.87	3630334.457	636700.785
2	AMMONIA STORAGE TANK	1872672.20	6779801.71	3630385.392	636685.253
3	UNIT 3–2 COOLING WATER MODULE	1872424.97	6779663.75	3630309.824	636643.667
4	UNIT 3–1 COOLING TOWER	1871807.38	6779723.11	3630121.798	636663.070
5	DIESEL FIRE PUMP	1872257.56	6779561.14	3630258.655	636612.794
6	CONTROL POINT 200	1872982.41	6778546.39	3630477.237	636301.967
7	CONTROL POINT 202	1872953.38	6781183.51	3630473.989	637105.611
8	CONTROL POINT 205	1871734.29	6781208.80	3630102.616	637116.024
9	CONTROL POINT 210	1871637.63	6778516.21	3630067.39	636295.648
10	EXISTING FENCE CORNER	1872937.09	6778597.75	3630463.582	636317.698
11	EXISTING FENCE CORNER	1872956.09	6781118.36	3630474.797	637085.808

LEGEND

- PROPERTY LINE
- EXISTING OVERHEAD ELECTRICAL LINE
- EXISTING FIRE WATER
- EXISTING POTABLE WATER
- EXISTING STORM DRAIN
- EXISTING DRAIN
- EXISTING GAS
- FENCE
- OVERHEAD ELECTRICAL LINE
- FIRE WATER
- GAS
- WASTE WATER
- FIRE HYDRANT



NOTES

1. TOPOGRAPHIC INFORMATION PROVIDED BY TRI STATE SURVEYING, LTD. (775) 358–9491. PROJECT NO. 05383.01, 8–25–05.
2. PROPERTY CORNER AND BOUNDARY INFORMATION OBTAINED FROM *.
3. EXISTING FEATURES ARE DEPICTED BY LIGHTER WEIGHT (SCREENED) LINES. NEW STRUCTURES AND FACILITIES ARE SHOWN IN HEAVIER LINES.

THIS DRAWING WAS PREPARED BY POWER ENGINEERS, INC. FOR A SPECIFIC PROJECT, TAKING INTO CONSIDERATION THE SPECIFIC AND UNIQUE REQUIREMENTS OF THE PROJECT. REUSE OF THIS DRAWING OR ANY INFORMATION CONTAINED IN THIS DRAWING FOR ANY PURPOSE IS PROHIBITED UNLESS WRITTEN PERMISSION FROM BOTH POWER AND POWER'S CLIENT IS GRANTED.

5.3ecc1_1_1.dwg

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD	REFERENCE DRAWINGS	
C	ISSUED FOR REVIEW	05/04/06	WMT	WKW	WKW	DEJ		
B	ISSUED FOR REVIEW	02/24/06	WMT	WKW	WKW	DEJ	M1–1	GENERAL ARRANGEMENT NEW UNIT 3
A	ISSUED FOR REVIEW	01/26/06	WMT	WKW	WKW	DEJ	C1–1–2	SITE PLAN & UTILITY INTERFACE SHT 2

DSGN	WKW	10/21/05
DRN	WMT	10/21/05
CKD	WKW	10/21/05

SCALE: 1"= 100'

FOR 22x34 DWG ONLY

POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT

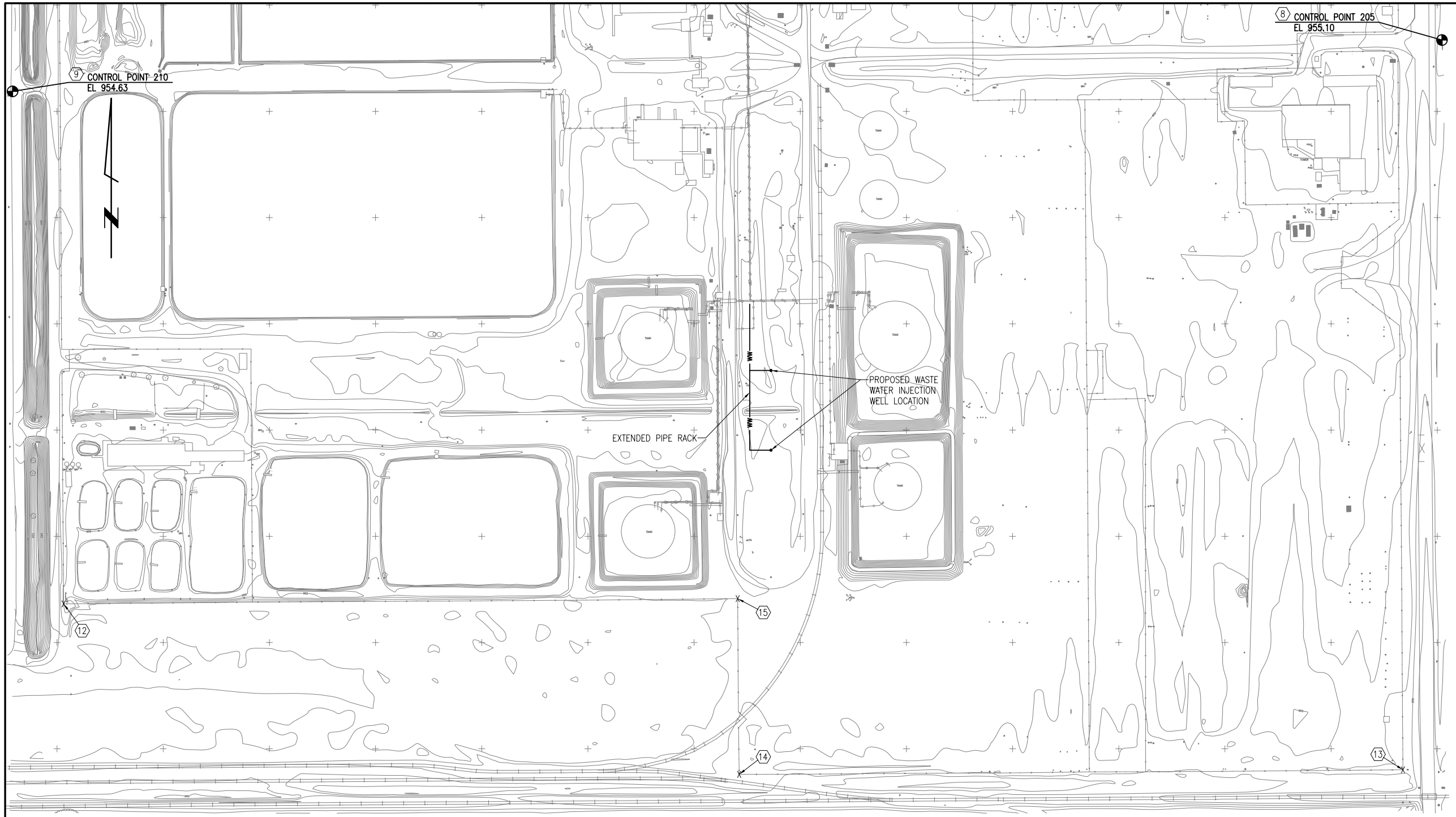
EL CENTRO UNIT 3 REPOWERING

SITE PLAN AND UTILITY INTERFACE SHEET 1

JOB NUMBER 108745

REV C

FIGURE 2–2A



LEGEND

- PROPERTY LINE
- P — EXISTING OVERHEAD ELECTRICAL LINE
- FW — EXISTING FIRE WATER
- PW — EXISTING POTABLE WATER
- SD — EXISTING STORM DRAIN
- D — EXISTING DRAIN
- G — EXISTING GAS
- FENCE
- P — OVERHEAD ELECTRICAL LINE
- FW — FIRE WATER
- G — GAS
- WW — WASTE WATER
- FIRE HYDRANT

NOTES

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2. PROPERTY CORNER AND BOUNDARY INFORMATION OBTAINED FROM *.
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LOCATION	DESCRIPTION	STATE PLANE COORDINATE (FEET, NAD 83)		UTM COORDINATE (METERS, NAD 83)	
		NORTHING	EASTING	NORTHING	EASTING
8	CONTROL POINT 205	1871734.29	6781208.80	3630102.616	637116.024
9	CONTROL POINT 210	1871637.63	6778516.21	3630067.39	636295.648
12	EXISTING FENCE CORNER	1870672.84	6778612.40	3629773.62	636327.02
13	EXISTING FENCE CORNER	1870360.48	6781135.30	3629683.81	637096.51
14	EXISTING FENCE CORNER	1870351.80	6779884.98	3629678.50	636715.51
15	EXISTING FENCE CORNER	1870682.71	6779882.13	3629779.33	636713.93

0 50 100 200 300 FEET
1"= 100'

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53ecc1_1_2.dwg

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD
A	ISSUED FOR REVIEW	05/04/06	WMT	WKW	WKW	DEJ

REFERENCE DRAWINGS	
M1-1	GENERAL ARRANGEMENT NEW UNIT 3
C1-1-1	SITE PLAN & UTILITY INTERFACE SHT 1

DSGN	WKW	05/01/06
DRN	WMT	05/01/06
CKD	WKW	05/08/06

SCALE: 1"= 100'
FOR 22x34 DWG ONLY

POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 REPOWERING
SITE PLAN AND UTILITY INTERFACE SHEET 2

JOB NUMBER 108745
REV A

FIGURE 2-2B

N

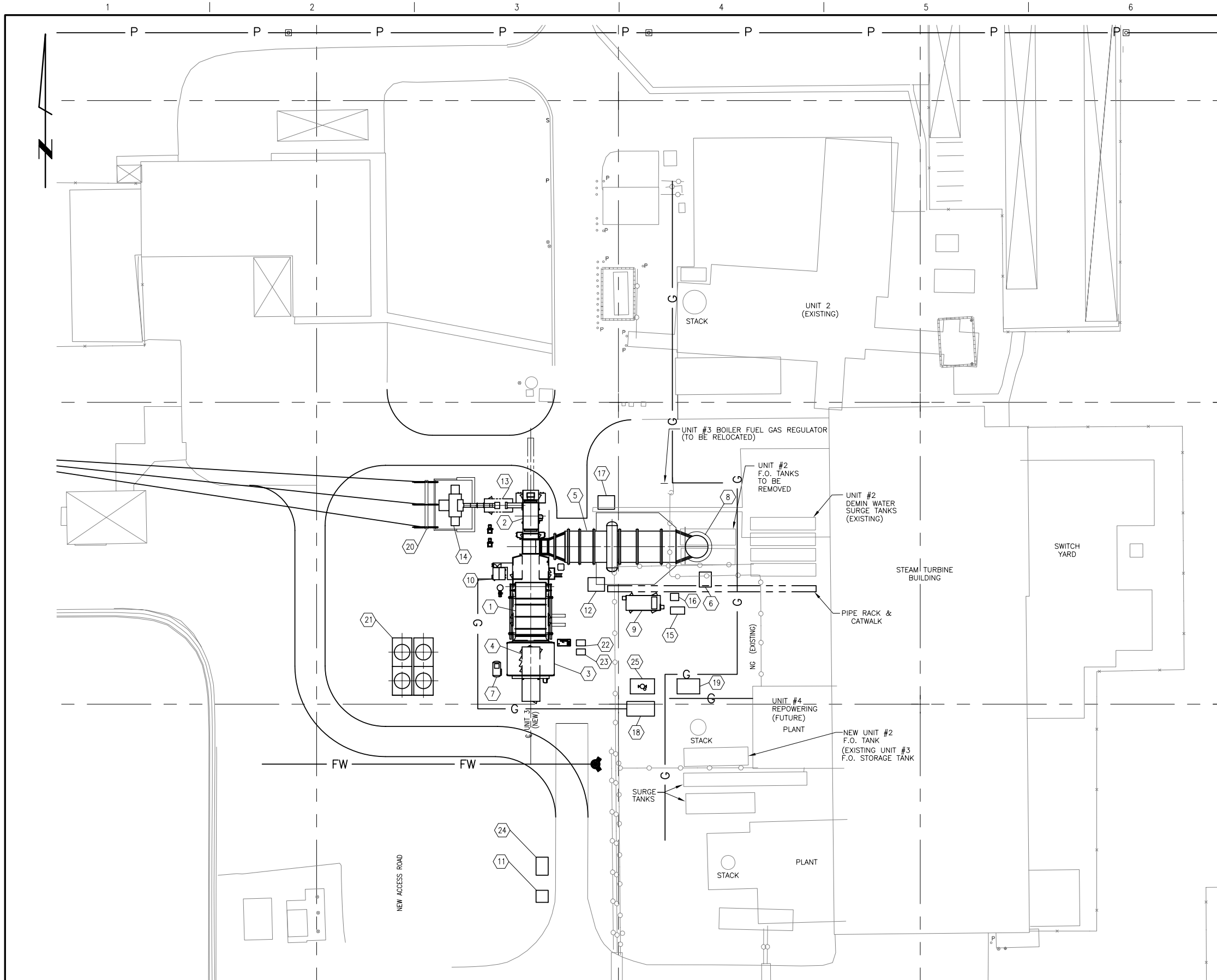
One Inch = 15 Miles

Plant Rendering

El Centro Unit 3 Repower Project
Imperial Irrigation District

URS

FIGURE 2-3



ITEM	DESCRIPTION	NOTES
1	GAS TURBINE	
2	GENERATOR	
3	INLET AIR FILTER	
4	PACKAGED ELECTRIC ELECTRONIC CONTROL CENTER	
5	HRSG	
6	CEMS	
7	FIRE PROTECTION SKID	
8	STACK	
9	POWER DISTRIBUTION CONTROL ENCLOSURE	
10	CTG FUEL GAS MODULE	
11	NEW DRAIN SUMP	
12	DUCT BURNER FUEL GAS SKID	
13	GENERATOR AUXILIARY COMPARTMENT	
14	MAIN STEP UP TRANSFORMER	
15	4160V AUXILIARY TRANSFORMER	
16	480V AUXILIARY TRANSFORMER	
17	AMMONIA FLOW CONTROL SKID	
18	FUEL GAS HEATER	
19	LP FUEL GAS REGULATION STATION	
20	DEAD END TOWER	
21	COOLING WATER MODULE	
22	WATER WASH DRAIN TANK	
23	WASTE OIL TANK	
24	OIL WATER SEPERATOR	
25	FUEL GAS SCRUBBER AND DRAINS TANK	

THIS DRAWING WAS PREPARED BY POWER ENGINEERS, INC. FOR A SPECIFIC PROJECT, TAKING INTO CONSIDERATION THE SPECIFIC AND UNIQUE REQUIREMENTS OF THE PROJECT. REUSE OF THIS DRAWING OR ANY INFORMATION CONTAINED IN THIS DRAWING FOR ANY PURPOSE IS PROHIBITED UNLESS WRITTEN PERMISSION FROM BOTH POWER AND POWER'S CLIENT IS GRANTED.

