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December 29, 2010

Ms. Christina Snow
Compliance Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Subject: Cosumnes Power Plant Project (01-AFC-19C) Petition for Post-certification License Amendment for Fuel Supply Modifications and Revisions to Conditions of Certification AQ-17, AQ-18, AQ-19, AQ-24 and WATER RES-1

Dear Ms. Snow:

Attached please find four (4) hardcopies and one (1) CDROM of the Cosumnes Power Plant Petition for Post-certification License Amendment for Fuel Supply Modifications and Revisions to Conditions of Certification AQ-17, AQ-18, AQ-19, AQ-24 and WATER RES-1

If you have any questions about this matter, please contact me at (916) 286-0221.

Sincerely,

CH2M HILL

Keith McGregor
Project Manager

cc: Project File

STATE OF CALIFORNIA

STATE ENERGY RESOURCES
CONSERVATION AND DEVELOPMENT COMMISSION

In the matter of:	)	**Docket No. 01-AFC-19C**
	)	
SMUD Cosumnes Power Plant Project Licensing Case Compliance	)))	**SFA'S PETITION FOR POST CERTIFICATION PROJECT MODIFICATION**
	)	

The Sacramento Municipal Utility District Financing Authority ("SFA") hereby submits this Petition for Post Certification Project Modification ("Petition") for the SMUD Cosumnes Power Plant ("CPP") project ("Project") Licensing Case Compliance pursuant to Section 1769(a), Title 20, California Code of Regulations, to the California Energy Commission ("CEC"). By this Petition, SFA requests approval to modify the CEC's Conditions of Certification AQ-17, AQ-18, AQ-19, AQ-24 and WATER RES-1.

As an officer of SFA, I hereby attest, under penalty of perjury, under the laws of the State of California, that the contents of this Petition are truthful and accurate to the best of my knowledge and belief.

SACRAMENTO MUNICIPAL UTILITY DISTRICT
FINANCING AUTHORITY

Respectfully submitted,

ARLEN S. ORCHARD, General Counsel
LOURDES JIMENEZ-PRICE, Senior Attorney

Dated: December 20, 2010

/Lourdes Jimenez-Price/

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Petition for Post-certification License Amendment

Fuel Supply Modifications and Revisions to Conditions of Certification AQ-17, AQ-18, AQ-19, AQ-24 and WATER RES-1

for the

Cosumnes Power Plant

Sacramento, California

(01-AFC-19C)

Submitted to the:

California Energy Commission

Submitted by:

Sacramento Municipal Utility District Financing Authority

December 2010

With Technical Assistance by:

CH2MHILL

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Acronyms and Abbreviations

AFC	Application for Certification
CCR	California Code of Regulations
CEC	California Energy Commission
CEMS	continuous emissions monitoring system
CEQA	California Environmental Quality Act
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalent
COC	Condition of Certification
CPP	Cosumnes Power Plant
CVFA	Central Valley Financing Authority
CVP	Central Valley Project
DAS	data acquisition system
DOT	United States Department of Transportation
EPA	United States Environmental Protection Agency
ERC	emission reduction credit
FSC	Folsom South Canal
FSA	Final Staff Assessment
GE	General Electric
GHG	greenhouse gas
gpm	gallons per minute
gr	grain
HARP	Hotspots Analysis Reporting Program
HHV	high heating value
HRSG	heat recovery steam generator
LORS	laws, ordinances, regulations, and standards
NAAQS	National Ambient Air Quality Standard
NOx	oxides of nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
PG&E	Pacific Gas and Electric Company
PM_{10}	particulate matter less than 10 micrometers in aerodynamic diameter
$PM_{2.5}$	particulate matter less than 2.5 micrometers in aerodynamic diameter

ppb	parts per billion
ppmvc	parts per million by volume corrected to 15 percent oxygen
ppmw	parts per million by weight
PSD	Prevention of Significant Deterioration
PTO	permit to operate
ROC	reactive organic compound
SAAQS	State Ambient Air Quality Standards
scf	standard cubic feet
scfm	standard cubic feet per minute
SFA	Sacramento Municipal Utility District Financing Authority
SMAQMD	Sacramento Metropolitan Air Quality Management District
SMUD	Sacramento Municipal Utility District
SOx	oxides of sulfur
SO_2	sulfur dioxide
SRWTP	Sacramento Regional Wastewater Treatment Plant
TAC	toxic air contaminant
TDS	total dissolved solids
TSS	total suspended solids
$\mu g/m^3$	micrograms per cubic meter
ZLD	zero-liquid discharge

Executive Summary

The Sacramento Municipal Utility District Financing Authority (SFA) respectfully submits this petition to the California Energy Commission (CEC) for post-certification license modification for the Cosumnes Power Plant (CPP) (01-AFC-19). This petition for post-certification license amendment (Petition to Amend) proposes the following actions:

- Inject digester gas from the Sacramento Regional Wastewater Treatment Plant into the natural gas supply line serving CPP, resulting in a more efficient use of the renewable energy created by the wastewater treatment digester gas, and increase Sacramento Municipal Utility District's (SMUD) renewable energy portfolio
- Refine the allowable levels of total dissolved solids in the cooling tower recirculation water to match the actual performance of the newly installed OnePass water filtration system
- Remove the peak flow condition in WATER RES-1 to allow SFA to maximize generation on high-temperature days while maintaining compliance with the annual water use limit

All proposed modifications would be associated with existing facilities at CPP; no additional construction activities at CPP would be required as part of this Petition to Amend.

This Petition to Amend proposes to modify the CEC Conditions of Certification AQ-17, AQ-18, AQ-19, AQ-24 and WATER RES-1. The environmental impacts assessment presented in Section 3.0 concludes that there will be no significant environmental impacts associated with the implementation of the actions specified in this Petition to Amend, and that the project, as modified, will comply with all applicable laws, ordinances, regulations, and standards.

SECTION 1.0

Introduction

1.1 Background

1.1.1 Cosumnes Power Plant

The California Energy Commission (CEC or Commission) approved the Cosumnes Power Plant (CPP) project in September 2003 (CEC, 2003a). The project is located adjacent to the former Rancho Seco Nuclear Plant in southern Sacramento County. Submitted in September 2001, the Application for Certification (AFC) for the CPP analyzed the impacts associated with four General Electric (GE) Model 7241FA gas turbines exhausting into four unfired heat recovery steam generator (HRSG) units (01-AFC-19) (SMUD, 2001). The initial operation of Phase 1 of the CPP (two gas turbines, two HRSGs, one condensing steam turbine, one cooling tower) began in October 2005 and this phase of the project has been in commercial operation since February 2006.

The Sacramento Municipal Utility District Financing Authority (SFA) submitted a Petition to Amend the CEC license in November 2007. The purpose of the Amendment was to make the CPP project description and air quality Conditions of Certification (COC) consistent with the modified cooling tower specifications and operating parameters, which included a change in the design flow rate and maximum allowable total dissolved solids (TDS) levels set in COC AQ-24. The changes in the circulating water flow rate were the result of consultation with the final design engineer for optimum cooling tower operation after the completion of the CPP’s certification process. The proposed changes to the TDS levels were a result of unexpected variations in raw water quality and the increased TDS levels compared to the data used in the AFC and associated environmental record (referred to as the AFC). The CEC approved the Petition to Amend in June 2008 (CEC, 2008). As a result, the TDS limit was revised from 470 parts per million by weight (ppmw) to 800 ppmw.

The Sacramento Municipal Utility District (SMUD) has water rights to use 15,000 acre-feet per year (AFY) of American River water and an existing water service contract to use 60,000 AFY of Central Valley Project (CVP) water with the United States Bureau of Reclamation, dating back to 1970. CPP was licensed by the CEC to use approximately 2,700 AFY of water from the Folsom South Canal (FSC) for Phase 1 of the project, largely for cooling tower make-up water. However, the water service contract was amended in 2006, and partial assignment of entitlement to CVP water was agreed to between SMUD and the Sacramento County Water Agency. As a result, a portion of the American River water supplied to the FSC would be replaced with Sacramento River water as part of the Freeport Regional Water Project.

In 2008, the Freeport Regional Water Authority began construction of an outtake structure and piping system that would convey Sacramento River water to the FSC. Because Sacramento River water contains higher total suspended solids (TSS) and TDS than the American River, introduction of Sacramento River water into FSC will significantly alter the constituents of the plant’s raw water supply. In preparation for the change in water quality, SFA prepared a second Petition to Amend in February 2009. The proposed modifications were necessary to adapt CPP to the increased TSS and TDS levels in the influent from FSC and allow CPP to continue operating according to the terms of its approved license and permits. Absent the proposed modifications, the additional TSS in the feedwater would have overwhelmed the filters and damaged equipment in the facility, leading to lowered reliability and power production. The Petition to Amend was approved by the CEC in April 2009 (CEC, 2009). As a result, a new aboveground single-pass water filtration system ("OnePass") was installed and modifications were made to the existing zero-liquid discharge (ZLD) system. The modifications to the systems were deemed substantially complete in November 2009 and, after extensive testing, began commercial operation in July 2010.

Based on the recent operating data compiled by the plant operating engineers, SFA has identified the need to further refine COC AQ-24 for the cooling tower recirculation water to match the actual performance of the newly installed OnePass water filtration system and provide a margin of compliance for the increased TDS levels expected with the introduction of Sacramento River water in early 2011. Therefore, SFA has included a request in this Petition to Amend to increase the maximum allowable TDS level in the cooling tower recirculation water from 800 ppmw to 1,500 ppmw.

1.1.2 Carson Ice-Gen

The CEC granted an exemption for the Carson Energy Ice-Gen Facility, also known as the Central Valley Financing Authority (CVFA) Cogeneration plant in June 1993 (Docket No. 92-SPPE-1). The project consists of a 97.7-MW (net) cogeneration Power plant along with a 300-ton-per-day ice plant. The combined-cycle (base load) gas turbine, duct burner, and peaking turbine units at the site are permitted to fire a combination of natural gas and digester gas.

The CVFA facility supplements its natural gas supply by burning digester gas received from the Sacramento Regional Wastewater Treatment Plant (SRWTP). Because of liquid impurities, this gas is burned in the CVFA facility duct burners. The CVFA facility runs at an average heat rate of 9,500 Btu/kWh, high heating value (HHV). Since the CPP facility operates at an average heat rate of 6,900 Btu/kWh (HHV), moving the digester gas from the CVFA facility to CPP is a more efficient way to use the renewable energy created by the wastewater treatment process gas, providing both an economic benefit and an increase in SMUD's renewable energy portfolio. Therefore, CVFA is proposing to compress the digester gas at the CVFA facility and inject it into its transmission pipeline where it will be blended with pipeline natural gas on its way to CPP.

CVFA proposes to install a digester gas treatment system at the Carson Energy Ice-Gen Facility to meet the standards for pipeline quality gas prior to injection in the existing pipeline. The installation of the digester gas treatment system will be addressed separately by CVFA under the California Environmental Quality Act (CEQA). Therefore, the plant modifications at the CVFA facility are not addressed further in this document.

1.2 Overview of Proposed Amendments

This Petition to Amend addresses the operational impacts associated with the injection of digester gas in the fuel supply pipeline and the refinements to the water filtration system as a result of the changes in water quality at the CPP facility.

- SFA, which owns and operates CPP, proposes to inject digester gas from the SRWTP into the natural gas supply line serving CPP. Redirecting the digester gas from the CVFA facility to CPP is a more efficient way to use the renewable energy created by the wastewater treatment process gas, providing both an economic benefit and an increase in the SMUD's renewable energy portfolio. However, because the digester gas is expected to have a higher sulfur content than natural gas, the blending of the digester gas and natural gas will potentially increase the sulfur content of the fuel supply and dilute the Btu content of the gas. As a result of the higher sulfur content and lower Btu content, the proposed project would result in an increase in sulfur dioxide emissions and an increase in the gas flow at CPP to maintain the rated turbine output. The potential environmental impacts associated with the blended fuel are evaluated in Section 3.0.
- Based on the recent operating data, SFA has identified the need to further refine the allowable TDS levels in the cooling tower recirculation water to match the actual performance of the newly installed OnePass water filtration system. The refinement will also provide a margin of compliance to account for the increased TDS levels expected with the introduction of Sacramento River water. Therefore, SFA requests an increase in the allowable TDS levels in the cooling tower recirculation water from 800 ppmw to 1,500 ppmw, measured over a 3- hour averaging period (COC AQ-24, as amended June 24, 2008). The higher TDS levels would potentially result in higher emissions of particulate matter less than 10 micrometers in aerodynamic diameter (PM_{10}) from the CPP cooling tower. Therefore, the potential impacts associated with an increase in PM_{10} emissions are addressed in Section 3.0.
- SFA has determined that under the current COCs for water resources (WATER RES-1), CPP is unable to maintain adequate or required cooling tower water levels on high-temperature days because of high evaporation rates. The removal of the peak flow condition in WATER RES-1 would allow SFA to maximize generation on high-temperature days while maintaining compliance with the annual water use limit. Therefore, SFA requests the removal of the peak flow condition in WATER RES-1.

Detailed descriptions of the proposed modifications are included in Section 2.0.

This Petition to Amend contains all of the information that is required pursuant to the CEC's Siting Regulations (California Code of Regulations [CCR] Title 20, Section 1769, Post Certification Amendments and Changes). The information necessary to fulfill the requirements of Section 1769 is contained in Sections 1.0 through 6.0 as summarized in Table 1.2-1.

TABLE 1.2-1
Informational Requirements for Post-certification Modifications

Section 1769 Requirement	Section of Petition Fulfilling Requirement
(A) A complete description of the proposed modifications, including new language for any conditions that will be affected	Section 2.0—Proposed modifications Sections 3.1 to 3.4—Proposed changes to COCs, if necessary, are located at the end of each technical section
(B) A discussion of the necessity for the proposed modifications	Section 1.3
(C) If the modification is based on information that was known by the petitioner during the certification proceeding, an explanation why the issue was not raised at that time	Section 1.3
(D) If the modification is based on new information that changes or undermines the assumptions, rationale, findings, or other bases of the final decision, an explanation of why the change should be permitted	Sections 1.4, 3.1 to 3.4
(E) An analysis of the impacts the modification may have on the environment and proposed measures to mitigate any significant adverse impacts	Section 3.1 to 3.4
(F) A discussion of the impact of the modification on the facility's ability to comply with applicable laws, ordinances, regulations, and standards;	Section 3.1 to 3.4
(G) A discussion of how the modification affects the public	Section 4.0
(H) A list of property owners potentially affected by the modification	Section 5.0
(I) A discussion of the potential effect on nearby property owners, the public and the parties in the application proceedings.	Section 6.0

1.3 Ownership of the Facility Property

The CPP is owned and operated by the SFA. The existing 26-mile natural gas pipeline from the CVFA facility to CPP is owned and operated by SMUD.

1.4 Necessity of Proposed Changes

The CEC Siting Regulations require a discussion of the necessity for the proposed revisions to CPP certification and whether the amendment is based on information known by the petitioner during the certification proceeding (Title 20, CCR, Sections 1769 (a)(1)(B), and (C)). This Petition to Amend proposes to make changes to the fuel supply and modify the following COCs: AQ-17, AQ-18, AQ19, AQ-24 and WATER RES-1. The proposed changes are required for the following reasons and were a result of information obtained after certification:

- The SRWTP digester gas is currently burned in the CVFA facility's duct burners. By installing new digester treatment equipment at the CVFA facility, SMUD will be able to achieve the United States Department of Transportation (DOT), Pacific Gas and Electric Company (PG&E) Rule 21, and GE large gas turbine pipeline natural gas quality standards. Therefore, the digester gas would meet the pipeline and turbine manufacturer requirements allowing the consumption of the blended digester gas at CPP. Because the CPP facility operates at an average heat rate of 6,900 Btu/kWh (HHV) compared to an average heat rate of 9,500 Btu/kWh (HHV) at CVFA, moving the digester gas from the CVFA facility to CPP is a more efficient way to use the renewable energy created by the wastewater treatment process. The additional power generation attributed to the differential heat rates would be a maximum of about 2,140 kW per hour.
- As approved by the CEC in 2009, SFA installed an aboveground single-pass water filter system (OnePass) and completed modifications to the existing ZLD system. However, SFA has determined that the performance of the OnePass and ZLD system requires the refinement of the permissible TDS levels in the cooling tower recirculation water. Therefore, in order to maintain cooling tower efficiency and remain compliant with the CEC COC for TDS (i.e., AQ-24), SFA requests an increase in the allowable cooling tower recirculation water TDS levels from 800 ppmw to 1,500 ppmw.
- The current language in the WATER RES-1 limits the annual water usage to 2,663 AFY over 3 successive years and limits the peak flow to 2,500 gallons per minute (gpm). SFA has determined that CPP is unable to maintain adequate or required cooling tower water levels during high-temperature days because of high evaporation rates without exceeding an instantaneous peak flow limit of 2,500 gpm. As a result, SFA is required to curtail load during peak generation demand on high-temperature days. To maximize generation on high-temperature days, SFA requests the removal of the peak flow language included in WATER RES-1. Removal of the peak flow language will not increase the annual water use limit set forth in WATER RES-1.

1.5 Consistency of Changes with Certification

The CEC Siting Regulations also require a discussion of the consistency of the proposed project revision with the applicable laws, ordinances, regulations, and standards (LORS) and whether the modifications are based on new information that changes or undermines the assumptions, rationale, findings, or other basis of the final decision (Title 20, CCR Section 1769 (a)(1)(D)). If the project is no longer consistent with the certification, the Petition to Amend must provide an explanation why the modification should be permitted.

The proposed project modifications are consistent with all applicable LORS, as discussed in Section 3.0, and this Petition to Amend is not based on new information that changes or undermines any basis for the final decision. The proposed project modifications would allow the CPP facility to continue to run efficiently, and to meet environmental goals and the current demand for electricity. The CPP facility would continue to operate in compliance with all applicable LORS. Therefore, the findings and conclusions contained in the Commission Decision for CPP (CEC, 2003a) would remain applicable to the project, as modified.

1.6 Summary of Environmental Impacts

The CEC Siting Regulations require that an analysis be conducted to address the potential impacts the proposed modifications may have on the environment and proposed measures to mitigate any potentially significant adverse impacts (Title 20, CCR, Section 1769 (a)(1)(E)). The regulations also require a discussion of the impact of the modification on the facility's ability to comply with applicable LORS (Section 1769 (1)(a)(F)). Section 3.0 of this Petition to Amend includes a discussion of the potential environmental impacts associated with the modifications as well as a discussion of the consistency of the modification with LORS. Section 3.0 also includes updated environmental baseline information if changes have occurred since the AFC was prepared that would have a bearing on the environmental analysis of this Petition to Amend. Section 3.0 concludes that there will be no significant environmental impacts associated with implementing the actions specified in this Petition to Amend and that the project, as modified, will comply with all applicable LORS.

1.7 Conditions of Certification

This Petition to Amend proposes to change the allowable oxides of sulfur (SOx) and particulate emissions (AQ-17, 18, and 19), TDS levels in the cooling tower recirculation water (AQ-24), and peak water use restrictions (WATER RES-1). A detailed description of the proposed modifications to the COCs is included after the respective technical discussion in Section 3.0.

SECTION 2.0

Description of Proposed Amendments

This section includes a description of the proposed project modifications, consistent with CEC Siting Regulations (Title 20, CCR, Section 1769 (a)(1)(A)).

2.1 Digester Gas Project

2.1.1 Proposed Modifications to Fuel Supply

Digester gas produced by the anaerobic digesters at the SRWTP is currently consumed in the duct burners at the CVFA facility or flared at the SRWTP facility. SMUD commissioned a feasibility study in 2009 to evaluate the technical feasibility and potential environmental and economic benefits associated with the consumption of the digester gas at the CPP facility. Based on this feasibility study, it was determined that because of the differential heat rates between the CVFA and CPP facilities, SMUD could enhance its renewable energy production from the digester gas by consuming it at CPP. It is estimated that SMUD could potentially produce an additional 2,140 kW per hour using the same quantity of digester gas. During times when CPP is unable to accept the digester gas, the CVFA facility and the SRWTP will retain the capability and permit authority to combust the digester gas.

Therefore, based on the results of the feasibility study, SFA proposes to blend digester gas from the SRWTP into the CPP natural gas supply pipeline for consumption at the CPP facility. However, the digester gas produced by the SRWTP contains contaminants that could potentially damage the components of the gas pipeline, the combustion turbines, and the associated equipment. Therefore, CVFA proposes to install a digester gas treatment system at the CVFA facility in order to meet the DOT, PG&E Rule 21, and GE large gas turbine requirements for gaseous fuels. The CVFA facility (92-SPPE-01) received an exemption from the CEC in June 1993. Therefore, the installation of the digester gas treatment system at the CVFA facility will be addressed separately under CEQA.

2.1.2 Proposed Modifications to the Turbine Emission Limits (AQ-17, AQ-18, and AQ-19)

After the digester gas has been treated, it will be injected into the gas supply pipeline at the CVFA facility. The maximum blend of digester gas into the gas supply pipeline will not exceed four percent of the natural gas volume when CPP is operating both turbines at full load. While the digester gas treatment process will require no changes to the equipment at CPP or the gas pipeline, the blending of the digester gas and natural gas will dilute the Btu content of the gas and potentially increase the sulfur content of the fuel supply. As a result of the lower Btu content, an increase in the gas flow at CPP will be required to maintain the rated turbine output. The potential environmental impacts associated with the blended fuel are evaluated in Section 3.1 (Air Quality) and 3.2 (Public Health). Because the digester gas project will require no changes to the equipment at CPP or the gas pipeline, no other environmental disciplines are expected to be impacted by the injection of digester gas in the gas supply pipeline.

2.2 Balance of Plant Updates

2.2.1 Proposed Modifications to the Permissible TDS Level (AQ-18, AQ-19, and AQ-24)

The modifications to the ZLD system outlined in the 2009 Petition to Amend were deemed substantially complete in November 2009 and, after extensive testing, began commercial operation in July 2010. Based on operating data compiled by the plant operating engineers and the existing FSC water quality data, SFA has identified that the maximum treatment capacity of the ZLD system is approximately 280 gpm. During normal plant operations, the cooling towers generate an average of 130,000 gallons of blowdown per day or 90 gpm. Therefore, the ZLD system is able to maintain an adequate quantity of water supply for cooling tower make-up and system operations. During peak generation periods, the quantity of cooling tower blowdown can increase to 353,000 gallons per day, which exceeds the capacity of the ZLD system. However, the capacity of the brine storage tank provides enough storage to allow the ZLD system to catch up during the overnight hours using the current water supply. Therefore, the system is also able to maintain an adequate quantity of water supply for cooling tower make-up and system operations using the current water supply.

As Sacramento River water is introduced in the FSC, the future water supply to CPP is expected to have higher concentrations of TSS and TDS. Due to these higher concentrations, the number of cooling tower cycles must be reduced to maintain compliance with the existing TDS limits of 800 ppmw, and the average cooling tower blowdown is expected to increase at 8.89 cycles to 354,000 gallons of blowdown per day or 281 gpm. During peak operations, the cooling tower blowdown at 6.67 cycles would increase to 404,640 gallons of blowdown per day or 375 gpm. Under these conditions, the capacity of the ZLD system would be exceeded during peak periods and the brine storage would reach or exceed capacity. Therefore, the only option would be to reduce the generation capacity of CPP. However, with a higher TDS level of 1,500 ppmw, SFA expects the new ZLD system would be able to process the amount of cooling tower blowdown produced during average and peak conditions.

In addition to the current balance of plant updates discussed previously, SFA determined that a Sacramento Metropolitan Air Quality Management District (SMAQMD) Permit to Operate (PTO) is required for the perlite dust collector, which was installed as part of the OnePass membrane water filtration system in 2009. Therefore, this Petition to Amend also addresses the potential impacts on air quality associated with the perlite storage silo and dust collector (Section 3.1).

2.2.2 Proposed Modifications to the Peak Flow Limitation (WATER RES-1)

The current language in WATER RES-1 limits the annual water usage to 2,663 AFY over 3 successive years and limits the peak flow to 2,500 gpm. SFA has determined that CPP is unable to maintain adequate or required cooling tower water levels during high-temperature days because of high evaporation rates based on an instantaneous peak flow limit of 2,500 gpm. As a result, SFA is required to curtail load during peak generation demand on high-temperature days. To maximize peak generation on high-temperature days, SFA requests the removal of the peak flow language included in WATER RES-1. Removal of the peak flow language will not increase the annual water use limit set forth in WATER RES-1.