58_ecm1_1.dwg

REV	REVISIONS	DATE	DRN	DSGN	CKD	APPD	REFERENCE DRAWINGS	
D	ISSUED FOR REVIEW	05/04/06	TDW	PR	DEJ	DCT		
C	ISSUED FOR REVIEW	01/20/06	AS	MP	DEJ	DCT		
B	ISSUED FOR REVIEW	11/23/05	AS	MP	DEJ	DCT		
A	ISSUED FOR REVIEW	11/21/05	AS	MP	DEJ	DCT	*	*

DSGN	AS	11/14/05
DRN	AS	11/14/05
CKD		*
SCALE:	1"=40'	
FOR 22x34 DWG ONLY		

IMPERIAL IRRIGATION DISTRICT

EL CENTRO UNIT 3 REPOWERING

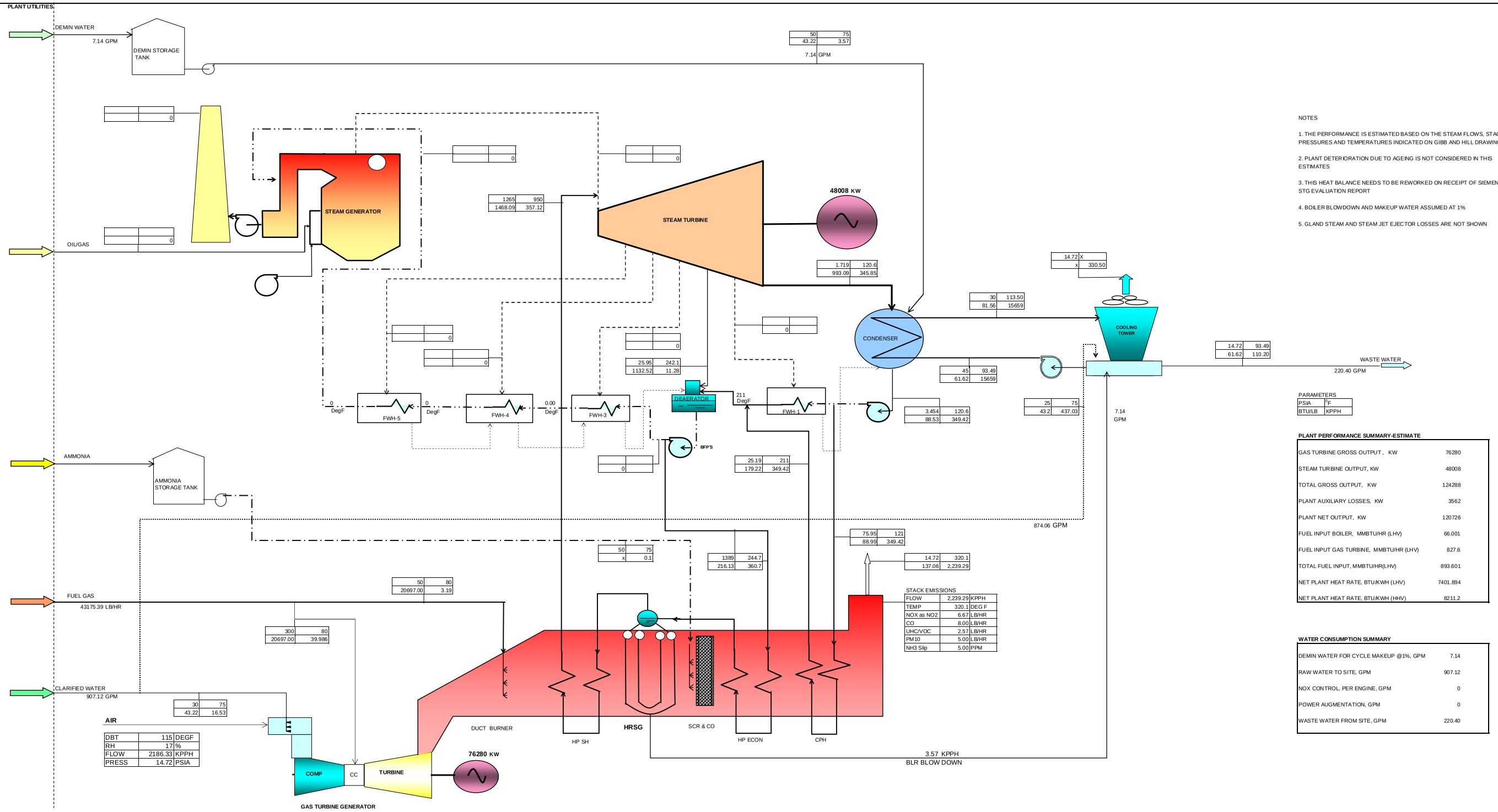
GENERAL ARRANGEMENT
NEW UNIT 3

JOB NUMBER 108745

REV D

FIGURE 2–4

UNIT #3 REPWR 115F, Duct Fired



NOTES

1. THE PERFORMANCE IS ESTIMATED BASED ON THE STEAM FLOWS, STAGE PRESSURES AND TEMPERATURES INDICATED ON GIBB AND HILL DRAWING.

2. PLANT DETERIORATION DUE TO AGEING IS NOT CONSIDERED IN THIS ESTIMATES

3. THIS HEAT BALANCE NEEDS TO BE REWORKED ON RECEIPT OF SIEMENS STG EVALUATION REPORT

4. BOILER BLOWDOWN AND MAKEUP WATER ASSUMED AT 1%

5. GLAND STEAM AND STEAM JET EJECTOR LOSSES ARE NOT SHOWN

PARAMETERS

PSIA	°F
BTU/LB	KPPH

PLANT PERFORMANCE SUMMARY-ESTIMATE

GAS TURBINE GROSS OUTPUT , KW	76280
STEAM TURBINE OUTPUT, KW	48008
TOTAL GROSS OUTPUT, KW	124288
PLANT AUXILIARY LOSSES, KW	3562
PLANT NET OUTPUT, KW	120726
FUEL INPUT BOILER, MMBTU/HR (LHV)	66.001
FUEL INPUT GAS TURBINE, MMBTU/HR (LHV)	827.6
TOTAL FUEL INPUT, MMBTU/HR(LHV)	893.601
NET PLANT HEAT RATE, BTU/KWH (LHV)	7401.894
NET PLANT HEAT RATE, BTU/KWH (HHV)	8211.2

WATER CONSUMPTION SUMMARY

DEMIN WATER FOR CYCLE MAKEUP @1%, GPM	7.14
RAW WATER TO SITE, GPM	907.12
NOX CONTROL, PER ENGINE, GPM	0
POWER AUGMENTATION, GPM	0
WASTE WATER FROM SITE, GPM	220.40

REV	DESCRIPTION	MECH	PE	PM	DATE
A	ISSUED FOR ID REVIEW AND COMMENTS	PR/MP	DEJ	DCT	1/11/2006

REFERENCE DOCUMENTS

1. GIBB AND HILL INC HEAT BALANCE SHEET NO:55-P-205
2. STEAM PRO AND REMASTER SOFTWARE

Design Case:

Configuration: Fri/7EA GTG + DUCT FIRED HRSG Amb. Pres 14.70 psia
Dry Bulb Temp.: 115.00 deg F RH%: 17.00 %
Total Water Consumption 914.26 GPM

POWER ENGINEERS

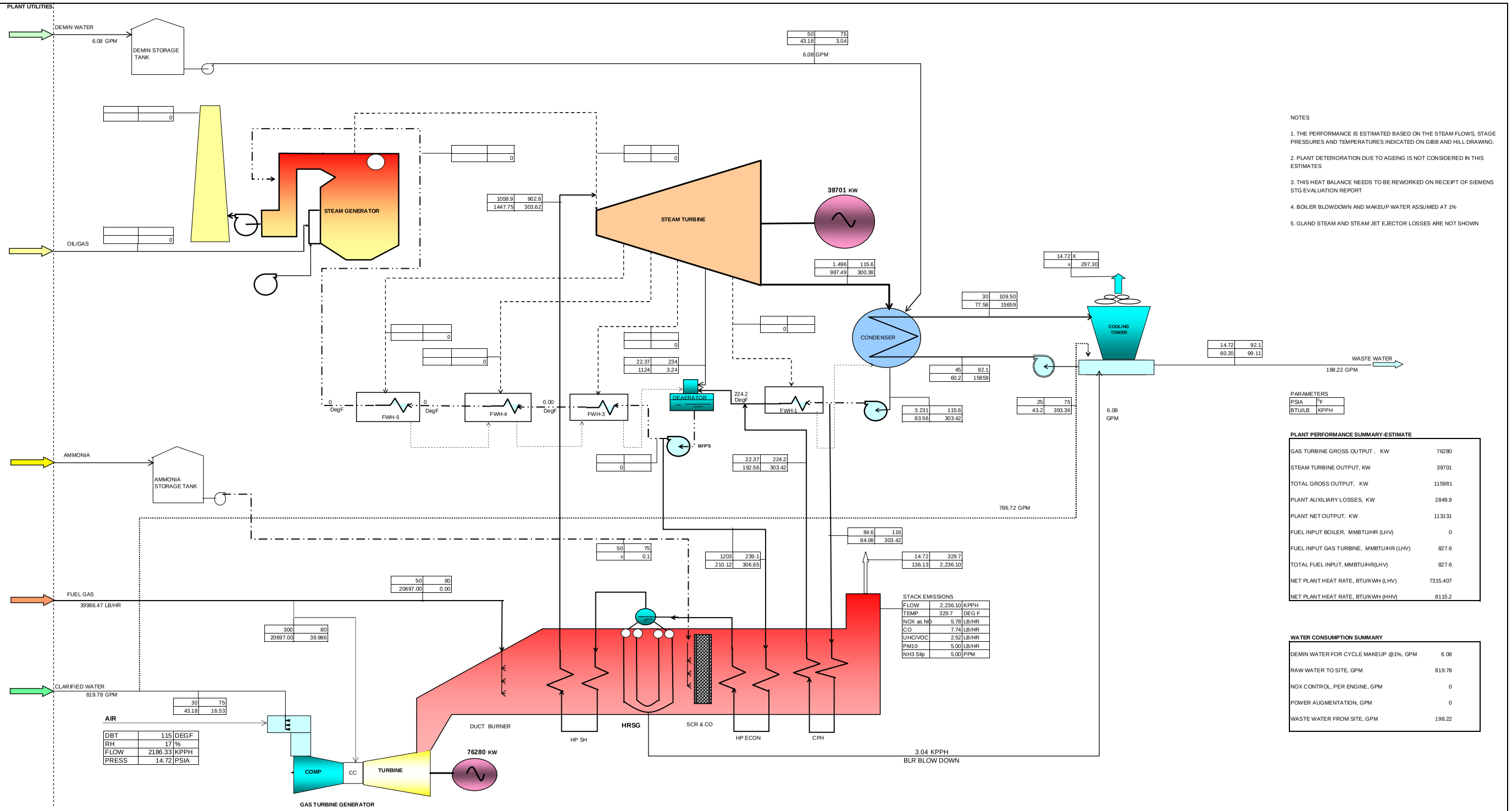
IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT#3 REPOWERING

HEAT AND MASS BALANCE DIAGRAM
115DegF, DUCT FIRED CASE

FIGURE NO: 2-5A

Rev. A

UNIT#3 REPWR 115F, No Duct Fire



NOTES

1. THE PERFORMANCE IS ESTIMATED BASED ON THE STEAM FLOWS, STAGE PRESSURES AND TEMPERATURES INDICATED ON GIBB AND HILL DRAWING.

2. PLANT DETERIORATION DUE TO AGEING IS NOT CONSIDERED IN THIS ESTIMATES

3. THIS HEAT BALANCE NEEDS TO BE REWORKED ON RECEIPT OF SIEMENS STG EVALUATION REPORT

4. BOILER BLOWDOWN AND MAKEUP WATER ASSUMED AT 1%

5. GLAND STEAM AND STEAM JET EJECTOR LOSSES ARE NOT SHOWN

PARAMETERS

PSIA	°F
BTU/LB	KPPH

PLANT PERFORMANCE SUMMARY-ESTIMATE

GAS TURBINE GROSS OUTPUT , KW	76280
STEAM TURBINE OUTPUT, KW	39701
TOTAL GROSS OUTPUT, KW	115981
PLANT AUXILIARY LOSSES, KW	2849.9
PLANT NET OUTPUT, KW	113131
FUEL INPUT BOILER, MMBTU/HR (LHV)	0
FUEL INPUT GAS TURBINE, MMBTU/HR (LHV)	827.6
TOTAL FUEL INPUT, MMBTU/HR(LHV)	827.6
NET PLANT HEAT RATE, BTU/KWH (LHV)	7315.407
NET PLANT HEAT RATE, BTU/KWH (HHV)	8115.2

WATER CONSUMPTION SUMMARY

DEMIN WATER FOR CYCLE MAKEUP @1%, GPM	6.08
RAW WATER TO SITE, GPM	819.78
NOX CONTROL, PER ENGINE, GPM	0
POWER AUGMENTATION, GPM	0
WASTE WATER FROM SITE, GPM	198.22

REV	DESCRIPTION	MECH	PE	PM	DATE
A	ISSUED FOR IID REVIEW AND COMMENTS	PR/MP	DEJ	DCT	1/11/2006

REFERENCE DOCUMENTS

1. GIBB AND HILL INC HEAT BALANCE SHEET NO:55-P-205
2. STEAM PRO AND REMASTER SOFTWARE

Design Case:

Configuration: Fr#7EA GTG + DUCT FIRED HRSG — Amb. Pres 14.70 psia
Dry Bulb Temp.: 115.00 deg F — RH%: 17.00 %
Total Water Consumption 825.86 GPM

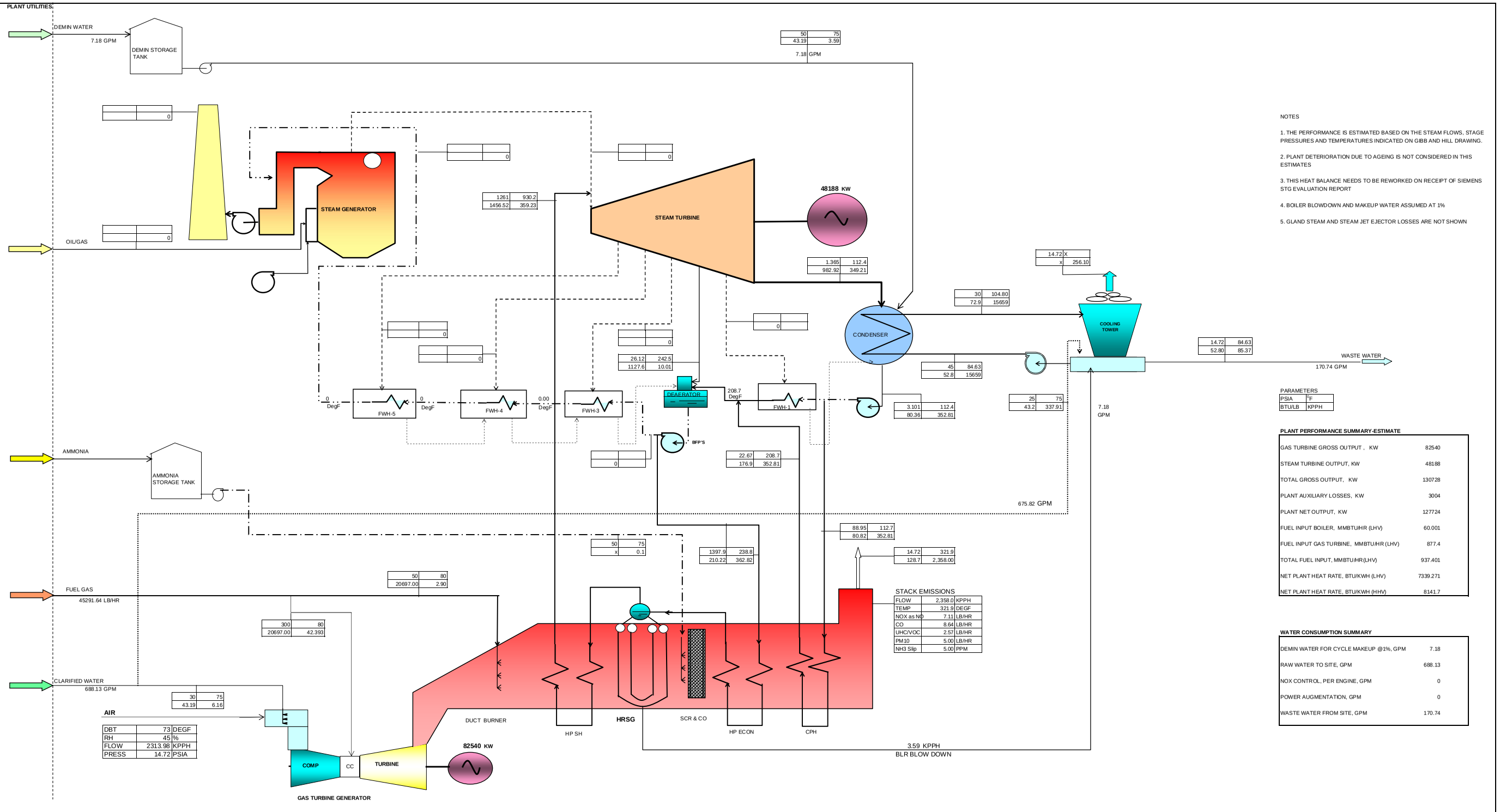
POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT#3 REPOWERING

HEAT AND MASS BALANCE DIAGRAM
115DegF, NO DUCT FIRE

FIGURE NO: 2-5B — Rev. A

UNIT #3 REPWR 73F, Duct Fired



NOTES

1. THE PERFORMANCE IS ESTIMATED BASED ON THE STEAM FLOWS, STAGE PRESSURES AND TEMPERATURES INDICATED ON GIBB AND HILL DRAWING.

2. PLANT DETERIORATION DUE TO AGEING IS NOT CONSIDERED IN THIS ESTIMATES

3. THIS HEAT BALANCE NEEDS TO BE REWORKED ON RECEIPT OF SIEMENS STG EVALUATION REPORT

4. BOILER BLOWDOWN AND MAKEUP WATER ASSUMED AT 1%

5. GLAND STEAM AND STEAM JET EJECTOR LOSSES ARE NOT SHOWN

PARAMETERS

PSIA	°F
BTU/LB	KPPH

PLANT PERFORMANCE SUMMARY-ESTIMATE

GAS TURBINE GROSS OUTPUT , KW	82540
STEAM TURBINE OUTPUT, KW	48188
TOTAL GROSS OUTPUT, KW	130728
PLANT AUXILIARY LOSSES, KW	3004
PLANT NET OUTPUT, KW	127724
FUEL INPUT BOILER, MMBTU/HR (LHV)	60.001
FUEL INPUT GAS TURBINE, MMBTU/HR (LHV)	877.4
TOTAL FUEL INPUT, MMBTU/HR(LHV)	937.401
NET PLANT HEAT RATE, BTU/KWH (LHV)	7339.271
NET PLANT HEAT RATE, BTU/KWH (HHV)	8141.7

WATER CONSUMPTION SUMMARY

DEMIN WATER FOR CYCLE MAKEUP @1%, GPM	7.18
RAW WATER TO SITE, GPM	688.13
NOX CONTROL, PER ENGINE, GPM	0
POWER AUGMENTATION, GPM	0
WASTE WATER FROM SITE, GPM	170.74

REV	DESCRIPTION	MECH	PE	PM	DATE
A	ISSUED FOR ID REVIEW AND COMMENTS	PR/MP	DEJ	DCT	1/11/2006

REFERENCE DOCUMENTS

1. GIBB AND HILL INC HEAT BALANCE SHEET NO:55-P-205
2. STEAM PRO AND REMASTER SOFTWARE

Design Case:

Configuration: Fr#7EA GTG + DUCT FIRED HRSG — Amb. Pres 14.70 psia
Dry Bulb Temp.: 73.00 deg F — RH% 45.00 %
Total Water Consumption 695.31 GPM

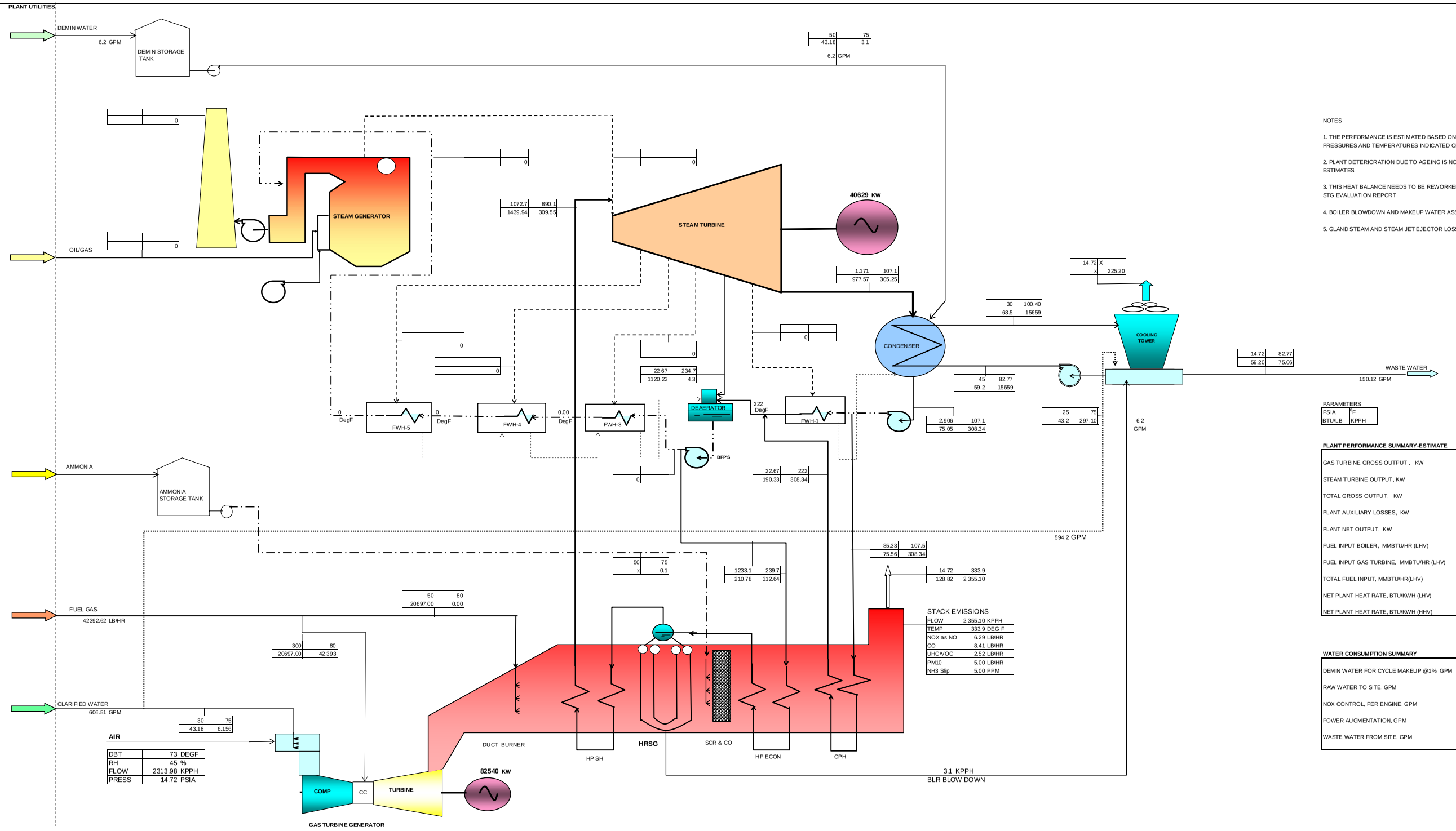
POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT#3 REPOWERING

HEAT AND MASS BALANCE DIAGRAM
73DegF, DUCT FIRED CASE

FIGURE NO: 2-5C — Rev. A

UNIT#3 REPWR 73F, No Duct Fire



NOTES

1. THE PERFORMANCE IS ESTIMATED BASED ON THE STEAM FLOWS, STAGE PRESSURES AND TEMPERATURES INDICATED ON GIBB AND HILL DRAWING.

2. PLANT DETERIORATION DUE TO AGEING IS NOT CONSIDERED IN THIS ESTIMATES

3. THIS HEAT BALANCE NEEDS TO BE REWORKED ON RECEIPT OF SIEMENS STG EVALUATION REPORT

4. BOILER BLOWDOWN AND MAKEUP WATER ASSUMED AT 1%

5. GLAND STEAM AND STEAM JET EJECTOR LOSSES ARE NOT SHOWN

PARAMETERS

PSIA	°F
BTU/LB	KPPH

PLANT PERFORMANCE SUMMARY-ESTIMATE

GAS TURBINE GROSS OUTPUT , KW	82540
STEAM TURBINE OUTPUT, KW	40629
TOTAL GROSS OUTPUT, KW	123169
PLANT AUXILIARY LOSSES, KW	2906
PLANT NET OUTPUT, KW	120263
FUEL INPUT BOILER, MMBTU/HR (LHV)	0
FUEL INPUT GAS TURBINE, MMBTU/HR (LHV)	877.4
TOTAL FUEL INPUT, MMBTU/HR(LHV)	877.4
NET PLANT HEAT RATE, BTU/KWH (LHV)	7295.677
NET PLANT HEAT RATE, BTU/KWH (HHV)	8093.3

WATER CONSUMPTION SUMMARY

DEMIN WATER FOR CYCLE MAKEUP @1%, GPM	6.20
RAW WATER TO SITE, GPM	606.51
NOX CONTROL, PER ENGINE, GPM	0
POWER AUGMENTATION, GPM	0
WASTE WATER FROM SITE, GPM	150.12

REV	DESCRIPTION	MECH	PE	PM	DATE
A	ISSUED FOR IID REVIEW AND COMMENTS	PRAMP	DEJ	DCT	1/11/2006

REFERENCE DOCUMENTS

1. GIBB AND HILL INC HEAT BALANCE SHEET NO:55-P-205
2. STEAM PRO AND REMASTER SOFTWARE

Design Case:

Configuration: Fnl7EA GTG + DUCT FIRED HRSG — Amb. Pres 14.70 psia
Dry Bulb Temp.: 73.00 deg F — RH%: 45.00 %
Total Water Consumption 612.71 GPM