SECTION 3.0

Environmental Analysis of Proposed Amendments

The proposed modifications to the CPP would be limited to changes in the fuel supply and administrative changes in the COCs (no construction activities will be conducted at CPP as part of this Petition to Amend). As a result, the environmental analysis for most of the environmental disciplines does not differ significantly from that described in the AFC and the impacts associated with this Petition to Amend would be less than significant. The following environmental disciplines would not differ significantly from the AFC:

- Biological Resources
- Cultural Resources
- Land Use
- Noise
- Worker Health and Safety
- Socioeconomics
- Agriculture and Soils
- Traffic and Transportation
- Visual Resources
- Hazardous Materials Handling
- Geological Hazards and Resources
- Paleontological Resources

The proposed changes may have an impact on the remaining four environmental disciplines:

- Air Quality
- Public Health
- Waste Management
- Water Resources

The following subsections present a discussion of the potential impacts that the proposed changes may have on the environmental analysis as presented in the AFC for these four environmental disciplines. Each discussion includes an environmental analysis, an assessment of compliance with applicable LORS, proposed mitigation measures, and, if applicable, proposed changes to the COCs that are necessary as a result of project modifications.

3.1 Air Quality

In the 2003 Commission Decision, it was determined that CPP was in compliance with all applicable LORS. As described in this Petition to Amend, the proposed modifications for the CPP are also consistent with all applicable LORS, and this Petition to Amend will not alter the assumptions or conclusions made in the Commission Decision for the CPP. However, as discussed below, the proposed modification to the CPP may result in an increase in the potential to emit for SOx, PM_{10}, particulate matter less than 2.5 micrometers in aerodynamic diameter ($PM_{2.5}$), and greenhouse gas (GHG) emissions. Therefore, this section evaluates the potential air quality impacts associated with the proposed modifications.

3.1.1 Environmental Baseline Information

Since the Commission Decision for the CPP in 2003, the following new air quality regulatory developments have been instituted regarding the four pollutants affected by the proposed CPP modifications:

- The Federal New Source Performance Standards (NSPS) for gas turbines (40 CFR 60, Subpart GG) currently applies to the gas turbines at the CPP. A new gas turbine NSPS was adopted by the United States Environmental Protection Agency (EPA) that applies to gas turbines installed or modified after February 18, 2005 (40 CFR 60, Subpart KKKK). This new regulation has lower emission limits for oxides of nitrogen (NOx) and SOx than the older gas turbine NSPS. For NOx, the new NSPS emission limit is approximately 42 parts per million by volume corrected to 15 percent oxygen (ppmvc) as compared to the previous 75 ppmvc limit for the size of gas turbines at the CPP. The new NSPS emission limit for SOx is approximately 41 ppmvc versus 150 ppmvc for the old Subpart GG. In addition, the new NSPS has different calculation procedures for determining excess emissions.

- In a May 16, 2008 Federal Register notice, EPA clarified that while local agencies are amending their permit programs to incorporate $PM_{2.5}$, beginning on July 15, 2008, EPA requires new major sources or major modifications of $PM_{2.5}$ located in $PM_{2.5}$ nonattainment areas to undergo New Source Review (NSR) permitting via 40 CFR 51, Appendix S.

- On June 3, 2010, EPA finalized the Prevention of Significant Deterioration (PSD) GHG tailoring regulation. The purpose of this regulation is to establish criteria to determine which new stationary sources and/or project modifications trigger PSD and Title V review due to increases in GHG emissions. Under the GHG tailoring regulation and subsequent EPA guidance documents, beginning on July 1, 2011, existing major sources of GHG emissions that undergo a modification that increases GHG emissions by 75,000 tons/year of carbon dioxide equivalent (CO_{2e}) are subject to PSD review.

- On September 21, 2006, EPA adopted a new 24-hour average $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) of 35 micrograms per cubic meter ($\mu g/m^3$), which replaced the previous standard of 65 $\mu g/m^3$. As with the previous standard, the new standard is based on the 3-year average of the 98th percentile of 24-hour $PM_{2.5}$ monitored values.

- On August 23, 2010, a new 1-hour sulfur dioxide (SO_2) NAAQS of 195 µg/m^3 (75 parts per billion [ppb]) became effective. This new standard is based on a 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average monitored values. This regulatory action also revoked the two existing primary NAAQS for SO_2 of 140 ppb (24-hour average) and 30 ppb (annual average).
- On June 5, 2003, new State Ambient Air Quality Standards (SAAQS) for PM_{10} and $PM_{2.5}$ became effective. For PM_{10}, the annual average standard was lowered from 30 to 20 µg/m^3. For $PM_{2.5}$, a new annual average standard of 12 µg/m^3 became effective.

In addition to the new air quality regulations adopted since the CEC approval of the CPP, the background ambient SO_2, PM_{10}, and $PM_{2.5}$ concentrations for the project area used during the 2003 CEC permitting process have also been updated. For instance, the ambient air quality impact analysis included as part of the CEC Staff's Final Staff Assessment (FSA) includes a listing of background ambient concentrations for the project area (Air Quality Table 5, p. 4.1-14) (CEC, 2003b). Because these background concentrations were based on data collected at nearby monitoring stations during the 3-year period from 1999 to 2001, it is necessary to update these values to account for more recent data collected during the 3-year period from 2007 to 2009. Table 3.1-1 summarizes the updated data and compares them to the maximum values listed in the FSA.

TABLE 3.1-1
Ambient Background Levels for the CPP Project Area

Pollutant	Averaging Time	Previous Background Levels[a] (µg/m^3)	Current Background Levels[b] (µg/m^3)	Percent Change (%)
SO_2	1-hour	78.6	78.6	0
	24-hour	47.2	10.5	-78
	Annual	—	2.6	N/A
PM_{10}	24-hour	88.0	89.0	1
	Annual	21.3	32.0	50
$PM_{2.5}$	24-hour	108.0	54.9	-49
	Annual	—	18.9	N/A

[a] FSA for CPP (01-AFC-19), February 11, 2003, Table 5.
[b] Based on maximum background levels recorded at Sacramento County monitoring stations during the period from 2007 to 2009. Based on data from the ARB and EPA. (ARB, 2010; EPA 2010a)

As shown by this table, other than annual average PM_{10}, there is only a minor increase in the 24-hour average PM_{10} background level and significant decreases in the background levels for 24-hour SO_2 and 24-hour $PM_{2.5}$.

3.1.2 Environmental Consequences

The proposed combustion of digester gas at the CPP is expected to result in an increase in the potential to emit SOx emissions from the CPP gas turbines. In addition, the proposed increase in the cooling water total dissolved solids (TDS) level is expected to increase the potential to emit particulate emissions for the CPP cooling tower. These increases in the potential to emit for the CPP gas turbines and cooling tower are discussed in more detail in the following paragraphs.

3.1.2.1 Gas Turbine Emission Assessment

3.1.2.1.1 SO_X Emission Change

The proposed CPP modifications include the combustion of up to a maximum of 2,500 standard cubic feet per minute (scfm) of SRWTP digester gas in the CPP gas turbines. The digester gas will have a maximum total sulfur content of 1 grain (gr)/100 standard cubic foot (scf) (17 parts per million by volume) and displace an equal amount of natural gas on a heat input basis. Therefore, the use of digester gas by the CPP gas turbines will not result in an increase in the heat input rate. For these emission calculations, the CPP gas turbine full load operating case was evaluated and the net SOx emission change associated with the combustion of 2,500 scfm of digester gas was compared to an equal amount of natural gas on a heat input basis. The SOx emissions for the combustion of natural gas were based on a natural gas total sulfur content of 0.25 gr/100 scf, which is the basis for the existing emission limits in the SMAQMD PTO for CPP and the corresponding emission limits in the CEC's approval of CPP. The following calculations show the net increase in hourly SOx emissions associated with the combustion of digester gas:

Digester Gas
Heat Input (MMBtu/hr) = (2,500 scf/min) x (60 min/hr) x (617.55 Btu/scf) x (MMBtu/10^6Btu)
Heat Input (MMBtu/hr) = 92.63 MMBtu/hr
SOx (lb/hr) = (2,500 scf/min) x (60 min/hr) x (1 gr/100 scf) x (lb/7000 gr) x (64 lb_{SOx}/32 lb_s)
SOx (lb/hr) = 0.43 lb/hr
Natural Gas
Natural gas fuel use (scf/hr) = (92.63 MMBtu/hr) x (10^6 Btu/MMBtu) x (scf/1019.0 Btu)
Natural gas fuel use (scf/hr) = 90,902.85 scf/hr
SOx (lb/hr) = (90,902.85 scf/hr) x (0.25 gr/100 scf) x (lb/7000 gr) x (64 lb_{SOx}/32 lb_s)
SOx (lb/hr) = 0.065 lb/hr
Net SOx Emission Change
Net SOx Emissions Change = (0.43 lb/hr) – (0.065 lb/hr) = 0.37 lb/hr

Table 3.1-2 shows the change in hourly, daily, quarterly, and annual SOx emissions associated with the combustion of blended fuel in the CPP gas turbines. These proposed new SOx emission levels are based on full load/full-time operation of the CPP gas turbines. As shown by this table, there is an expected SOx net emission increase for all averaging times. It should be noted that the existing COC SOx emission limit for the CPP gas turbines has been changed from 1.31 to 1.32 lb/hr. This change was made to correct an apparent rounding error in the existing SMAQMD PTO for CPP. Using the maximum allowable heat

input rate in the SMAQMD PTO (1,865 MMBtu/hr) and the SOx emission factor (0.00071 lb/MMBtu) results in a SOx emission limit of 1.32 lb/hr rather than 1.31 lb/hr.

TABLE 3.1-2
CPP Gas Turbines, SOx Emission Summary

	Existing COCs	Proposed Levels	Net Emission Increase
Gas Turbine hourly SOx emission limit (lb/hr)	1.32	1.69	0.37
Gas Turbine daily SOx emission limit (lb/day)	31.4	40.56	9.16
Facility-wide daily SOx emission limit (lb/day)	62.9	72.06	9.16
Facility-wide quarterly SOx emission limit (lb/quarter)	5,405 (1Q)	6,229 (1Q)	824 (1Q)
	5,465 (2Q)	6,299 (2Q)	834 (2Q)
	5,525 (3Q)	6,368 (3Q)	843 (3Q)
	5,525 (4Q)	6,368 (4Q)	843 (4Q)
Facility-wide annual SOx emission limit (lb/year)	21,922	25,264	3,344

3.1.2.1.2 Impacts on NOx, CO, ROC, and PM_{10} Emissions

Blending SRWTP digester gas with the existing natural gas supply will change the composition and physical properties of the gas burned by the CPP gas turbines. This change to the gas composition is expected to increase the exhaust flow rate associated with each Btu of gas burned by this equipment. This increase is associated with the relatively high concentrations of carbon dioxide (CO_2) in the digester gas. The factor that accounts for the exhaust flow per unit of heat input to a combustion device is known as the "F-Factor."[1] Increasing the exhaust flow rate for each Btu of heat input may result in a corresponding increase in the maximum hourly mass emission rates of for NOx, carbon monoxide (CO), and reactive organic compounds (ROC) for the gas turbines.

Regarding PM_{10} emissions, SFA has concluded that there will be no significant measurable increase in PM_{10} emissions associated with the proposed combustion of blended gas in the CPP gas turbines. This conclusion is based on the existing uncertainties in the actual level of PM_{10} emissions from natural-gas-fired turbine units associated with the inherent limitations of existing EPA-approved test methods and because there is no change in the maximum turbine firing rate as a result of the use of the blended gas.

The CPP has the flexibility of operating with either one or two gas turbines and operating each CPP gas turbine at 50 to 100 percent load depending on power grid requirements. The natural gas/digester gas mixture will change depending on the number of gas turbines operating and the gas turbine operating load. Gas mixture changes affect the exhaust flow characteristics and heating value of the gas. Table 3.1-3 summarizes the resulting blended gas factors for several CPP operating cases and shows the percent change in the gas factors compared to 100 percent natural gas. The detailed gas mixture analyses are included as Appendix A.

[1] See 40 CFR Part 60, Appendix A, Method 19.

TABLE 3.1-3
Change in Blended Gas Parameters Compared to 100% Natural Gas[a]

Fuel/Operating Case	F-Factor[b] (dscf/MMBtu)	Heat Content (HHV) (Btu/scf)	Percent Change in F-Factor (%)	Percent Change in Heat Content (HHV) (%)
100% Natural gas/all operating cases	8,650	1019	0	0
Blended gas/single GT only, 50% load	8,693	963	0.50	-5.52
Blended gas/single GT only, 100% load	8,671	987	0.25	-3.08
Blended gas/two GTs, 50% load	8,669	990	0.22	-2.84
Blended gas/two GTs, one at 50% load and one at 100%	8,662	998	0.14	-2.02
Blended gas/two GTs, 100% load	8,659	1,002	0.10	-1.63

[a] See Appendix A for detailed calculations.
[b] F-Factor calculated from actual site natural gas composition data; see Appendix A.