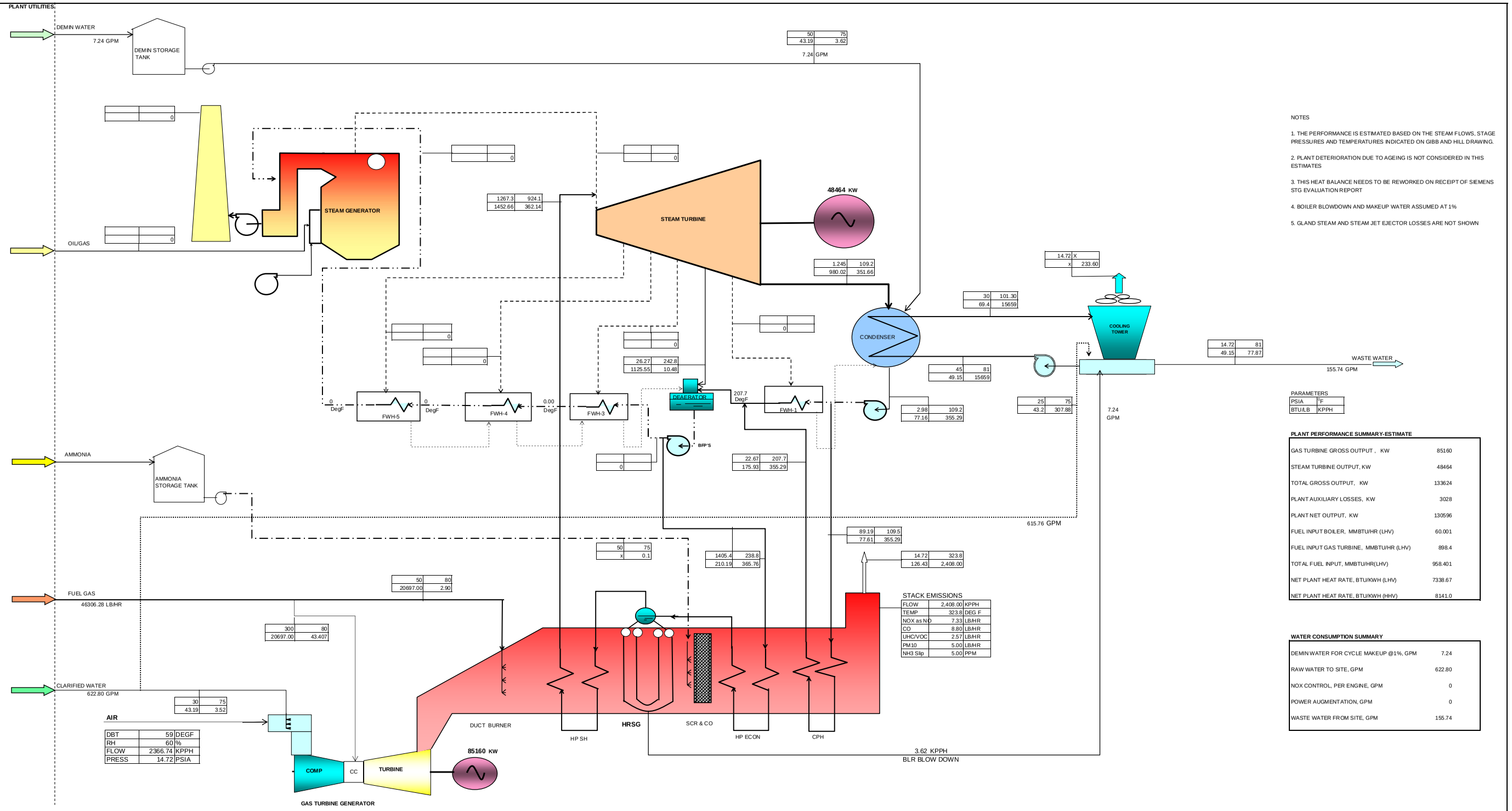
POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT#3 REPOWERING

HEAT AND MASS BALANCE DIAGRAM
73DegF, NO DUCT FIRE

FIGURE NO: 2-5D — Rev. A

UNIT #3 REPWR 59F, Duct Fired



NOTES

1. THE PERFORMANCE IS ESTIMATED BASED ON THE STEAM FLOWS, STAGE PRESSURES AND TEMPERATURES INDICATED ON GIBB AND HILL DRAWING.

2. PLANT DETERIORATION DUE TO AGEING IS NOT CONSIDERED IN THIS ESTIMATES

3. THIS HEAT BALANCE NEEDS TO BE REWORKED ON RECEIPT OF SIEMENS STG EVALUATION REPORT

4. BOILER BLOWDOWN AND MAKEUP WATER ASSUMED AT 1%

5. GLAND STEAM AND STEAM JET EJECTOR LOSSES ARE NOT SHOWN

PARAMETERS

PSIA	°F
BTU/LB	KPPH

PLANT PERFORMANCE SUMMARY-ESTIMATE

GAS TURBINE GROSS OUTPUT , KW	85160
STEAM TURBINE OUTPUT, KW	48464
TOTAL GROSS OUTPUT, KW	133624
PLANT AUXILIARY LOSSES, KW	3028
PLANT NET OUTPUT, KW	130596
FUEL INPUT BOILER, MMBTU/HR (LHV)	60.001
FUEL INPUT GAS TURBINE, MMBTU/HR (LHV)	898.4
TOTAL FUEL INPUT, MMBTU/HR(LHV)	958.401
NET PLANT HEAT RATE, BTU/KWH (LHV)	7338.67
NET PLANT HEAT RATE, BTU/KWH (HHV)	8141.0

WATER CONSUMPTION SUMMARY

DEMIN WATER FOR CYCLE MAKEUP @1%, GPM	7.24
RAW WATER TO SITE, GPM	622.80
NOX CONTROL, PER ENGINE, GPM	0
POWER AUGMENTATION, GPM	0
WASTE WATER FROM SITE, GPM	155.74

REV	DESCRIPTION	MECH	PE	PM	DATE
A	ISSUED FOR ID REVIEW AND COMMENTS	PR/MP	DEJ	DCT	1/11/2006

REFERENCE DOCUMENTS

1. GIBB AND HILL INC HEAT BALANCE SHEET NO:55-P-205
2. STEAM PRO AND REMASTER SOFTWARE

Design Case:

Configuration: Fr#7EA GTG + DUCT FIRED HRSG — Amb. Pres 14.70 psia
Dry Bulb Temp.: 59.00 deg F — RH%: 60.00 %
Total Water Consumption 630.04 GPM

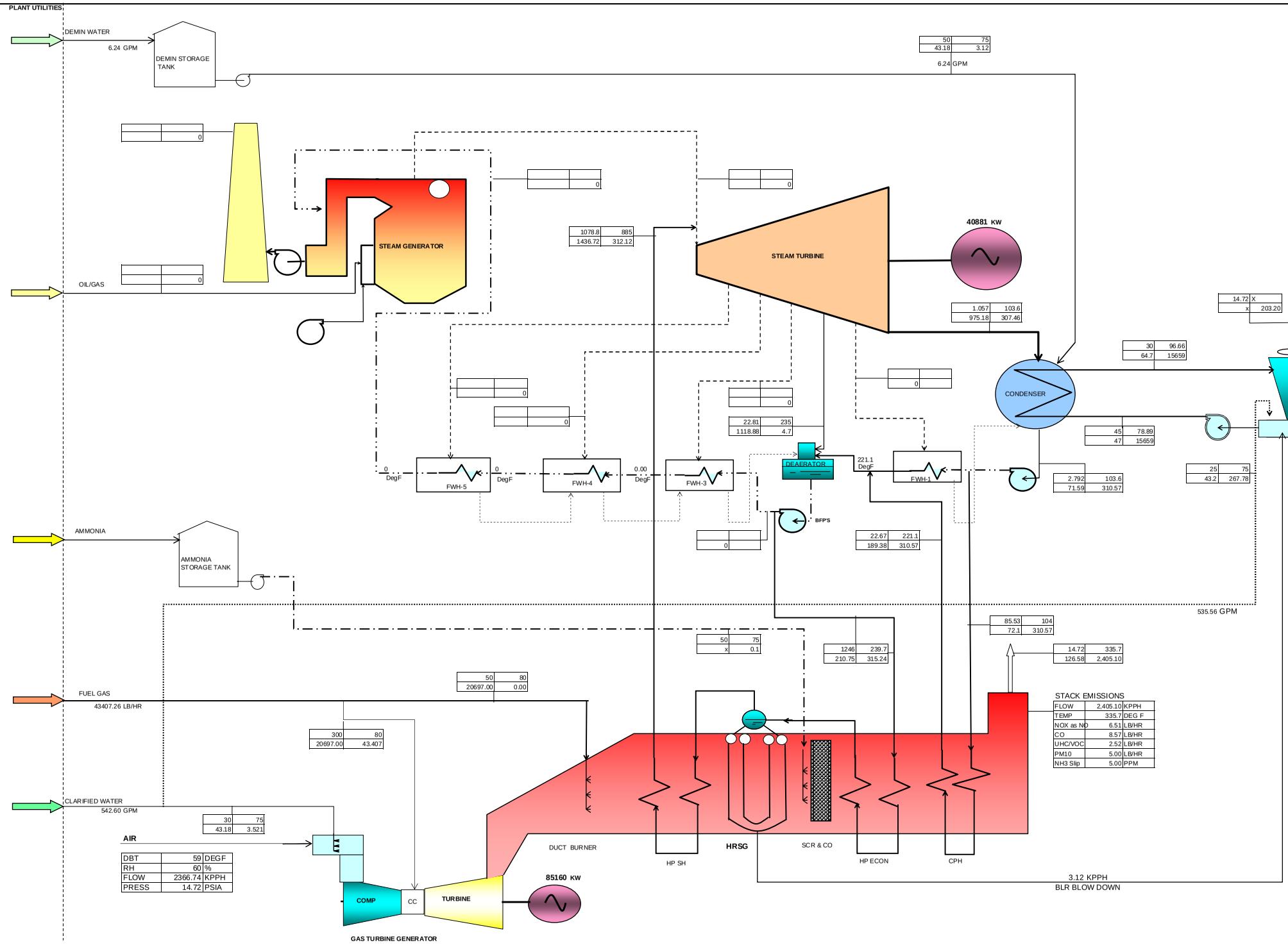
POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT#3 REPOWERING

HEAT AND MASS BALANCE DIAGRAM
59DegF, DUCT FIRED CASE

FIGURE NO: 2-5E — Rev. A

UNIT#3 REPWR 59F, No Duct Fire



NOTES

1. THE PERFORMANCE IS ESTIMATED BASED ON THE STEAM FLOWS, STAGE PRESSURES AND TEMPERATURES INDICATED ON GIBB AND HILL DRAWING.

2. PLANT DETERIORATION DUE TO AGEING IS NOT CONSIDERED IN THIS ESTIMATES

3. THIS HEAT BALANCE NEEDS TO BE REWORKED ON RECEIPT OF SIEMENS STG EVALUATION REPORT

4. BOILER BLOWDOWN AND MAKEUP WATER ASSUMED AT 1%

5. GLAND STEAM AND STEAM JET EJECTOR LOSSES ARE NOT SHOWN

PARAMETERS

PSIA	°F
BTU/LB	KPPH

PLANT PERFORMANCE SUMMARY-ESTIMATE

GAS TURBINE GROSS OUTPUT , KW	85160
STEAM TURBINE OUTPUT, KW	40881
TOTAL GROSS OUTPUT, KW	126041
PLANT AUXILIARY LOSSES, KW	2929.4
PLANT NET OUTPUT, KW	123112
FUEL INPUT BOILER, MMBTU/HR (LHV)	0
FUEL INPUT GAS TURBINE, MMBTU/HR (LHV)	898.4
TOTAL FUEL INPUT, MMBTU/HR(LHV)	898.4
NET PLANT HEAT RATE, BTU/KWH (LHV)	7297.444
NET PLANT HEAT RATE, BTU/KWH (HHV)	8095.3

WATER CONSUMPTION SUMMARY

DEMIN WATER FOR CYCLE MAKEUP @1%, GPM	6.24
RAW WATER TO SITE, GPM	542.60
NOX CONTROL, PER ENGINE, GPM	0
POWER AUGMENTATION, GPM	0
WASTE WATER FROM SITE, GPM	135.46

REV	DESCRIPTION	MECH	PE	PM	DATE
A	ISSUED FOR IID REVIEW AND COMMENTS	PR/MP	DEJ	DCT	1/11/2006

REFERENCE DOCUMENTS

1. GIBB AND HILL INC HEAT BALANCE SHEET NO:55-P-205
2. STEAM PRO AND REMASTER SOFTWARE

Design Case:

Configuration: Fr#7EA GTG + DUCT FIRED HRSG — Amb. Pres 14.70 psia
Dry Bulb Temp.: 59.00 deg F — RH%: 60.00 %
Total Water Consumption 548.84 GPM

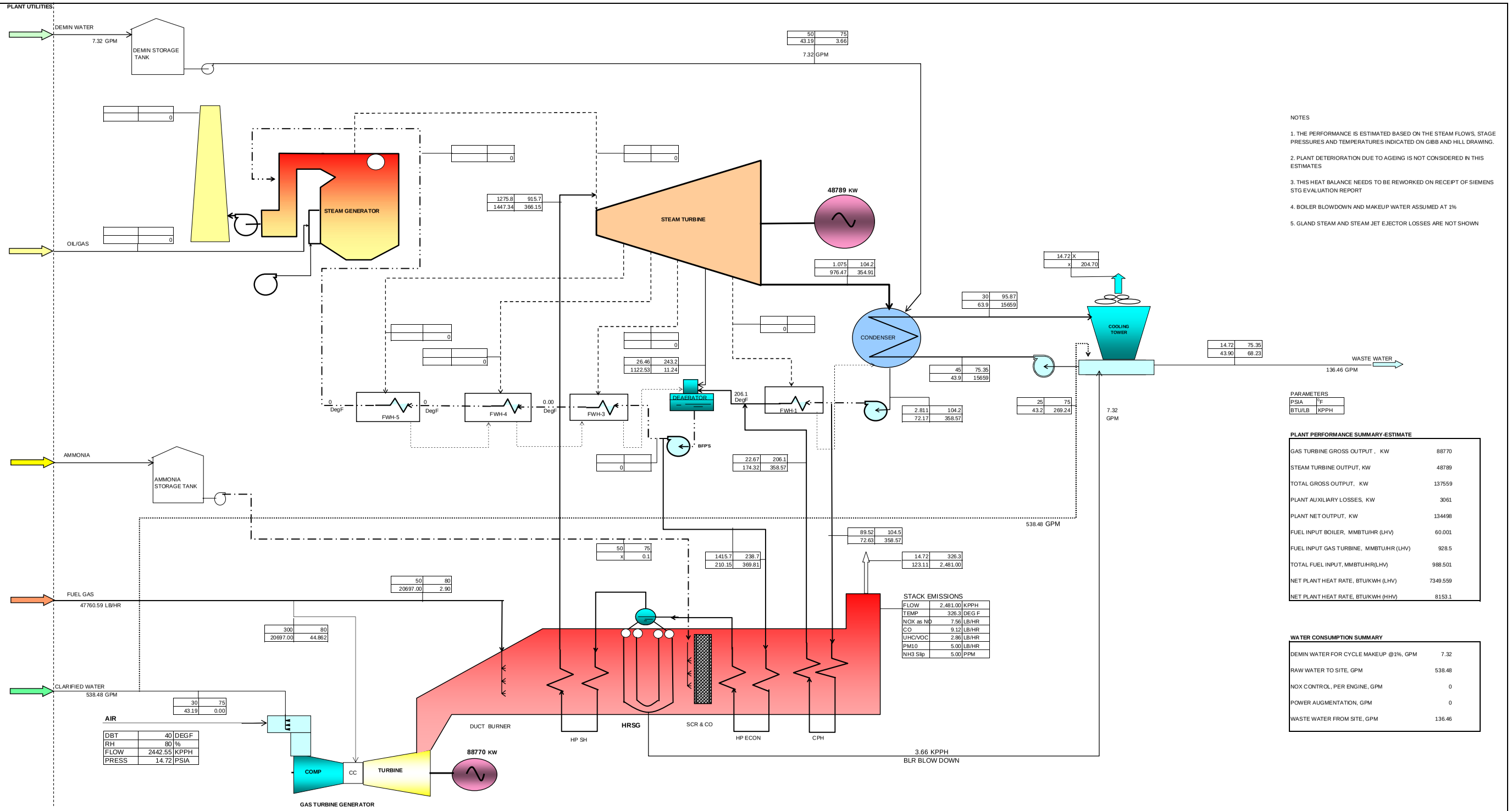
POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT#3 REPOWERING

HEAT AND MASS BALANCE DIAGRAM
59DegF, NO DUCT FIRE

FIGURE NO: 2-5F — Rev. A

UNIT #3 REPWR 40F, Duct Fired



NOTES

1. THE PERFORMANCE IS ESTIMATED BASED ON THE STEAM FLOWS, STAGE PRESSURES AND TEMPERATURES INDICATED ON GIBB AND HILL DRAWING.

2. PLANT DETERIORATION DUE TO AGEING IS NOT CONSIDERED IN THIS ESTIMATES

3. THIS HEAT BALANCE NEEDS TO BE REWORKED ON RECEIPT OF SIEMENS STG EVALUATION REPORT

4. BOILER BLOWDOWN AND MAKEUP WATER ASSUMED AT 1%

5. GLAND STEAM AND STEAM JET EJECTOR LOSSES ARE NOT SHOWN

PARAMETERS

PSIA	°F
BTU/LB	KPPH

PLANT PERFORMANCE SUMMARY-ESTIMATE

GAS TURBINE GROSS OUTPUT , KW	88770
STEAM TURBINE OUTPUT, KW	48789
TOTAL GROSS OUTPUT, KW	137559
PLANT AUXILIARY LOSSES, KW	3061
PLANT NET OUTPUT, KW	134498
FUEL INPUT BOILER, MMBTU/HR (LHV)	60.001
FUEL INPUT GAS TURBINE, MMBTU/HR (LHV)	928.5
TOTAL FUEL INPUT, MMBTU/HR(LHV)	988.501
NET PLANT HEAT RATE, BTU/KWH (LHV)	7349.559
NET PLANT HEAT RATE, BTU/KWH (HHV)	8153.1

WATER CONSUMPTION SUMMARY

DEMIN WATER FOR CYCLE MAKEUP @1%, GPM	7.32
RAW WATER TO SITE, GPM	538.48
NOX CONTROL, PER ENGINE, GPM	0
POWER AUGMENTATION, GPM	0
WASTE WATER FROM SITE, GPM	136.46

REV	DESCRIPTION	MECH	PE	PM	DATE
A	ISSUED FOR IID REVIEW AND COMMENTS	PR/MP	DEJ	DcT	1/11/2006

REFERENCE DOCUMENTS

1. GIBB AND HILL INC HEAT BALANCE SHEET NO:55-P-205
2. STEAM PRO AND REMASTER SOFTWARE

Design Case:

Configuration: Fr#7EA GTG + DUCT FIRED HRSG — Amb. Pres 14.70 psia
Dry Bulb Temp.: 40.00 deg F — RH%: 80.00 %
Total Water Consumption 545.80 GPM

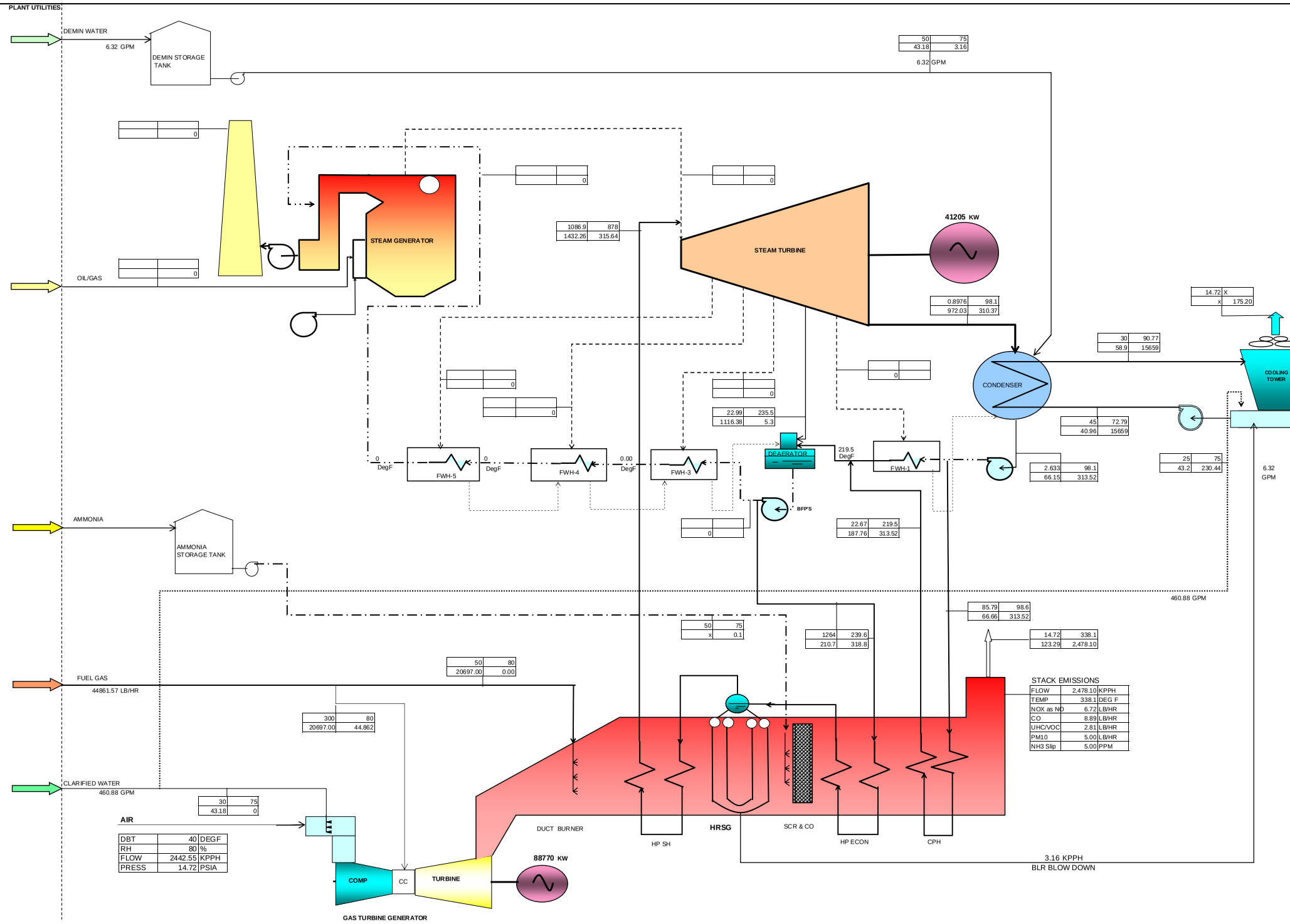
POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT#3 REPOWERING

HEAT AND MASS BALANCE DIAGRAM
40DegF, DUCT FIRED CASE

FIGURE NO: 2-5G — Rev. A

UNIT#3 REPWR 40F, No Duct Fire



NOTES

1. THE PERFORMANCE IS ESTIMATED BASED ON THE STEAM FLOWS, STAGE PRESSURES AND TEMPERATURES INDICATED ON GIBB AND HILL DRAWING.

2. PLANT DETERIORATION DUE TO AGEING IS NOT CONSIDERED IN THIS ESTIMATES

3. THIS HEAT BALANCE NEEDS TO BE REWORKED ON RECEIPT OF SIEMENS STG EVALUATION REPORT

4. BOILER BLOWDOWN AND MAKEUP WATER ASSUMED AT 1%

5. GLAND STEAM AND STEAM JET EJECTOR LOSSES ARE NOT SHOWN

PARAMETERS

PSIA	°F
BTU/LB	KPPH

PLANT PERFORMANCE SUMMARY-ESTIMATE

GAS TURBINE GROSS OUTPUT , KW	88770
STEAM TURBINE OUTPUT, KW	41205
TOTAL GROSS OUTPUT, KW	129975
PLANT AUXILIARY LOSSES, KW	2962.8
PLANT NET OUTPUT, KW	127012
FUEL INPUT BOILER, MMBTU/HR (LHV)	0
FUEL INPUT GAS TURBINE, MMBTU/HR (LHV)	928.5
TOTAL FUEL INPUT, MMBTU/HR(LHV)	928.5
NET PLANT HEAT RATE, BTU/KWH (LHV)	7310.321
NET PLANT HEAT RATE, BTU/KWH (HHV)	8109.6

WATER CONSUMPTION SUMMARY

DEMIN WATER FOR CYCLE MAKEUP @1%, GPM	6.32
RAW WATER TO SITE, GPM	460.88
NOX CONTROL, PER ENGINE, GPM	0
POWER AUGMENTATION, GPM	0
WASTE WATER FROM SITE, GPM	116.80

REV	DESCRIPTION	MECH	PE	PM	DATE
A	ISSUED FOR IID REVIEW AND COMMENTS	PR/MP	DEJ	DCT	1/11/2006

REFERENCE DOCUMENTS

1. GIBB AND HILL INC HEAT BALANCE SHEET NO:55-P-205
2. STEAM PRO AND REMASTER SOFTWARE

Design Case:

Configuration: Fr#7EA GTG + DUCT FIRED HRSG — Amb. Pres 14.70 psia
Dry Bulb Temp.: 40.00 deg F — RH%: 80.00 %
Total Water Consumption 467.20 GPM

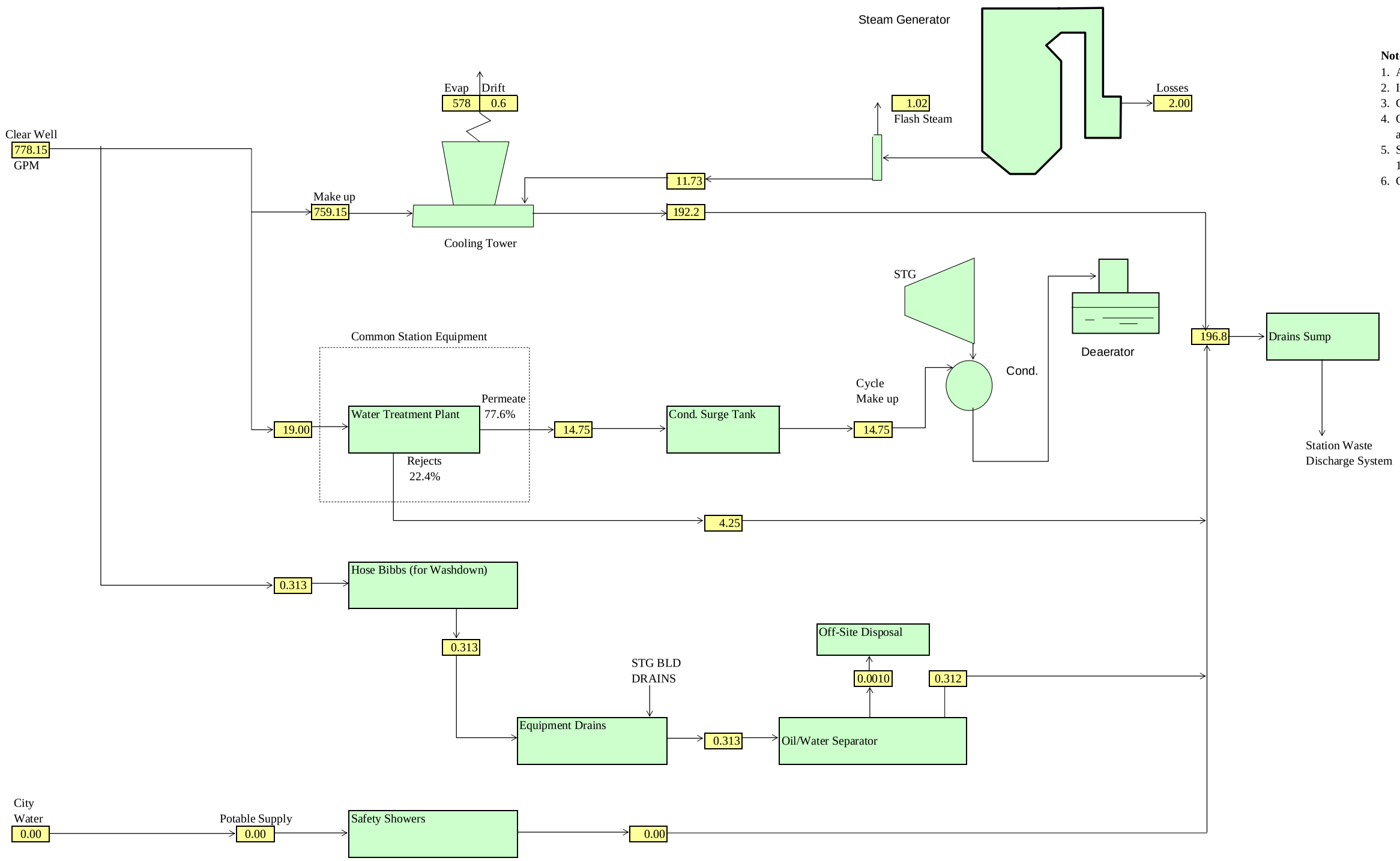
POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT#3 REPOWERING

HEAT AND MASS BALANCE DIAGRAM
40DegF, NO DUCT FIRE

FIGURE NO: 2-5H — Rev. A

Unit 3 Original WBD @ 115F



Notes:

1. All flow rates are in gallons per minute.
2. Intermittent flows shown as average flows.
3. CW System flow of 32000 gpm.
4. CW system flow includes 800 gpm for STG coolers and 500 gpm for AUX coolers.
5. Steam Generator continuous blow down assumed at 1.5% of rated capacity (Refer dwg 55-P-205).
6. Cooling tower cycles of concentration of 4.0.