In addition to comparing the blended gas parameters to actual natural gas characteristics at CPP, SFA compared the blended gas F-Factors to the default EPA 40 CFR Part 60, Appendix A, Method 19 F-Factor. The default EPA value is used by the CPP continuous emissions monitoring system (CEMS)/data acquisition system (DAS) and firms that have performed compliance tests on the CPP gas turbines over the past 5 years (2006 to 2010). This comparison is shown in Table 3.1-4. Unlike the comparison with actual natural gas at CPP, which shows an increase in the F-Factor, the CEMS/Compliance Test comparison shows a decrease in the F-Factor when blended gas is used.

TABLE 3.1-4
Comparison between Blended Gas F-Factors and CEM/DAS and Compliance Test F-Factors

CPP Operating Case	Blended Gas F-Factor (dscf/MMBtu)	CEMS/DAS EPA Default F-Factor (dscf/MMBtu)	Compliance Test Default F-Factor (dscf/MMBtu)	Percent Change (%)
Single GT, 50% load	8,693	8710	8710	-0.19
Single GT, 100% load	8,671	8710	8710	-0.44
Two GTs, 50% load	8,669	8710	8710	-0.47
Two GTs, one at 50% load and one at 100%	8,662	8710	8710	-0.55
Two GTs, 100% load	8,659	8710	8710	-0.59

As shown in Tables 3.1-3 and 3.1-4, the percent changes in the F-Factor of the blended gases for the various CPP operating cases are relatively minor, with either a small increase when compared to actual natural gas at CPP or a small decrease when compared to CEMS/Compliance Testing default factors of less than 1 percent. The expected effect on

CPP emissions associated with the change to the F-Factor is discussed in the following paragraphs.

To determine whether it is necessary to increase the existing NOx, CO, or ROC COC emission limits for the CPP gas turbine as a result of the combustion of digester gas, it is necessary to compare the relatively small increase in the blended gas F-Factor to the current emission compliance margins at CPP. Appendix B provides a number of tables showing the current compliance margins for CPP. These compliance margins were calculated by comparing the current CPP permit limits with actual emissions data. Compliance margin is calculated as (Permit Limit – Actual Emissions) / (Permit Limit), so a large percentage value for compliance margin indicates a larger difference between actual and permitted emissions. The actual emissions data were determined based on a review of CEMS/DAS hourly emissions data for the past five quarters (1st quarter 2009 to 1st quarter 2010), emissions data for compliance tests performed over the past 5 years (2006 to 2010), and daily/quarterly/annual emission reports for the past 2 years (2008 and 2009).

As shown in Appendix B, the current compliance margins for CPP range from approximately 20 to 90 percent for the three pollutants that may be affected by the change in the F-Factor (NOx, CO, and ROC). Therefore, in general, the small change in the F-Factor (approximately 0.5 percent) associated with the combustion of blended gas at CPP is expected to have a negligible effect on the compliance margins for NOx, CO, and ROC. In addition, because the CEM/DAS system and source tests have used a EPA default natural gas F-Factor of 8,710 dscf/MMBtu, which is higher than the calculated blended gas factor, the use of blended gas at CPP will not result in an increase in the fuel F-Factor used by these compliance methods. As a result, SFA has concluded that there will be no increase in NOx, CO, and ROC emissions associated with the combustion of blended gas at CPP and there is no need to change the existing gas turbine permit emission limits for these pollutants. Therefore, there is no net emission increase for NOx, CO, or ROC associated with the proposed combustion of digester gas in the CPP gas turbines.

3.1.2.2 Cooling Tower

As discussed previously, the proposed change for the cooling tower is associated with an increase in the maximum expected cooling water TDS level. Normally, an increase in the maximum TDS level would result in a corresponding proportional increase in the maximum allowable PM_{10} emission rate for a cooling tower. However, due to a relatively new approach for calculating PM_{10} emissions from wet cooling towers, such a proportional increase in the allowable PM_{10} emission rate for the CPP cooling tower will not be necessary.

The new approach for calculating PM_{10} emissions from cooling towers accounts for the fact that the size distribution of particulate emissions from cooling towers is directly related to the size distribution of the water droplets in the drift from cooling towers. Relatively large water droplets entrained in the drift from a cooling tower form relatively large particulates and small water droplets form small particulates. Accurate water droplet size distribution data are available from the cooling tower manufacturers. A detailed discussion of the approach used to calculate the PM_{10} emissions for the CPP cooling tower is enclosed as Appendix C.

The detailed cooling tower PM_{10} emission rates shown in Appendix C are based on the manufacturer's droplet size distribution data, maximum CPP cooling water recirculation rate, maximum TDS level in the cooling water, and drift rate. While this is a relatively new method for calculating PM_{10} emissions from cooling towers, it has been recently reviewed and approved by the San Joaquin Valley Air Pollution Control District and the CEC Staff for the Elk Hills Power Plant. Table 3.1-5 presents the estimated PM_{10} emissions from the cooling tower at the CPP. As presented in this table, there will be an hourly, a daily, and a quarterly net emission increase for PM_{10} for the CPP cooling tower associated with this proposed change.

TABLE 3.1-5
CPP Cooling Tower, PM_{10} Emission Summary

	Existing COCs	Proposed Levels Based on Droplet Size	Net Emission Increase
Cooling tower hourly PM_{10} emission limit (lb/hr)	0.31	0.39	0.08
Cooling tower daily PM_{10} emission limit (lb/day)	7.43	9.36	1.93
Facility-wide quarterly PM_{10} emission limit (lb/quarter)	39,550 (1Q)	39,724 (1Q)	174
	39,989 (2Q)	40,165 (2Q)	176
	40,428 (3Q)	40,606 (3Q)	178
	40,428 (4Q)	40,606 (4Q)	178
Facility-wide annual PM_{10} emission limit (lb/year)	160,395	161,101	706

3.1.2.3 Perlite Storage Silo

The 2009 Petition to Amend addressed the ZLD system modifications as well as the installation of a membrane (OnePass) water filtration system. Perlite is used in the membrane water filtration system to aid filtration of solids from the incoming raw water supply. A dust collector is used to control particulate emissions during the periodic loading of the perlite storage silo. Based on operational data collected since July 2010, it was determined that the small dust collector associated with the membrane water filtration system requires a PTO from SMAQMD. As reported in the permit application package submitted to SMAQMD on September 13, 2010, the PM_{10} emissions from this dust collector are minimal (approximately 2.6 lb/quarter, 10.4 lb/year) and will not result in any new significant air quality impacts. A copy of this application is included in Appendix D.

3.1.2.4 Ambient Air Quality Impact Analysis

SFA performed an ambient air quality impact analysis to ensure that the proposed CPP modifications will not interfere with the attainment or maintenance of an applicable ambient air quality standard. Normally this type of ambient air quality impact analysis is required only for a new major source or major modification, and the proposed CPP modifications are neither a new major source nor a major modification. However, because SO_2 and PM_{10} modeling was performed for the CPP gas turbines and cooling tower during previous permitting efforts, SFA used these previous modeling results to estimate the revised ambient impacts associated with the proposed higher emissions levels for the gas turbines and cooling tower. Table 3.1-6 summarizes the maximum ambient SO_2 impacts for the CPP gas turbines shown in a 2001 permit application and estimates the corresponding impacts associated with the proposed higher SOx emission levels using a simple emissions ratio method.

TABLE 3.1-6
Ambient Impacts for the Gas Turbines and Cooling Tower

	Previous Modeling Analysis	Revised Impacts	Background Levels[f]	Total Impact	Ambient Air Quality Standard
Gas Turbines (SO_2 Impacts)					
1-hour Impact – State Standard (µg/m^3)	0.58[a]	0.74[c]	78.6	79.3	655
1-hour Impact – National Standard (µg/m^3)	0.58[a]	0.74[c]	14.7	15.4	195
24-hour Impact (µg/m^3)	0.22[a]	0.28[c]	10.5	10.8	105
Annual Impact (µg/m^3)	0.02[b]	0.03[c]	2.6	2.6	80
Cooling Tower (PM_{10} Impacts)					
24-hour Impact (µg/m^3)	0.177[d]	0.223[e]	89	89	50
Annual Impact (µg/m^3)	0.020[d]	0.025[e]	32	32	20
Cooling Tower ($PM_{2.5}$ Impacts)					
24-hour Impact (µg/m^3)	N/A	0.086[g]	54.9	55.0	35
Annual Impact (µg/m^3)	N/A	0.0096[g]	18.9	18.9	12

[a]CEC Final Staff Assessment, CPP (01-AFC-19), February 2003, Air Quality Table 5 (Phase 1 ambient impacts).

[b]Supplement A to AFC for CPP (01-AFC-19), March 15, 2002, Table 8.1-28R (calculated based on one-half of combined impacts for four gas turbines to account for impacts for only two gas turbines).

[c]Based on ratio between proposed gas turbine SOx emissions of 1.32 lb/hr and proposed level of 1.69 lb/hr.

[d]Permit application package for modification to PTO for CPP cooling tower, March 22, 2007, Table 5 and Petition to Amend CEC Approval of CPP, November 2007, Table 2.

[e]Based on ratio between proposed cooling tower daily PM_{10} emissions of 9.36 lb/day and the permitted level of 7.43 lb/day.

[f]Based on maximum background levels recorded by Sacramento County monitoring stations during the period from 2007 to 2009. Based on data from ARB and EPA (ARB, 2010; EPA, 2010a) http://www.epa.gov/air/data/repsco.html?co~06067~Sacramento%20Co%2C%20California.

[g]Based on revised PM_{10} ambient impacts for the cooling tower and the ratio between proposed cooling tower daily $PM_{2.5}$ emissions of 3.60 lb/day (0.15 lb/hr x 24 hours) and the proposed daily PM_{10} emissions of 9.36 lb/day.

[h]Based on NAAQS 1-hr SO_2 background 99th percentile design value of 5.6 ppb for Sacramento County (2005 to 2007) from EPA. (EPA, 2010b).

A similar approach was used for the PM_{10} impacts for the cooling tower. Table 3.1-6 presents the PM_{10} ambient impacts shown in a 2007 permit application for the CPP cooling tower. This emissions ratio method is appropriate to estimate ambient impacts for the CPP gas turbines and cooling tower because the exhaust characteristics of this equipment are unchanged from the previous modeling analyses.

As presented in Table 3.1-6, while the proposed potential to emit SOx emissions for the gas turbines has increased, the maximum ambient SO_2 impacts remain below ambient air quality standards. Consequently, there are no new significant SO_2 ambient impacts associated with the proposed use of digester gas in the CPP gas turbines. For the cooling tower, the maximum ambient 24-hour and annual average impacts are well below the ambient air quality standards. When cooling tower impacts are combined with the ambient background levels, the total PM_{10} impacts are above the 24-hour and annual ambient air quality standards due to high background levels. However, because these impacts are well below the PSD significance levels for PM_{10} of 5.0 $\mu g/m^3$ (24-hr average) and 1.0 $\mu g/m^3$ (annual average), these small net increases are considered negligible. Consequently, there are no new significant PM_{10} ambient impacts associated with the proposed increase in the cooling water TDS level for the cooling tower.

A similar conclusion is reached regarding cooling tower $PM_{2.5}$ ambient impacts, with the cooling tower impacts alone being well below ambient air quality standards while background levels exceed the standards. In addition, the cooling tower $PM_{2.5}$ impacts are well below the PSD significant levels for PM_{10} (5.0 $\mu g/m^3$ and 1.0 $\mu g/m^3$), which is also an indication of negligible impacts (no significant impact levels have been adopted for $PM_{2.5}$). Consequently, there are no new significant $PM_{2.5}$ ambient impacts associated with the proposed increase in the cooling water TDS level for the cooling tower.

3.1.3 Mitigation Measures

SMAQMD Rule 201, Section 302 requires that emission offsets be provided on a per-pollutant basis for increases in quarterly emissions from a new or modified emissions unit if the stationary source's post-project potential to emit exceeds the levels specified in Table 3.1-7.

TABLE 3.1-7
Facility-wide Emission Offset Trigger Level

Pollutant	Offset Threshold (lb/quarter)	CPP Facility-Wide Quarterly Potential to Emit (lb/quarter)	Facility-Wide Trigger Level Exceeded?
Gas Turbines			
SOx	13,650	6,229 to 6,368	No
Cooling Tower			
PM_{10}	7,500	39,724 to 40,606	Yes

3.1.3.1 Gas Turbines

As presented in Table 3.1-7, the facility-wide quarterly potential to emit following the net emission increase associated with the combustion of digester gas by the CPP gas turbines does not exceed the emission offset threshold for SOx. Consequently, this Petition to Amend does not trigger emission offset requirements under the SMAQMD regulations.

Regarding mitigation under CEQA, it is important to remember that mitigation for SOx emission increases is typically required by the CEC to mitigate secondary particulate formation. As part of the original 2003 CEC approval of the CPP and as a result of a June 4, 2008 amendment, SFA has been required to provide the following PM_{10} emission reduction credits (ERCs) for the directly emitted PM_{10} emissions for CPP:[2]

- 1st Quarter: 39,550 lb
- 2nd Quarter: 39,991 lb
- 3rd Quarter: 40,429 lb
- 4th Quarter: 40,428 lb

Due to the requirements of the SMAQMD regulations, these PM_{10} ERCs were provided to SMAQMD using an offset ratio of either 1.2:1 or 1.5:1 depending on the distance from the source of the emission offsets and the CPP. Both of these offset ratios are higher than the ratio of 1:1 required by the CEC for CEQA mitigation. Consequently, for CEQA mitigation purposes SFA has provided surplus PM_{10} ERCs (a surplus of 20 to 50 percent depending on the specific ERC in question) for the directly emitted PM_{10}. Based on the lower of the two SMAQMD offset ratios, SFA provided a surplus of PM_{10} ERCs ranging from approximately 7,910 to 8,086 lb/quarter. These levels of surplus PM_{10} ERCs are greater than the proposed increase in quarterly SOx potential to emit shown on Table 3.1-7. Therefore, the PM_{10} ERCs already provided by SFA for the CPP are sufficient to mitigate the proposed increase in the SOx emissions potential to emit and no further mitigation is necessary for CEQA purposes.

3.1.3.2 Cooling Tower

As shown in Table 3.1-7, the facility-wide quarterly potential to emit exceeds the SMAQMD emission offset threshold for PM_{10}. Consequently, the next step is to determine the amount of PM_{10} emission offsets required for the proposed increase in the cooling water TDS level for the CPP cooling tower. Under Rule 201, Section 418, the amount of PM_{10} emission offsets is calculated on a pounds/quarter basis for each emissions unit. For modifications, this calculation is done by subtracting the historic potential emissions (for fully offset units like the CPP cooling tower, this is equal to the current SMAQMD PTO limits) from the proposed potential emissions for a modified emissions unit. Using the calculation approach described above, the proposed change in the cooling tower TDS level results in a net quarterly PM_{10} emission increase from 174 to 178 lb/quarter. Therefore, SFA must obtain PM_{10} offsets to cover this net emission increase. SFA has access to sufficient emission offsets for this Petition to Amend. Tentatively, SMAQMD ERC Certificate 07-01030 will be used to comply with the emission offset requirements. Providing these additional PM_{10} ERCs also represents the CEQA mitigation requirements under the CEC process.

3.1.3.3 Perlite Storage Silo Dust Collector

As discussed previously, the PM_{10} emissions estimated for the small dust collector installed on the perlite storage silo are approximately 2.6 lb/quarter. As with the PM_{10} emission increase associated with the cooling tower, SFA must obtain PM_{10} offsets to cover this net emission increase. Tentatively, SMAQMD ERC Certificate 07-01030 will be used to comply with the emission offset requirements. Providing these additional PM_{10} ERCs also represent the CEQA mitigation required under the CEC process.

[2] SMAQMD Permit to Operate for CPP Gas Turbines revised 05/06/2010, Attachment C.

3.1.4 Consistency with LORS

The 2003 Commission Decision approving the CPP found the project to be in compliance with all applicable LORS. As described in this Petition to Amend, the modifications proposed for CPP are consistent with all applicable LORS, and the Petition to Amend will not alter the assumptions or conclusions made in the Commission Decision for the CPP. As discussed in Section 3.1.1, since the Commission Decision for the CPP in 2003, there have been several new air quality regulatory developments that may apply to the CPP modifications. The applicability of and corresponding compliance with these new air quality regulations to the proposed CPP modifications are discussed in the following paragraphs. It should also be noted that a complete air quality regulatory analysis of the proposed CPP modifications is included in the application to modify the SMAQMD PTOs for the CPP gas turbines and cooling tower that was submitted to the SMAQMD on August 24, 2010. A copy of the SMAQMD application is included as Appendix E.

3.1.4.1 NSPS for Gas Turbines

As discussed previously, the federal NSPS for gas turbines (40 CFR 60, Subpart GG) currently applies to the gas turbines at the CPP. A new gas turbine NSPS was adopted by EPA that applies to gas turbines installed or modified after February 18, 2005 (40 CFR 60, Subpart KKKK). Under the NSPS regulations, a modification to a subject piece of equipment occurs if there is a physical or operational change that results in an increase in the hourly potential to emit for either NOx or SOx. As shown previously in Table 3.1-2, there is an expected increase in the hourly SOx potential to emit. However, there is an exemption from the new NSPS requirements if the equipment modification consists solely of the use of an alternative fuel (see 40 CFR 60.14.e.4). Because there are no physical changes necessary at the CPP to use blended gas, the proposed combustion of the blended gas by the CPP gas turbines appears to qualify for this exemption. As such, the proposed use of digester gas by the CPP gas turbines would not trigger the new gas turbine Subpart KKKK NSPS requirements.

3.1.4.2 $PM_{2.5}$ NSR Permitting Regulation

Because $PM_{2.5}$ has not yet been incorporated into the SMAQMD NSR regulations, this pollutant is covered by the Federal NSR regulations. As discussed above, in a May 16, 2008 Federal Register notice, EPA clarified that while local agencies are amending their permit programs to incorporate $PM_{2.5}$, beginning on July 15, 2008, EPA requires new major sources or major modifications of $PM_{2.5}$ located in $PM_{2.5}$ nonattainment areas to undergo NSR permitting via 40 CFR 51, Appendix S. While the CPP is located in a Federal $PM_{2.5}$ nonattainment area, as shown above on Table 3.1-5 the facility-wide $PM_{2.5}$ potential to emit for CPP (limited by the PM_{10} annual emission limit), both before and after the proposed increase in the cooling water TDS level, is well below the federal NSR major source threshold for $PM_{2.5}$ of 100 tons/year. Therefore, the federal NSR regulations for $PM_{2.5}$ do not apply to the proposed modifications to CPP.

3.1.4.3 PSD Greenhouse Gas Tailoring Regulation

As discussed previously, under the GHG tailoring regulation and subsequent EPA guidance documents, beginning on July 1, 2011, existing major sources of GHG emissions that undergo a modification that increases GHG emissions by 75,000 tons/year CO_{2e} are subject to PSD review. It is expected that the CPP modifications will receive final permit approval before July 1, 2011, and therefore, will not be subject to this new GHG PSD trigger level. Nonetheless, with respect to the proposed modifications to the CPP, the combustion of digester gas by the CPP gas turbines will increase the CO_2 emissions for these units solely due to the pass-through of the CO_2 in the digester gas, and this increase will not exceed 75,000 tons/year. The following calculation of this increase in GHG emissions is based on a digester gas CO_2 content of approximately 40 percent by volume.

(2500 scfm) x 0.4 x (lb-mol/385 scf) x (44 lb CO_2/lb-mol) x (60 min/hr) x
(8760 hr/yr) x (ton/2000 lb) = <u>30,034 tons/yr of CO_2</u>

As shown by this calculation, the GHG emission increase associated with the combustion of digester gas by the CPP gas turbines is below the PSD trigger level of 75,000 tons/year. Therefore, with respect to GHG emissions, the proposed combustion of digester gas by the CPP gas turbines is not subject to PSD review.

3.1.4.4 New Ambient Air Quality Standards

As discussed in Section 3.1.1, there are new NAAQS for $PM_{2.5}$ and SO_2. In addition, there are new SAAQS for PM_{10} and $PM_{2.5}$. As discussed in Section 3.1.2, these new air quality standards were included in the ambient impact analysis performed for the proposed CPP modifications. This analysis shows that there will be no significant ambient impacts associated with this Petition to Amend.

3.1.4.5 GHG Emissions

As discussed previously, the combustion of digester gas by the CPP gas turbines will increase the CO_2 emissions for these units solely due to the pass-through of the CO_2 in the digester gas resulting in a GHG emission increase at CPP of approximately 30,034 tons/year of CO_2. Because the digester gas is already combusted at the CVFA facility and SRWTP, there is no cumulative increase in GHG emissions from combusting the digester gas at CPP. Thus, the combustion of digester gas by the CPP gas turbines would not worsen current conditions and would not result in any new impacts that are cumulatively significant with respect to GHG emission impacts.

Therefore, the proposed modifications to the CPP will remain consistent with all applicable LORS related to Air Quality.

3.1.5 Conditions of Certification

SFA requests approval of the following revisions to COCs AQ-17, AQ-18, AQ-19, and AQ-24, which were most recently revised in 2007 (CEC, 2007). Requested changes are shown in ~~strikeout~~/<u>underline</u>.

In addition to the requested changes to the air quality COCs associated with the proposed use of blended gas and increase in the cooling water TDS levels, it will also be necessary to revise the COCs to account for the installation of a small dust collector on the CPP membrane water filtration system. However, because the SMAQMD has not yet issued the permit for this dust collector, at this point it is not possible to include these changes below.

AQ-17 Emissions from the following equipment shall not exceed the following limits, not including periods containing start-ups and short-term excursions as defined in condition AQ-26.

Pollutant	Maximum Allowable Emissions	
	CTG #1 (lb/hr)	**CTG #2 (lb/hr)**
NOx	13.51 [a]	13.51 [a]
CO	16.46 [b]	16.46 [b]
ROC	3.30 [c]	3.30 [c]
SOx	~~1.31~~ 1.69 [d,f]	~~1.31~~ 1.69 [d,f]
PM_{10}	9.00 [e]	9.00 [e]

[a] Based on data submitted in the application and is monitored by the turbine's NOx CEM system (1 hour average).
[b] Based on data submitted in the application and is monitored by the turbine's CO CEM system (3 hour average)
[c] Based on a turbine ROC emission factor of 0.00177 lb/mmbtu and firing at full capacity.
[d] During 100% natural gas combustion, based on a turbine SOx emission factor of 0.00071 lb/mmbtu and firing at full capacity.
[e] Based on a turbine PM10 emission factor of 0.00483 lb/mmbtu and firing at full capacity.
[f] During blended gas combustion, based on a turbine SOx emission factor of 0.000906 lb/mmbtu of firing at full capacity.

Verification: As part of the quarterly and annual compliance reports, the project owner shall include information on the date, time, and duration of any violation of this permit condition.

AQ-18 Emissions of NOx, CO, ROC, SOx, and PM_{10} from Phase 1 of the CPP facility including start-ups and shut-downs shall not exceed the following limits.

Pollutant	Maximum Allowable Emissions			
	CTG #1	**CTG #2**	**Cooling Tower**	**Total**
NOx	523.7	523.7	NA	1,047.4
CO	3,051.7	3,051.7	NA	6,103.3
ROC	117.3	117.3	NA	234.6
SOx	~~31.4~~ 40.6	~~31.4~~ 40.6	NA	~~62.9~~ 72.1
PM_{10}	216.0	216.0	~~7.4~~ 9.4	~~439.4~~ 441.4

Verification: As part of the quarterly and annual compliance reports, the project owner shall include information on the date, time, and duration of any violation of this permit condition.

AQ-19 Emissions of NOx, CO, ROC, SOx, and PM_{10} from Phase 1 of the CPP facility including start-ups and shut-downs shall not exceed the following limits.

	Maximum Allowable Emissions				
Pollutant	**Qtr 1 (lb/quarter)**	**Qtr 2 (lb/quarter)**	**Qtr 3 (lb/quarter)**	**Qtr 4 (lb/quarter)**	**Total (lb/year)**
NOx	62,021	62,643	63,265	63,265	251,194
CO	147,929	148,687	149,444	149,444	595,505
ROC	14,807	14,958	15,110	15,110	59,986
SOx	~~5,405~~ <u>6,229</u>	~~5,465~~ <u>6,299</u>	~~5,525~~ <u>6,368</u>	~~5,525~~ <u>6,368</u>	~~21,922~~ <u>25,264</u>
PM_{10}	~~39,550~~ <u>39,724</u>	~~39,989~~ <u>40,165</u>	~~40,428~~ <u>40,606</u>	~~40,428~~ <u>40,606</u>	~~160,395~~ <u>161,101</u>

<u>**Verification**</u>**:** As part of the quarterly and annual compliance reports, the project owner shall include information on the date, time, and duration of any violation of this permit condition.

AQ-24 The total dissolved solids content of the circulating cooling water shall not exceed ~~800~~ <u>1,500</u> ppmw, averaged over any consecutive three-hour period.

3.2 Public Health

3.2.1 Environmental Baseline Information

This Petition to Amend does not require changes to the Public Health environmental baseline information as described in the AFC.