REV	DESCRIPTION	ENG	PE	PM	DATE
A	ISSUED FOR REVIEW	PR	DEJ	DCT	4/28/2006

REFERENCE DOCUMENTS

1. UNIT 3 ORIGINAL HEAT AND MASS BALANCE DRAWING 55-P-205

DESIGN CASE:

1. STEAM TURBINE AT BASE LOAD
2. EVAPORATOR USED FOR M/U
3. NO FIRE WATER PUMP DEMAND

POWER ENGINEERS

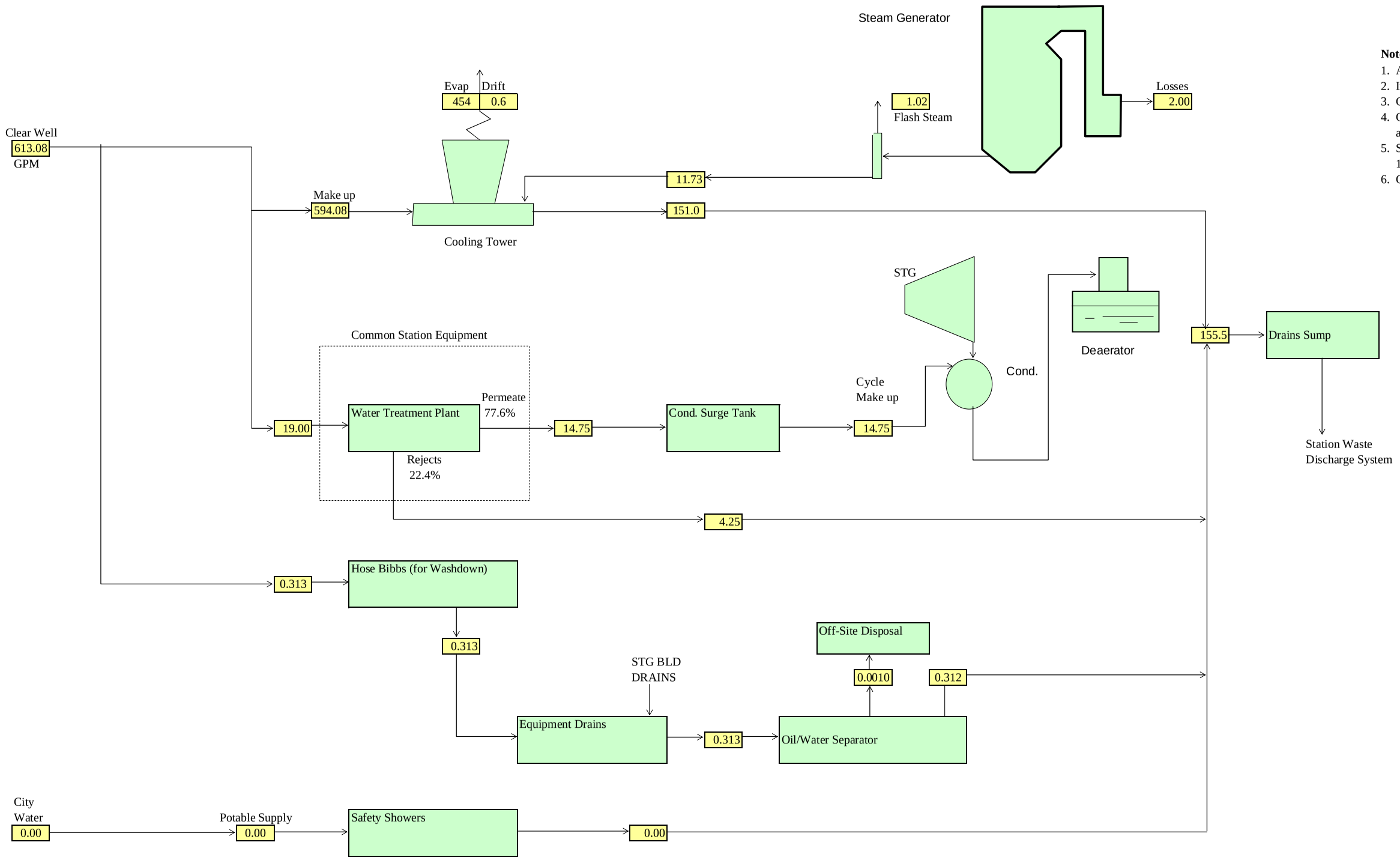
IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 ORIGINAL CYCLE

WATER BALANCE DIAGRAM
MAXIMUM AMBIENT TEMPERATURE

FIGURE 2-6A

Rev. A

Unit 3 Original WBD @ 73F



Notes:

1. All flow rates are in gallons per minute.
2. Intermittent flows shown as average flows.
3. CW System flow of 32000 gpm.
4. CW system flow includes 800 gpm for STG coolers and 500 gpm for AUX coolers.
5. Steam Generator continuous blow down assumed at 1.5% of rated capacity (Refer dwg 55-P-205).
6. Cooling tower cycles of concentration of 4.0.

REV	DESCRIPTION	ENG	PE	PM	DATE
A	ISSUED FOR REVIEW	PR	DEJ	DCT	4/28/2006

REFERENCE DOCUMENTS

1. UNIT 3 ORIGINAL HEAT AND MASS BALANCE DRAWING 55-P-205

DESIGN CASE:

1. STEAM TURBINE AT BASE LOAD
2. EVAPORATOR USED FOR M/U
3. NO FIRE WATER PUMP DEMAND

POWER ENGINEERS

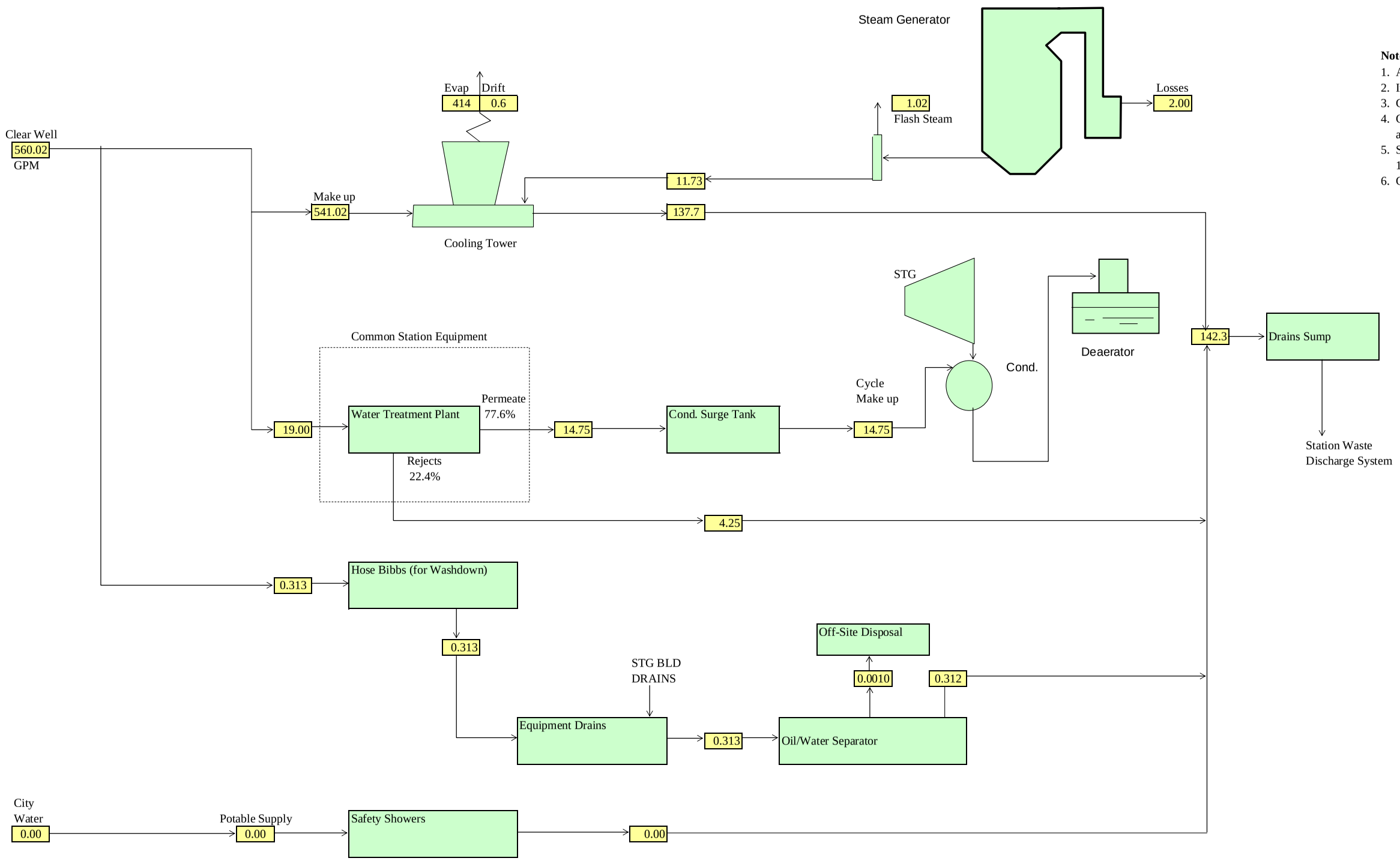
IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 ORIGINAL CYCLE

WATER BALANCE DIAGRAM
AVERAGE AMBIENT TEMPERATURE

FIGURE 2-6B

Rev. A

Unit 3 Original WBD @ 59F



Notes:

1. All flow rates are in gallons per minute.
2. Intermittent flows shown as average flows.
3. CW System flow of 32000 gpm.
4. CW system flow includes 800 gpm for STG coolers and 500 gpm for AUX coolers.
5. Steam Generator continuous blow down assumed at 1.5% of rated capacity (Refer dwg 55-P-205).
6. Cooling tower cycles of concentration of 4.0.

REV	DESCRIPTION	ENG	PE	PM	DATE
A	~~ISSUED FOR REVIEW~~	PR	DEJ	DCT	4/28/2006

REFERENCE DOCUMENTS

1. UNIT 3 ORIGINAL HEAT AND MASS BALANCE DRAWING 55-P-205

DESIGN CASE:

1. STEAM TURBINE AT BASE LOAD
2. EVAPORATOR USED FOR M/U
3. NO FIRE WATER PUMP DEMAND

POWER ENGINEERS

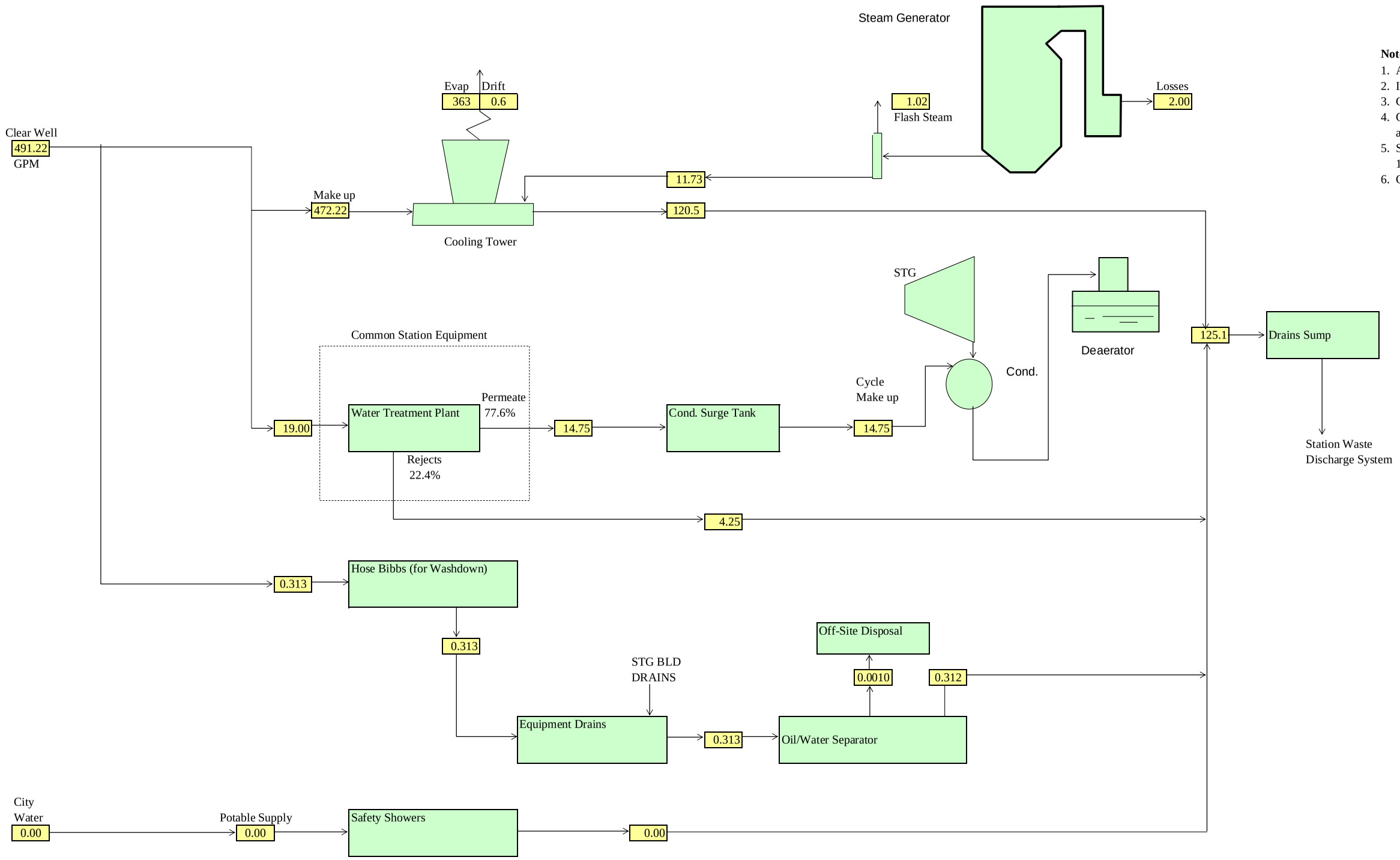
IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 ORIGINAL CYCLE

WATER BALANCE DIAGRAM
ISO AMBIENT TEMPERATURE

FIGURE 2-6C

Rev. A

Unit 3 Original WBD @ 40F



Notes:

1. All flow rates are in gallons per minute.
2. Intermittent flows shown as average flows.
3. CW System flow of 32000 gpm.
4. CW system flow includes 800 gpm for STG coolers and 500 gpm for AUX coolers.
5. Steam Generator continuous blow down assumed at 1.5% of rated capacity (Refer dwg 55-P-205).
6. Cooling tower cycles of concentration of 4.0.

REV	DESCRIPTION	ENG	PE	PM	DATE
A	ISSUED FOR REVIEW	PR	DEJ	DCT	4/28/2006

REFERENCE DOCUMENTS

1. UNIT 3 ORIGINAL HEAT AND MASS BALANCE DRAWING 55-P-205

DESIGN CASE:

1. STEAM TURBINE AT BASE LOAD
2. EVAPORATOR USED FOR M/U
3. NO FIRE WATER PUMP DEMAND

POWER ENGINEERS

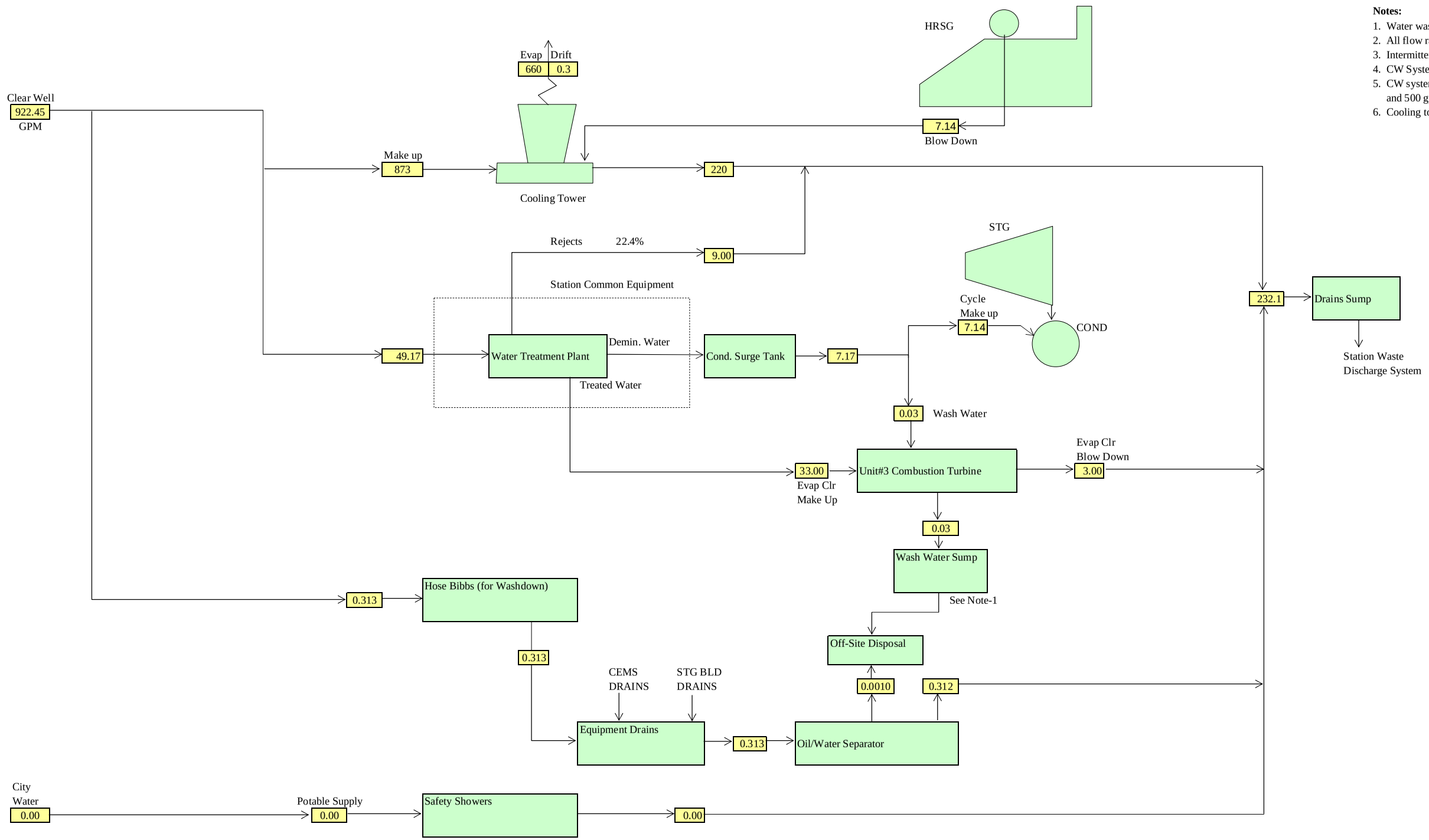
IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 ORIGINAL CYCLE

WATER BALANCE DIAGRAM
MINIMUM AMBIENT TEMPERATURE

FIGURE 2-6D

Rev. A

Unit 3 Repower WBD @ 115F DF



Notes:

1. Water wash based upon 1500 gallons per month.
2. All flow rates are in gallons per minute.
3. Intermittent flows shown as average flows.
4. CW System flow of 32000 gpm.
5. CW system flow includes 800 gpm for STG coolers and 500 gpm for AUX coolers.
6. Cooling tower cycles of concentration of 4.0.

REV	DESCRIPTION	ENG	PE	PM	DATE
A	ISSUED FOR REVIEW	PR	DEJ	DCT	4/18/2006
B	ISSUED FOR REVIEW	PR	DEJ	DCT	4/28/2006

REFERENCE DOCUMENTS

1. UNIT 3 REPOWER HEAT AND MASS BALANCE CALCULATIONS

DESIGN CASE:

1. 1xGE FRAME 7EA COMBINED CYCLE
2. NO FIRE WATER PUMP DEMAND
3. DM WATER SOURCED FROM EXISTING PLANT

POWER ENGINEERS

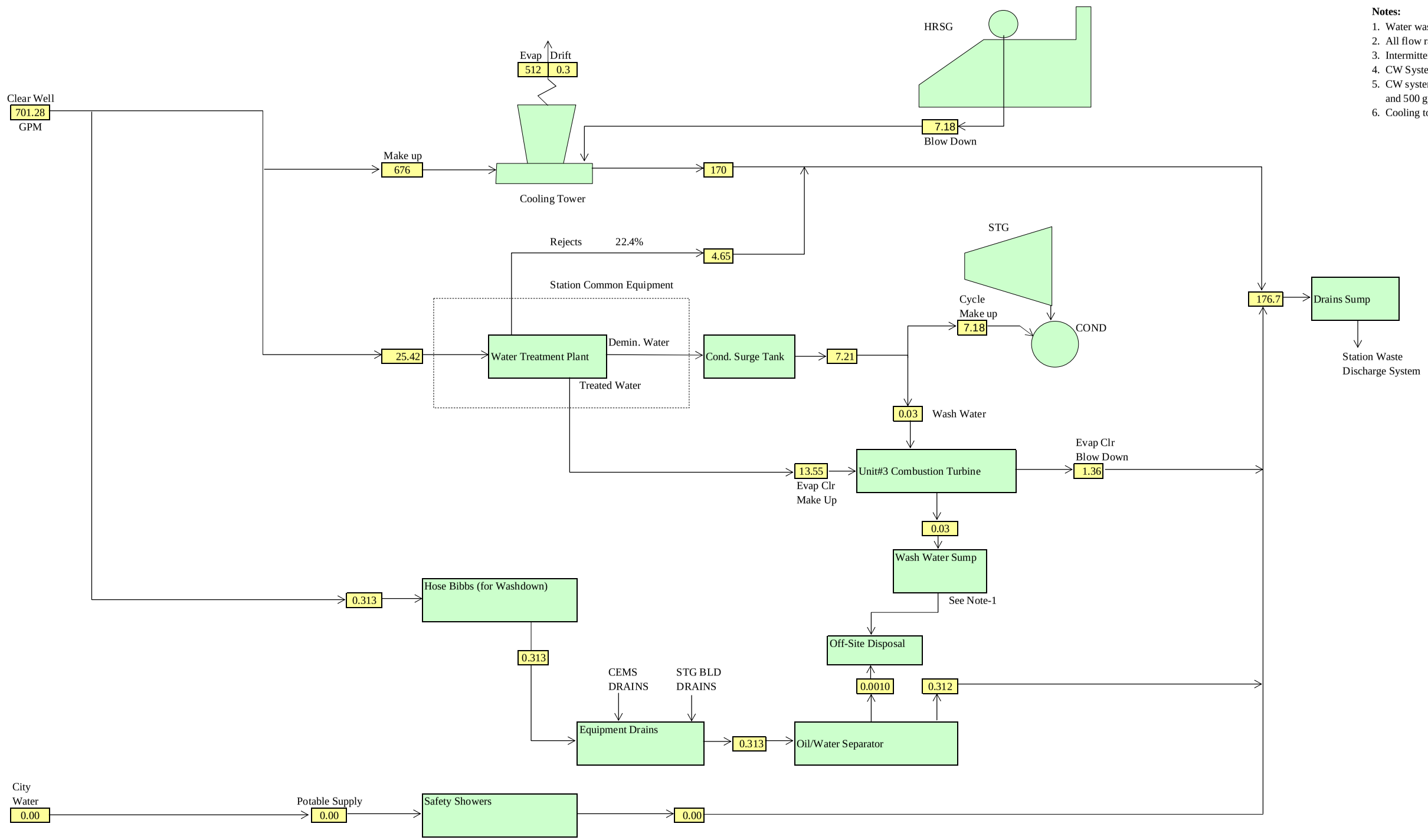
IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 REPOWERING

WATER BALANCE DIAGRAM
MAXIMUM AMBIENT TEMPERATURE

FIGURE 2-6E

Rev. B

Unit 3 Repower WBD @ 73F DF



Notes:

1. Water wash based upon 1500 gallons per month.
2. All flow rates are in gallons per minute.
3. Intermittent flows shown as average flows.
4. CW System flow of 32000 gpm.
5. CW system flow includes 800 gpm for STG coolers and 500 gpm for AUX coolers.
6. Cooling tower cycles of concentration of 4.0.