3.2.2 Environmental Consequences

3.2.2.1 Cooling Tower

While the proposed CPP modifications include an increase in the cooling water TDS level, there is no expected increase in toxic air contaminant (TAC) emissions associated with this change. Consequently, there is no need to analyze the TAC impacts for the CPP cooling tower.

3.2.2.2 Gas Turbines

For the proposed combustion of digester gas in the CPP gas turbines, there may be TAC emissions associated with the combustion of this gas. EPA AP-42 TAC emission factors for the combustion of digester gas by gas turbines were used to calculate the net TAC emission increase associated with the combustion of digester gas at CPP. In addition to the TAC emissions associated with digester gas combustion discussed in Section 3.1, there may be a small increase (approximately 0.5 percent increase) in the exhaust flow rate associated with the combustion of digester gas by the CPP gas turbines. Therefore, the corresponding increase in gas turbine ammonia emissions at the maximum permitted ammonia slip rate due to this small increase in the exhaust flow rate was also examined. The detailed TAC emission calculations for the CPP gas turbines associated with the combustion of digester gas are included in Appendix F. Some of these compounds have both carcinogenic and non-cancer health effects.

Under the SMAQMD's toxics policy, modified projects with TAC emissions are required to perform a screening level risk assessment. To determine whether the proposed combustion of digester gas in the CPP gas turbine will result in a significant change in the either the carcinogenic or non-cancer health impacts for the CPP, a screening level health risk assessment was performed for the net increase in TAC emissions for the CPP gas turbines. This analysis was prepared using the California Air Resources Board Hotspots Analysis and Reporting Program (HARP) computer model.

Per guidance from the SMAQMD, the results from the above HARP analysis were added to the results of the previous CPP HRA to determine the cumulative health impacts associated with the combustion of digester gas at CPP. As presented in Table 3.2-1, the cumulative HRA results remain below the SMAQMD significance levels of 1×10^{-6} for cancer risk and 1.0 for chronic and acute health hazard indices. Therefore, the cumulative health impacts associated with the proposed combustion of digester gas in the gas turbines at CPP are expected to be less than significant. The detailed HARP modeling results are included in Appendix G.

TABLE 3.2-1
HRA Results, CPP Gas Turbines

	Cancer Risk	Chronic Health Hazard Index	Acute Health Hazard Index
Previous HRA			
CEC Final Staff Assessment[a]	0.67×10^{-6}	0.015	0.10
SMAQMD Final Determination of Compliance[b]	0.67×10^{-6}	0.015	0.10
Predicted Impacts Associated with Digester Gas Combustion			
Maximum Impacts from Screening Level HRA	1.29×10^{-8}	0.00005	0.00008
Predicted Cumulative Impacts			
Predicted Impacts from Previous HRA Plus Impacts Associated with Digester Gas Combustion	0.67×10^{-6}	0.015	0.10

Notes:
[a]CEC Final Staff Assessment for the proposed Cosumnes Power Plant (01-AFC-19), February 11, 2003, Public Health Table 2 and page 4.7-13.

[b]SMAQMD Final Determination of Compliance for the proposed Cosumnes Power Plant, October 9, 2002, page 22 of 24.

3.2.3 Mitigation Measures

The CPP impacts on public health with the proposed modifications are less than significant, and, therefore, will not require additional mitigation measures.

3.2.4 Consistency with LORS

The modifications to the CPP fuel supply and water quality will remain consistent with all applicable LORS related to public health.

3.2.5 Conditions of Certification

The proposed modifications do not require changes to the COCs for public health.

3.3 Waste Management

3.3.1 Environmental Baseline Information

This Petition to Amend does not require changes to the Waste Management environmental baseline information as described in the AFC.

3.3.2 Environmental Consequences

The CPP modifications proposed as part of the Petition to Amend, specifically the increase in TDS levels in the cooling tower recirculation water, would result in a decrease in the quantity of cake solids generated by the ZLD system. The quantity of cake solids would decrease because SFA would not be required to remove the same quantity of solids needed to maintain compliance with the more restrictive TDS limit. Furthermore, the proposed CPP modifications would not modify the composition of waste generation relative to the discussion presented in the AFC and the 2009 Petition to Amend. Therefore, this Petition to Amend will not result in waste management impacts different than those previously analyzed by the CEC.

3.3.3 Mitigation Measures

The proposed CPP modifications will not create a significant waste management impact and will not require additional mitigation measures.

3.3.4 Consistency with LORS

CPP intends to continue the practice of testing the salt cake for appropriate disposal. Therefore, the project conforms to applicable laws related to hazardous materials management.

3.3.5 Conditions of Certification

The proposed modifications do not require changes to the COCs for waste management.

3.4 Water Resources

3.4.1 Environmental Baseline Information

This Petition to Amend does not require changes to the Water Resources environmental baseline information as described in the 2009 Petition to Amend.

3.4.2 Environmental Consequences

SFA has determined that CPP is unable to maintain adequate or required cooling tower water levels during high-temperature days because of high evaporation rates based on an instantaneous peak flow limit of 2,500 gpm. As a result, SFA is required to curtail load during peak generation demand on high-temperature days. To maximize peak generation, SFA requests the removal of the peak flow language included in WATER RES-1. The removal of the peak flow restriction will not cause an increase in the annual water usage or result in a conflict with the applicable LORS. Therefore, this Petition to Amend will not result in water resource impacts different than those analyzed by the CEC during the licensing of the project.

3.4.3 Mitigation Measures

The CPP impacts on water resources with the proposed modifications are less than significant, and therefore, will not require additional mitigation measures.

3.4.4 Consistency with LORS

The proposed changes to the fuel supply and amendment to COC WATER RES-1 will remain consistent with all applicable LORS related to Water Resources.

3.4.5 Conditions of Certification

SFA requests approval of the following revision to the CEC COC WATER RES-1. Requested changes are shown in ~~strikeout~~/underline.

WATER RES-1 Total water use by the project owner for the operation of the project and all landscape irrigation of the CPP site shall not exceed an annual average of 2,663 AFY over any three consecutive calendar years~~, nor exceed a peak flow of 2,500 gpm~~.

Verification: The owner shall maintain daily records of water use from each source (FSC, Rancho Seco Reservoir and/or reclaimed if used) and as part of its annual compliance report shall submit a water use summary to the CPM on an annual basis for the life of the project. ~~The owner shall track its water use (from any source) on a daily basis and shall notify the CPM immediately upon exceeding, or upon forecast to exceed, the peak flow of 2,500 gpm.~~ The annual average 2,663 AFY shall be calculated based upon any consecutive three-year period starting with the first full calendar year of operation and shall not exceed the average annual consumption for any three consecutive years for the life of the project.

SECTION 4.0

Potential Effects on the Public

This section discusses the potential effects on the public that may result from the modifications proposed in this Petition to Amend, in accordance with CEC Siting Regulations (Title 20, CCR, Section 1769(a)(1)(G)).

With the implementation of the modifications proposed, the project would have no adverse effect on the public. As previously mentioned, no construction activity is associated with the modifications, and the impacts to air quality, public health, waste management, and water resources are less than significant. Therefore, no adverse effects on the public will occur because of the changes to the project as proposed in this Petition to Amend.

SECTION 5.0

List of Property Owners

This section lists the property owners in accordance with the CEC Siting Regulations (Title 20, CCR, Section 1769(a)(1)(H)). The property owners whose property is located within 1,000 feet of CPP has not changed since the AFC was approved. Therefore, the list of property owners from the AFC is included as Appendix H.

SECTION 6.0

Potential Effects on Property Owners, the Public, and Parties in the Proceeding

This section addresses potential effects of the project changes proposed in this Petition to Amend on nearby property owners, the public, and parties in the application proceeding, in accordance with CEC Siting Regulations (Title 20, CCR, Section 1769 (a)(1)(I)).

The project as modified will not differ significantly in potential effects on adjacent land owners, compared with the project as previously certified. As previously mentioned, no construction activity is associated with the modifications, and the impacts to air quality, public health, waste management, and water resources are less than significant. The project, therefore, would have no adverse effects on nearby property owners, the public, or other parties in the application proceeding.

SECTION 7.0

References

California Air Resources Board. (ARB). 2010. Top 4 Summary Pollutant Web page. Available online at: http://www.arb.ca.gov/adam/topfour/topfour1.php

California Energy Commission (CEC). 2003a. Final Commission Decision on Cosumnes Power Plant. California Energy Commission, Sacramento, California. September.

CEC. 2003b. Final Staff Assessment for the Cosumnes Power Plant, Part 1. California Energy Commission, Sacramento, California. February.

CEC. 2008. Order to Amend the Energy Commission Decision to Change Three Air Quality Conditions of Certification and Project Description for the Cosumnes Power Plant. June.

CEC. 2009. Approval of Modification to Upgrade the Zero Liquid Discharge System for the Cosumnes Power Plant. April 16.

Sacramento Municipal Utility District (SMUD). 2001. Application for Certification for the Cosumnes Power Plant. Submitted to the California Energy Commission. September.

United States Environmental Protection Agency. (EPA). 2010a. EPA AirData Web site for Sacramento County, California. Available online at: http://www.epa.gov/air/data/repsco.html?co~06067~Sacramento%20Co%2C%20California.

EPA. 2010b. Appendix 3a: 2005-2007 and 2020 Design Values. Available online at : http://www.epa.gov/ttn/ecas/regdata/RIAs/fso2ria100602ch3a.pdf

Appendix A
Detailed Gas Mixture Analyses

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
Natural Gas and Digester Gas Properties (Natural gas)

Natural gas HHV (Btu/scf) =	1019
Digester gas HHV (Btu/scf) [1] =	617.55

Natural Gas

Component	Component	Volume Percent [4]	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	95.9114%	16.043	95.91	383.65	0.00	0.00	0.00	0.918	1013	912.93	23,879	21,520	15.39	1.1096
C2H6	**Ethane**	2.3068%	30.070	4.61	13.84	0.00	0.00	0.00	0.041	1792	1640.42	22,320	20,432	0.69	1.0924
C3H8	**Propane**	0.1556%	44.097	0.47	1.24	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.07	1.0861
N-C4H10	**N-Butane**	0.0222%	58.125	0.09	0.22	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0171%	58.125	0.07	0.17	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0020%	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0031%	72.152	0.02	0.04	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0074%	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0000%	31.998	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
N2		0.7434%	28.014	0.00	0.00	1.49	0.00	0.00	0.012					0.21	
CO2		0.8307%	44.009	0.83	0.00	0.00	1.66	0.00	0.022					0.37	
H2		0.0000%	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0000%	18.015	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
Dry Basis															
Total		100.0%		102.05	399.29	1.49	1.66	0.00	504.49	1018.83	918.88	22,982	20,728	16.76	1.1088
		Mol Wt		12.011	1.008	14.007	15.999	32.064							
gms/100 moles				1225.73	402.48	20.83	26.58	0.01	1675.64						
		Wt %		73.15%	24.02%	1.24%	1.59%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = 8649.981

1. Black & Veatch Corporation, Digester Gas Use for the Cosumnes Power Plant, January 2009, Appendix A, Gas Sampling Test Reports

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
Case 1: One GT 50% Load

Gas turbine 50% load heat input per unit HHV (MMBtu/hr) [1] =	1015.7
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	15100
Total blended gas flow rate (scfm) =	17600

Component	Component	Volume Percent	Natural Gas Flow rate (scfm)	Digester Gas Flow Rate (scfm)	Blended Gas Flow Rate (scfm)	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	90.9641%	14482.75	1526.95	16009.70	16.043	90.96	363.86	0.00	0.00	0.00	0.804	1013	912.93	23,879	21,520	14.59	1.1096
C2H6	**Ethane**	1.9793%	348.33	0.02	348.35	30.070	3.96	11.88	0.00	0.00	0.00	0.033	1792	1640.42	22,320	20,432	0.60	1.0924
C3H8	**Propane**	0.1338%	23.50	0.05	23.54	44.097	0.40	1.07	0.00	0.00	0.00	0.003	2590	2384.70	21,661	19,944	0.06	1.0861
N-C4H10	**N-Butane**	0.0193%	3.35	0.04	3.39	58.125	0.08	0.19	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0150%	2.58	0.05	2.63	58.125	0.06	0.15	0.00	0.00	0.00	0.000	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0018%	0.30	0.01	0.32	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0027%	0.47	0.01	0.48	72.152	0.01	0.03	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0069%	1.12	0.10	1.22	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0180%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.04	0.00	0.000					0.01	
N2		0.7241%	112.25	15.19	127.44	28.014	0.00	0.00	1.45	0.00	0.00	0.011					0.20	
CO2		6.0816%	125.44	944.93	1070.37	44.009	6.08	0.00	0.00	12.16	0.00	0.147					2.68	
H2		0.0014%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0514%	0.00	9.05	9.05	18.015	0.00	0.10	0.00	0.05	0.00	0.001					0.01	
Dry Basis																		
Total		99.9%	15100	2500	17600		101.61	377.40	1.45	12.25	0.00	492.71	962.56	868.07	20,033	18,067	18.16	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1220.41	380.42	20.29	196.00	0.02	1817.14						
					Wt %		67.16%	20.94%	1.12%	10.79%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = <u>8693.381</u>

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
Case 2: One Gas Turbine at Max Load

Gas turbine maximum heat input per unit HHV (MMBtu/hr) [1] =	1866
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	29010
Total blended gas flow rate (scfm) =	31510

Component	Component	Volume Percent	Natural Gas Flow rate (scfm)	Digester Gas Flow Rate (scfm)	Blended Gas Flow Rate (scfm)	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	93.1480%	27823.79	1526.95	29350.74	16.043	93.15	372.59	0.00	0.00	0.00	0.852	1013	912.93	23,879	21,520	14.94	1.1096
C2H6	**Ethane**	2.1239%	669.20	0.02	669.22	30.070	4.25	12.74	0.00	0.00	0.00	0.036	1792	1640.42	22,320	20,432	0.64	1.0924
C3H8	**Propane**	0.1434%	45.14	0.05	45.19	44.097	0.43	1.15	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.06	1.0861
N-C4H10	**N-Butane**	0.0206%	6.44	0.04	6.48	58.125	0.08	0.21	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0159%	4.96	0.05	5.01	58.125	0.06	0.16	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0019%	0.58	0.01	0.59	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0029%	0.90	0.01	0.91	72.152	0.01	0.03	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0071%	2.15	0.10	2.25	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0101%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.02	0.00	0.000					0.00	
N2		0.7326%	215.66	15.19	230.85	28.014	0.00	0.00	1.47	0.00	0.00	0.012					0.21	
CO2		3.7636%	240.99	944.93	1185.92	44.009	3.76	0.00	0.00	7.53	0.00	0.094					1.66	
H2		0.0008%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0287%	0.00	9.05	9.05	18.015	0.00	0.06	0.00	0.03	0.00	0.000					0.01	
Dry Basis																		
Total		100.0%	29010	2500	31510		101.80	387.06	1.47	7.58	0.00	497.91	987.41	890.51	21,282	19,193	17.54	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1222.76	390.16	20.52	121.21	0.02	1754.67						
					Wt %		69.69%	22.24%	1.17%	6.91%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = 8671.464

Case 3: Both Gas Turbine at 50% load

Gas turbine 50% load heat input per unit HHV (MMBtu/hr) [1] =	1015.7
Total heat input HHV (MMBtu/hr) =	2031
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	31716
Total blended gas flow rate (scfm) =	34216

Component	Component	Volume Percent	Natural Gas Flow rate (scfm)	Digester Gas Flow Rate (scfm)	Blended Gas Flow Rate (scfm)	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	93.3665%	30418.88	1526.95	31945.83	16.043	93.37	373.47	0.00	0.00	0.00	0.857	1013	912.93	23,879	21,520	14.98	1.1096
C2H6	**Ethane**	2.1383%	731.62	0.02	731.64	30.070	4.28	12.83	0.00	0.00	0.00	0.037	1792	1640.42	22,320	20,432	0.64	1.0924
C3H8	**Propane**	0.1444%	49.35	0.05	49.40	44.097	0.43	1.15	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.06	1.0861
N-C4H10	**N-Butane**	0.0207%	7.04	0.04	7.08	58.125	0.08	0.21	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0160%	5.42	0.05	5.47	58.125	0.06	0.16	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0019%	0.63	0.01	0.65	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0029%	0.98	0.01	1.00	72.152	0.01	0.03	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0072%	2.35	0.10	2.45	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0093%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.02	0.00	0.000					0.00	
N2		0.7335%	235.77	15.19	250.96	28.014	0.00	0.00	1.47	0.00	0.00	0.012					0.21	
CO2		3.5317%	263.46	944.93	1208.39	44.009	3.53	0.00	0.00	7.06	0.00	0.089					1.55	
H2		0.0007%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0264%	0.00	9.05	9.05	18.015	0.00	0.05	0.00	0.03	0.00	0.000					0.00	
Dry Basis																		
Total		100.0%	31716	2500	34216		101.82	388.03	1.47	7.11	0.00	498.43	989.89	892.75	21,412	19,310	17.48	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1223.00	391.13	20.55	113.73	0.02	1748.42						
					Wt %		69.95%	22.37%	1.18%	6.50%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = 8669.344

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
Case 4: One Gas Turbine at 50% load and One Gas Turbine at Max Load

Gas turbine 50% load heat input per unit HHV (MMBtu/hr) [1] =	1015.7
Gas turbine maximum heat input per unit HHV (MMBtu/hr) [2] =	1866
Total heat input HHV (MMBtu/hr) =	2882
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	45625
Total blended gas flow rate (scfm) =	48125

Component	Component	Volume Percent	Natural Gas Flow rate (scfm)	Digester Gas Flow Rate (scfm)	Blended Gas Flow Rate (scfm)	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	94.1021%	43759.93	1526.95	45286.88	16.043	94.10	376.41	0.00	0.00	0.00	0.874	1013	912.93	23,879	21,520	15.10	1.1096
C2H6	**Ethane**	2.1870%	1052.49	0.02	1052.51	30.070	4.37	13.12	0.00	0.00	0.00	0.038	1792	1640.42	22,320	20,432	0.66	1.0924
C3H8	**Propane**	0.1476%	70.99	0.05	71.04	44.097	0.44	1.18	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.07	1.0861
N-C4H10	**N-Butane**	0.0211%	10.13	0.04	10.17	58.125	0.08	0.21	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0163%	7.80	0.05	7.85	58.125	0.07	0.16	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0019%	0.91	0.01	0.93	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0030%	1.41	0.01	1.43	72.152	0.01	0.04	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0072%	3.38	0.10	3.48	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0066%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.01	0.00	0.000					0.00	
N2		0.7363%	339.18	15.19	354.37	28.014	0.00	0.00	1.47	0.00	0.00	0.012					0.21	
CO2		2.7510%	379.01	944.93	1323.94	44.009	2.75	0.00	0.00	5.50	0.00	0.070					1.21	
H2		0.0005%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0188%	0.00	9.05	9.05	18.015	0.00	0.04	0.00	0.02	0.00	0.000					0.00	
Dry Basis																		
Total		100.0%	45625	2500	48125		101.89	391.28	1.47	5.53	0.00	500.18	998.26	900.30	21,855	19,711	17.27	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1223.79	394.41	20.63	88.54	0.02	1727.38						
					Wt %		70.85%	22.83%	1.19%	5.13%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = <u>**8662.303**</u>

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
<u>**Case 5: Both Gas Turbine at Baseload**</u>

Gas turbine annual average heat input for two units HHV (MMBtu/hr) [1] =	3577
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	56993
Total blended gas flow rate (scfm) =	59493

Component	Component	Volume Percent	Natural Gas Flow rate (scfm)	Digester Gas Flow Rate (scfm)	Blended Gas Flow Rate (scfm)	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	94.4478%	54662.77	1526.95	56189.72	16.043	94.45	377.79	0.00	0.00	0.00	0.882	1013	912.93	23,879	21,520	15.15	1.1096
C2H6	**Ethane**	2.2099%	1314.71	0.02	1314.74	30.070	4.42	13.26	0.00	0.00	0.00	0.039	1792	1640.42	22,320	20,432	0.66	1.0924
C3H8	**Propane**	0.1491%	88.68	0.05	88.73	44.097	0.45	1.19	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.07	1.0861
N-C4H10	**N-Butane**	0.0213%	12.65	0.04	12.69	58.125	0.09	0.21	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0165%	9.75	0.05	9.79	58.125	0.07	0.16	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0019%	1.14	0.01	1.15	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0030%	1.77	0.01	1.78	72.152	0.01	0.04	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0073%	4.22	0.10	4.32	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0053%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.01	0.00	0.000					0.00	
N2		0.7377%	423.69	15.19	438.88	28.014	0.00	0.00	1.48	0.00	0.00	0.012					0.21	
CO2		2.3841%	473.44	944.93	1418.37	44.009	2.38	0.00	0.00	4.77	0.00	0.061					1.05	
H2		0.0004%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0152%	0.00	9.05	9.05	18.015	0.00	0.03	0.00	0.02	0.00	0.000					0.00	
Dry Basis																		
Total		100.0%	56993	2500	59493		101.92	392.81	1.48	4.79	0.00	501.00	1002.19	903.85	22,068	19,902	17.17	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1224.16	395.96	20.67	76.70	0.02	1717.50						
					Wt %		71.28%	23.05%	1.20%	4.47%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = <u>**8659.044**</u>

Appendix B
Current Compliance Margins Tables

Table 3.1-2-1
Hourly Emissions Compliance Margins
CPP Gas Turbines

	Permit limit [1] (lb/hr)	2010 [2]	2009 [3]	2008 [4]	2007 [4]	2006 [4]
	UNIT 2					
CO	16.46	77%	81%	80%	87%	77%
NOx	13.51	37%	40%	32%	21%	16%
ROC	3.30	87%	82%	83%	90%	74%
ROC	0.0018 lbs/MMBtu	86%	81%	81%	88%	72%
	UNIT 3					
CO	16.46	78%	83%	81%	89%	83%
NOx	13.51	35%	41%	39%	23%	30%
ROC	3.30	87%	72%	92%	94%	75%
ROC	0.0018 lbs/MMBtu	86%	70%	91%	94%	73%

Notes:
1. Hourly emission limits based on SMAQMD Permit to Operate (PTO), re-issued 5/6/2010, Condition 9.
2. Hourly compliance margins for CO and NOx are calculated based on hourly CEMS data. Hourly compliance margins for ROC are calculated based on 2010 source test results.
3. Hourly compliance margins for CO and NOx are calculated based on hourly CEMS data. Hourly compliance margins for ROC are calculated based on 2009 source test results.
4. Hourly compliance margins for all pollutants are calculated based on source test results.

Table 3.1-2-2
Daily Emissions Compliance Margins

	Permit limit [1] (lbs/day)	2010 [2]	2009 [3]	2008 [3]	Permit limit [1] (lbs/day)	2010 [2]	2009 [3]	2008 [3]	Permit limit [1] (lbs/day)	2009 [3]	2008 [3]
	UNIT 2				UNIT 3				Facility		
CO	3,051.7	97%	97%	96%	3,051.7	97%	97%	97%	6,103.3	97%	97%
NOx	523.7	61%	62%	61%	523.7	61%	62%	65%	1,047.4	67%	65%
ROC	117.3	--	43%	41%	117.3	--	43%	47%	234.6	51%	48%

Notes:
1. Daily emission limits based on SMAQMD Permit to Operate (PTO) for Cosumnes Power Plant, re-issued 5/6/2010, Condition 10.
2. Daily compliance margins for CO and NOx are calculated based on hourly CEMS emissions data from 1/1/2010 to 3/31/2010.
3. Daily compliance margins are calculated based on daily emission report data.

Table 3.1-2-3 Facility-Wide Quarterly Emissions Compliance Margins								
	2009 [2]				2008 [3]			
	1st QT	2nd QT	3rd QT	4th QT	1st QT	2nd QT	3rd QT	4th QT
CO	89%	90%	91%	89%	88%	90%	91%	88%
NOx	48%	60%	43%	50%	43%	48%	47%	49%
ROC	27%	44%	18%	29%	24%	27%	23%	29%

Notes:

1. Facility quarterly emissions include Units 2 & 3 and cooling tower.
2. Compliance margin calculations based on quarterly emission limits in SMAQMD Permit to Operate (PTO) for Cosumnes Power Plant, re-issued 5/6/2010, and quarterly facility emissions reported in 2009 4th Quarter Compliance Report for CPP.
3. Compliance margin calculations based on quarterly emission limits in SMAQMD Permit to Operate (PTO) for Cosumnes Power Plant, re-issued 5/6/2010, and quarterly facility emissions reported in 2008 4th Quarter Compliance Report for CPP.

Table 3.1-2-4 Facility-Wide Annual Facility Emissions Compliance Margins			
	Permit limit [1,2] (lbs/year)	2009 [3]	2008 [4]
CO	595,505	90%	89%
NOx	251,194	50%	47%
ROC	59,986	30%	26%

Notes:

1. Facility annual emissions include Units 2 & 3.
2. Annual emission limits based on SMAQMD Permit to Operate (PTO) for Cosumnes Power Plant, re-issued 5/6/2010, Condition 11.
3. Compliance margin calculations based on annual facility emissions reported in 2009 4th Quarter Compliance Report for CPP.
4. Compliance margin calculations based on annual facility emissions reported in 2008 4th Quarter Compliance Report for CPP.