REV	DESCRIPTION	ENG	PE	PM	DATE
A	~~ISSUED FOR REVIEW~~	PR	DEJ	DCT	4/18/2006
B	~~ISSUED FOR REVIEW~~	PR	DEJ	DCT	4/28/2006

REFERENCE DOCUMENTS

1. UNIT 3 REPOWER HEAT AND MASS BALANCE CALCULATIONS

DESIGN CASE:

1. 1xGE FRAME 7EA COMBINED CYCLE
2. NO FIRE WATER PUMP DEMAND
3. DM WATER SOURCED FROM EXISTING PLANT

POWER ENGINEERS

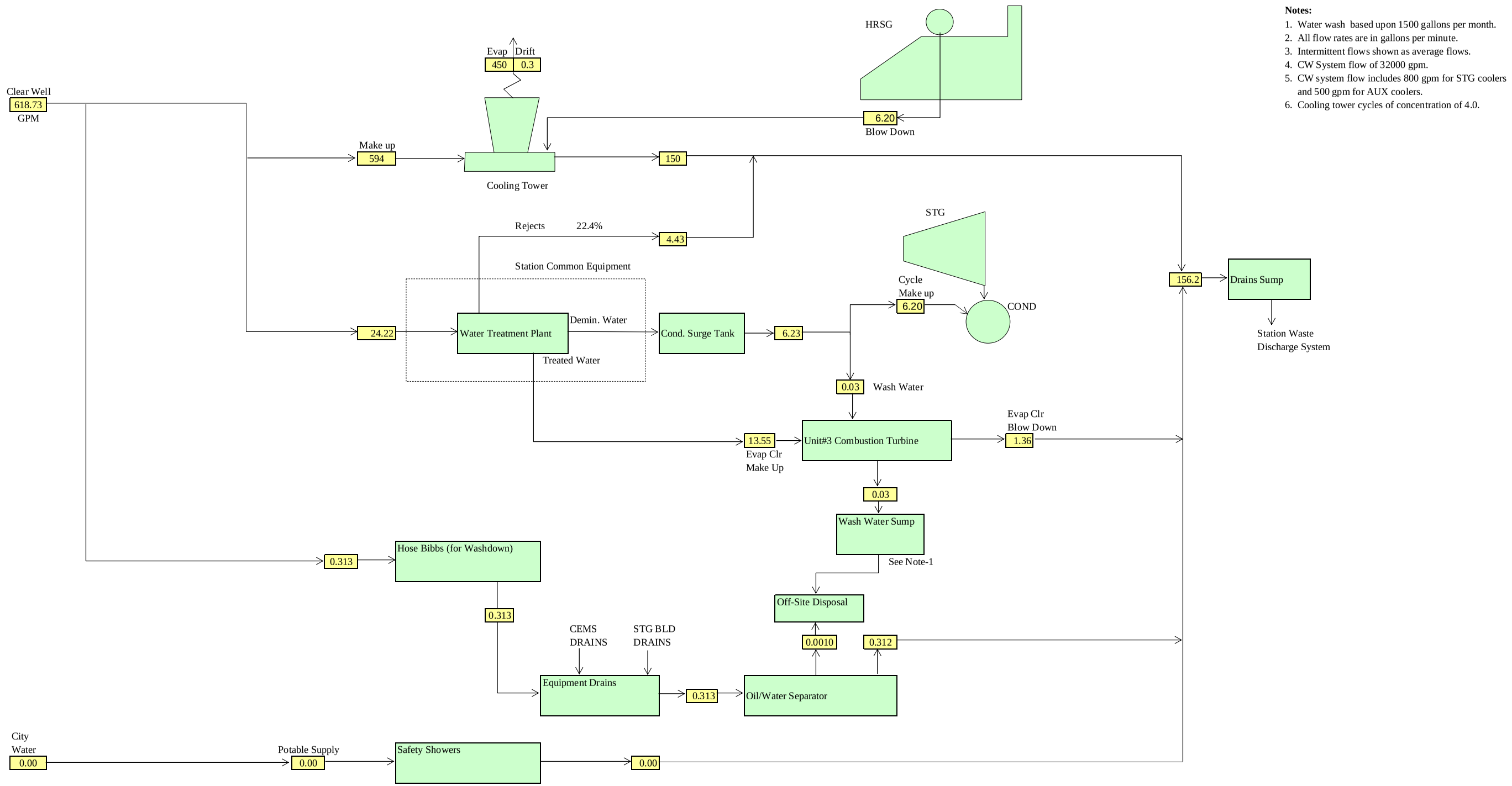
IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 REPOWERING

WATER BALANCE DIAGRAM
AVERAGE AMBIENT TEMPERATURE

FIGURE 2-6F

Rev. B

Unit 3 Repower WBD @ 73F NDF



Notes:

1. Water wash based upon 1500 gallons per month.
2. All flow rates are in gallons per minute.
3. Intermittent flows shown as average flows.
4. CW System flow of 32000 gpm.
5. CW system flow includes 800 gpm for STG coolers and 500 gpm for AUX coolers.
6. Cooling tower cycles of concentration of 4.0.

REV	DESCRIPTION	ENG	PE	PM	DATE
A	ISSUED FOR REVIEW	PR	DEJ	DCT	4/28/2006

REFERENCE DOCUMENTS

1. UNIT 3 REPOWER HEAT AND MASS BALANCE CALCULATIONS

DESIGN CASE:

1. 1xGE FRAME 7EA COMBINED CYCLE
2. NO FIRE WATER PUMP DEMAND
3. DM WATER SOURCED FROM EXISTING PLANT

POWER ENGINEERS

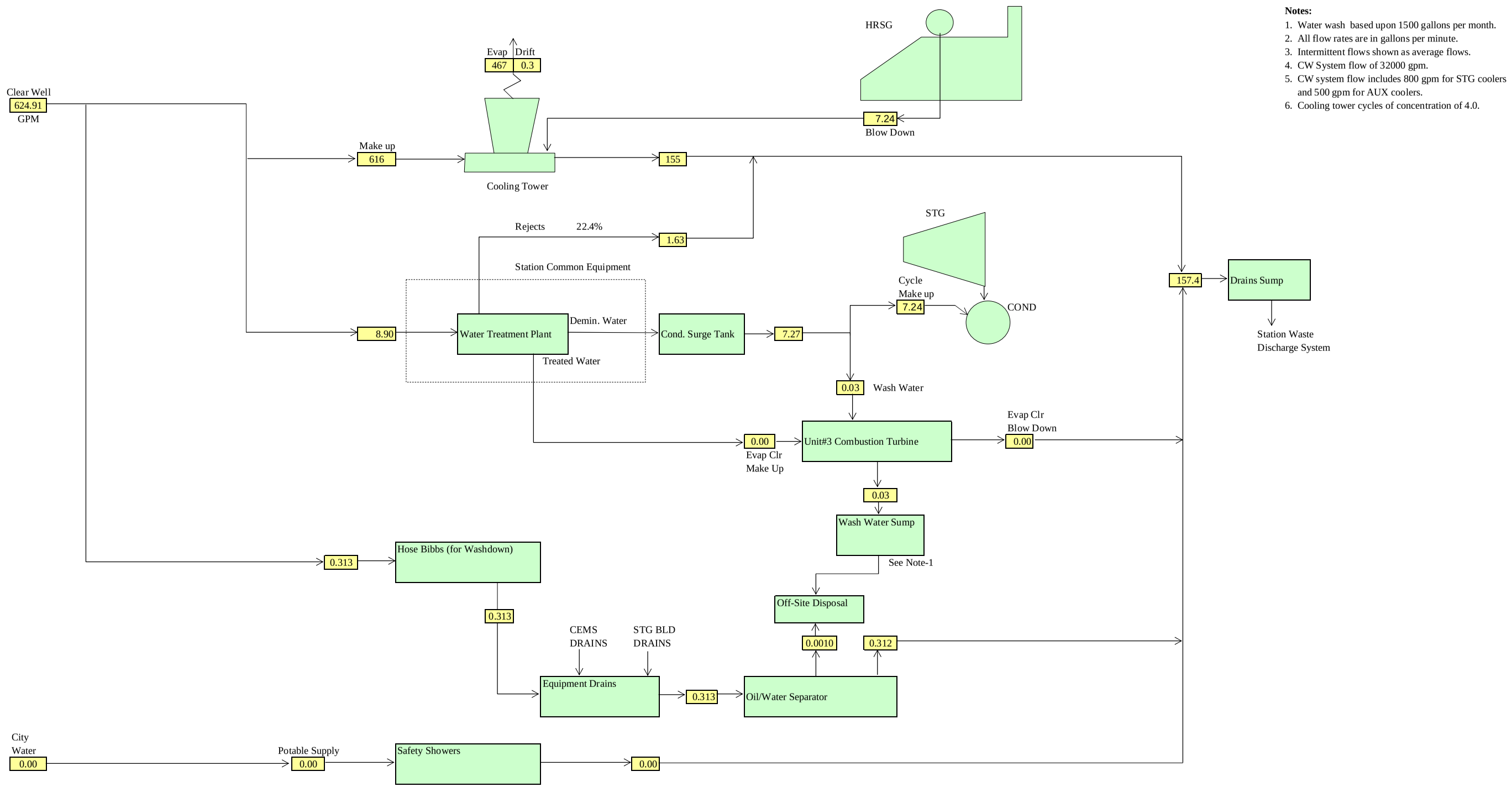
IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 REPOWERING

WATER BALANCE DIAGRAM
AVERAGE AMBIENT TEMPERATURE

FIGURE 2-6G

Rev. **A**

Unit 3 Repower WBD @ 59F DF



REV	DESCRIPTION	ENG	PE	PM	DATE
A	ISSUED FOR REVIEW	PR	DEJ	DCT	4/18/2006
B	ISSUED FOR REVIEW	PR	DEJ	DCT	4/28/2006

REFERENCE DOCUMENTS

1. UNIT 3 REPOWER HEAT AND MASS BALANCE CALCULATIONS

DESIGN CASE:

1. 1xGE FRAME 7EA COMBINED CYCLE
2. NO FIRE WATER PUMP DEMAND
3. DM WATER SOURCED FROM EXISTING PLANT

POWER ENGINEERS

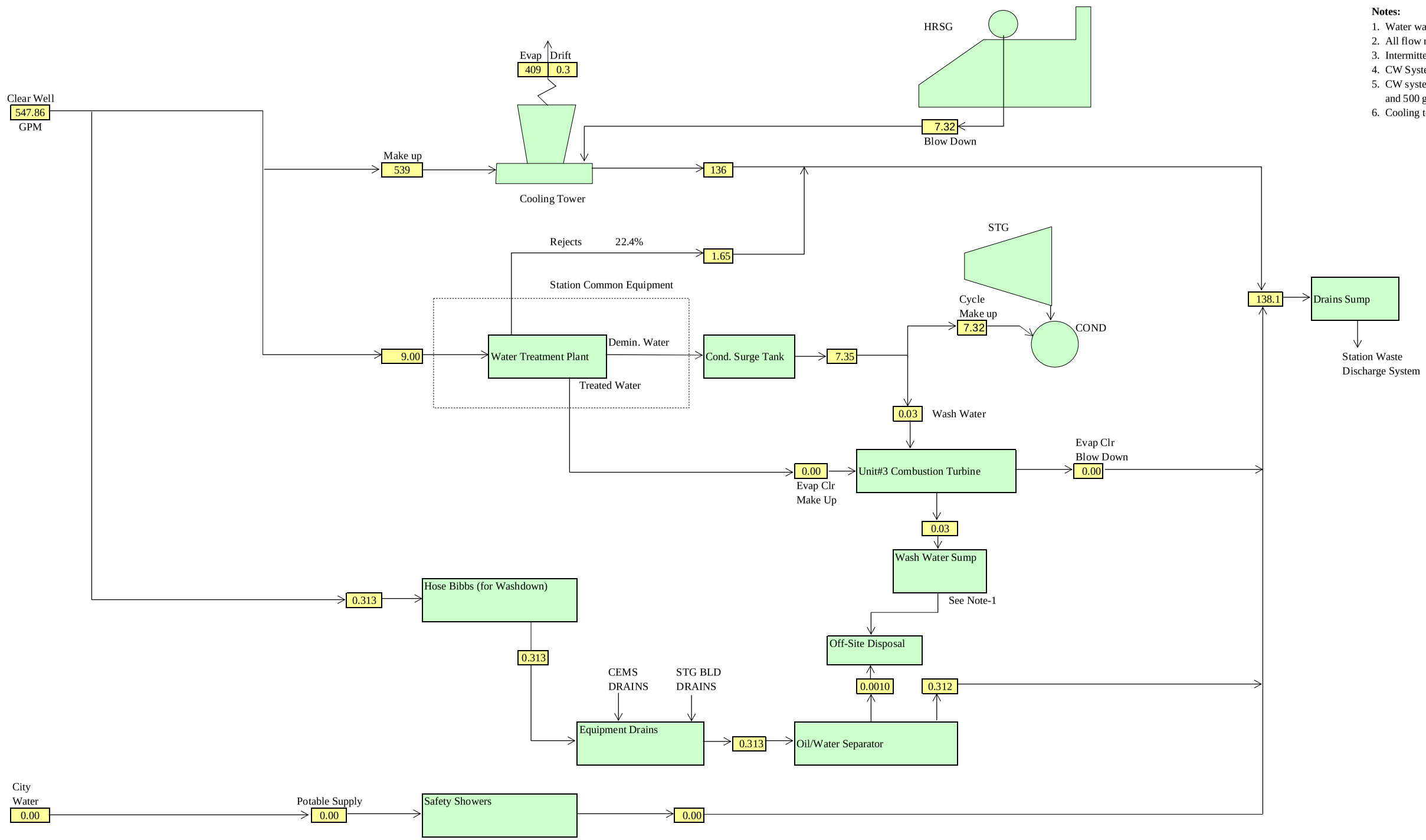
IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 REPOWERING

WATER BALANCE DIAGRAM
ISO AMBIENT TEMPERATURE

FIGURE 2-6H

Rev. B

Unit 3 Repower WBD @ 40F DF



Notes:

1. Water wash based upon 1500 gallons per month.
2. All flow rates are in gallons per minute.
3. Intermittent flows shown as average flows.
4. CW System flow of 32000 gpm.
5. CW system flow includes 800 gpm for STG coolers and 500 gpm for AUX coolers.
6. Cooling tower cycles of concentration of 4.0.

REV	DESCRIPTION	ENG	PE	PM	DATE
A	ISSUED FOR REVIEW	PR	DEJ	DCT	4/18/2006
B	ISSUED FOR REVIEW	PR	DEJ	DCT	4/28/2006

REFERENCE DOCUMENTS

1. UNIT 3 REPOWER HEAT AND MASS BALANCE CALCULATIONS

DESIGN CASE:

1. 1xGE FRAME 7EA COMBINED CYCLE
2. NO FIRE WATER PUMP DEMAND
3. DM WATER SOURCED FROM EXISTING PLANT

POWER ENGINEERS

IMPERIAL IRRIGATION DISTRICT
EL CENTRO UNIT 3 REPOWERING

WATER BALANCE DIAGRAM
MINIMUM AMBIENT TEMPERATURE

FIGURE 2-6I

Rev. B