Appendix C
PM_{10} Emissions Calculation for the CPP Cooling Tower

Calculation of PM, PM_{10}, and $PM_{2.5}$ Emissions for the CPP Cooling Tower[1]

Wet cooling towers like the CPP cooling tower cool water by evaporating a portion of the water through contact with the air. The nature of the contact is such that water droplets are entrained in the air and are carried out of the cooling tower. The entrained droplets are called "drift." Modern cooling towers have high efficiency drift eliminators which recover much of the entrained water. The high-efficiency drift eliminator installed on the CPP cooling tower is a Marley Model TU12 which reduces drift to less than 0.0005% of circulated cooling tower water.

The water that is entrained contains dissolved solids. When a water droplet that contains solids evaporates, the dissolved solids form a single particle, which remains suspended in the air. The volume of a droplet can be calculated if its diameter is known. The mass of water in the droplet can be calculated from the volume. The mass of solids in the droplet (and the resulting particle) can be calculated from the mass of the water droplet and the concentration of solids in the water. The volume of the particle can be calculated if the density of the solid is known. The diameter of a spherical particle can be calculated from the particle volume. The size of the final aerosol particle depends on the volume fraction of solid material and the droplet diameter as follows:

$$D_s = D_d \times (F_v)^{1/3}$$

Where:

D_s = diameter of solid particle
D_d = diameter of liquid droplet
F_v = volume fraction of solid material

This equation can be converted to calculate the resulting particle diameter for a cooling tower by accounting for the density of the particle:

$$D_s = D_d \times (\rho_d/\rho_s \times TDS/1{,}000{,}000)^{1/3}$$

Where:

D_s = diameter of solid particle, microns
D_d = diameter of liquid droplet, microns
ρ_d = density of droplet = 1 g/cm^3
ρ_s = density of solid particle = 2.2 g/cm^3 for sodium chloride
TDS = total dissolved solids, ppmw

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[1] *This approach for calculating particulate emissions from wet cooling towers is based an identical calculation approach discussed in the following reference documents:*

- *Calculating Realistic PM_{10} Emissions from Cooling Towers, Joel Reisman/Gordon Frisbie, Graystone Environmental, Abstract No. 216, Session No. AM-1b.*
- *Atmospheric Emissions From Evaporative Cooling Towers, Cooling Technology Institute, Wayne Micheletti, Paper Number TP05-05, February 28, 2005.*
- *Victorville 2 Hybrid Power Project (07-AFC-01), CEC Staff Data Request Numbers 1-9, July 23, 2007.*

The above equation predicts the physical diameter of a particle formed from a cooling tower droplet. This equation assumes that a single particle will be formed when a droplet evaporates, because there is no evidence that multiple particles will be formed.

The term "aerodynamic diameter" has been developed by aerosol physicists in order to provide a simple means of categorizing the sizes of particles having different shapes and densities with a single dimension. The aerodynamic diameter is the diameter of a spherical particle having a density of 1 gm/cm^3 that has the same inertial properties (i.e., terminal settling velocity in the gas as the particle of interest). The PM_{10} and $PM_{2.5}$ standards refer to aerodynamic diameter.

Therefore, in order to calculate PM_{10} and $PM_{2.5}$ emissions, the aerodynamic diameter of the cooling tower particles must be calculated as follows:[2]

$$D_a = D_s \times (\rho_s)^{0.5}$$

Where:
D_a = aerodynamic diameter, microns
D_s = diameter of solid particle, microns
ρ_s = density of solid particle = 2.2 g/cm^3 for sodium chloride

The following table represents the predicted mass distribution of drift droplet size for cooling tower drift dispersed from a Marley Model TU12 drift eliminator such as the one installed on the CPP cooling tower. This table was provided by the cooling tower vendor (see copy of vendor information provided with this attachment).

Table 3.1-3-1
Predicted Drift Droplet Size Distribution

Mass in Droplets (%)		Droplet Size (Microns)
0.2	Larger Than	525
1.0	Larger Than	375
5.0	Larger Than	230
10.0	Larger Than	170
20.0	Larger Than	115
40.0	Larger Than	65
60.0	Larger Than	35
80.0	Larger Than	15
88.0	Larger Than	10

[2] *http://www.epa.gov/air/oaqps/eog/bces/module3/diameter/diameter.htm.*

Using the equations described above, a solids density of 2.2 gm/cm^3 (based on the density of sodium chloride), and the droplet size distribution in the previous table, the following particle diameter distribution can be derived:

Table 3.1-3-2 Predicted Particle Aerodynamic Size Distribution		
Mass in Droplets (%)		Aerodynamic Particle Size (Microns)
0.2	Larger Than	68.5
1.0	Larger Than	49.0
5.0	Larger Than	30.0
10.0	Larger Than	22.2
20.0	Larger Than	15.0
40.0	Larger Than	8.5
60.0	Larger Than	4.6
80.0	Larger Than	2.0
88.0	Larger Than	1.3

Based upon this particle size distribution, approximately 67.7% of the particles emitted from the CPP cooling tower will be PM_{10} or smaller. Approximately 26.6% of the particles emitted from the CPP cooling tower will be $PM_{2.5}$ or smaller.

Hourly PM emissions from the CPP cooling tower were calculated using the tower design parameters provided in Table 1 of the main document. PM_{10} and $PM_{2.5}$ fractions were calculated using the mass fractions calculated above. PM, PM_{10}, and $PM_{2.5}$ emissions are shown in Table 3.1-3--3.

Table 3.1-3-3 PM, PM_{10}, and $PM_{2.5}$ Emissions from CPP Cooling Tower[1]	
Pollutant, units	Emissions
PM, lbs/hr	0.58
PM_{10}, lbs/hr	0.39
$PM_{2.5}$, lbs/hr	0.15

[1]Based on 155,000 gal/min, Drift = 0.0005%, TDS = 1,500 ppmw.

SPX Cooling Technologies

Balcke | Hamon Dry Cooling | Marley

COOLING TOWER DRIFT MASS DISTRIBUTION
Excel Drift Eliminators

The following table represents the predicted mass distribution of drift particle size for cooling tower drift dispersed from Marley TU10 and TU12 Excel Drift Eliminators properly installed in a cooling tower.

Mass in Particles (%)		Droplet Size (Microns)
0.2	Larger Than	525
1.0	Larger Than	375
5.0	Larger Than	230
10.0	Larger Than	170
20.0	Larger Than	115
40.0	Larger Than	65
60.0	Larger Than	35
80.0	Larger Than	15
88.0	Larger Than	10

How to read table: Example – 0.2% of the drift will have particle sizes larger than 525 microns.

Marley guarantees the data above for properly installed, undamaged drift eliminators in 'like-new' condition.

Appendix D
SMAQMD Dust Collector Permit Application

SFA
SACRAMENTO MUNICIPAL UTILITY DISTRICT FINANCING AUTHORITY
P.O. Box 15830, Sacramento, CA 95852-1830

Cosumnes Power Plant

September 13, 2010
SFA 10-009

Larry F. Greene
Air Pollution Control Officer
Sacramento Metropolitan Air Quality Management District
777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Re: Cosumnes Power Plant
Application for Permit to Operate
Perlite Storage Silo with Dust Filter

Dear Mr. Greene:

The Sacramento Municipal Utility District Financing Authority (SFA) submits the enclosed Permit to Operate application with initial permit fee in the amount of $1,268 for a perlite storage silo with integrated dust filter at Cosumnes Power Plant (CPP).

Perlite is a naturally occurring volcanic rock material that is processed for a variety of end uses. At CPP, perlite is used to aid filtration of solids from the incoming raw water supply. In response to changes in the quality of CPP's raw water supply from the Folsom South Canal, SFA installed the water treatment system at CPP in October 2009, which included a bulk storage silo for perlite with an integrated dust filtration system. The dust filtration system captures displaced and suspended perlite particulate matter when the storage silo is pneumatically filled via bulk perlite delivery truck. The silo and dust filter operated for brief commissioning purposes in November 2009 to confirm proper function of the equipment. Since July 2010, the silo and dust filter have been operated a few times because CPP's water supply required solids filtration.

Based on operational data collected since July 2010, SFA determined that the perlite storage silo and dust filter might require a Permit to Operate pursuant to Rule 201, and that the SFA could not demonstrate exemption under Section 122 of that rule. As such, SFA contacted Mr. Jorge DeGuzman of your staff by telephone on August 25, 2010, followed by a meeting with Mr. Brian Krebs of your staff on August 27, 2010, to discuss the matter and present information on the perlite storage silo and dust filter. These communications confirmed that the equipment was subject to permitting requirements. On September 3, 2010, SFA received additional guidance from Mr. Krebs that a single Permit to Operate application would suffice for the perlite storage silo with integrated dust filter.

In addition to a Permit to Operate, it is not clear to SFA at this time whether applicable requirements for the perlite storage silo and dust filter must also be incorporated into CPP's Title V federal operating permit. SFA requests guidance and direction from your staff on this matter, including what, if any, additional forms and information are required.

If there are any questions on the enclosed application and supporting information, please contact Stu Husband, Regulatory Compliance Coordinator, at (916) 732-6246.

Sincerely,

Ross Gould, Superintendent
Thermal Generation & Gas Pipeline
Power Generation Department

Enclosures

bcc: Kurt Hook, WGPO
Stu Husband, SMUD
Brad Jones, SMUD
Andrea McGagin, SMUD
Corporate Files
CPP File 1200.14

777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Sacramento Metropolitan
Air Quality Management District

(916) 874-4800
Fax(916)874-4899

FORM G100
APPLICATION FOR AUTHORITY TO CONSTRUCT AND/OR PERMIT TO OPERATE

A SEPARATE APPLICATION AND FORM(S) SPECIFIC TO THE PROCESS OR EQUIPMENT MUST BE COMPLETED FOR **EACH** PROCESS OR PIECE OF EQUIPMENT

A. Both pages of this application must be completed; an original signature (not a facsimile or copy) is required.
B. The appropriate permit fee must be submitted with the application (refer to the SMAQMD Rules or fee schedule).

1. Name of business or organization that is to receive the permit: Sacramento Municipal Utility District Financing Authority (SFA)

Business type: ☐ Sole Proprietorship ☐ Limited Liability Company ☐ Partnership ☐ Corporation ☐ Wholly-owned Subsidiary ☐ Government ☑ Other (Joint Powers Authority)

2. Employer Identification Number (E.I.N.): 68-0329429

3. Mailing address: P.O. Box 15830, MS-B355, Sacramento, CA 95852 (916) 452-3211
NUMBER STREET CITY STATE ZIP CODE PHONE NO.

4. Location Address (where the equipment will be operated, if different than above)
14295 Clay East Road, Herald, CA 95638 (209) 748-5177
NUMBER STREET CITY STATE ZIP CODE PHONE NO.

5. Name of Facility that will Operate the Equipment (if different than above):
DBA: Cosumnes Power Plant

6. Description of equipment/process to be permitted:
Perlite Storage Silo with integrated Dust Filter, Cyclonaire Model #18-DC-36

☐ Constructing/installing new equipment
Estimated startup date for new equipment: ____

☑ Initial permit for existing equipment
Date Operation First Commenced: November 2009

☐ Modification of existing permitted equipment or permit conditions
Estimated completion date for modification: ____ Previous Permit No.: ____

☐ Change of Ownership
Change of ownership date: ____ Previous Permit No.: ____

7. Is this permit application being submitted in response to a Notice of Violation (NOV) or Notice to Correct (NTC) issued by the SMAQMD? ☐ Yes ☑ No If Yes, NOV or NTC #: ____

DO NOT WRITE BELOW (SMAQMD USE ONLY)

DATE STAMP	PERMIT NUMBER	A/C FEE	A/C RECEIPT
	PREVIOUS P/O	P/O FEE	P/O RECEIPT

777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

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APPLICATION FOR AUTHORITY TO CONSTRUCT AND/OR PERMIT TO OPERATE

A SEPARATE APPLICATION AND FORM(S) SPECIFIC TO THE PROCESS OR EQUIPMENT MUST BE COMPLETED FOR **EACH** PROCESS OR PIECE OF EQUIPMENT

A. Both pages of this application must be completed; an original signature (not a facsimile or copy) is required.
B. The appropriate permit fee must be submitted with the application (refer to the SMAQMD Rules or fee schedule).

8. All information submitted to obtain an Authority to Construct/Permit to Operate is considered public information as defined by section 6254.7 of the California Government Code unless specifically marked as trade secret by the applicant. Each document containing trade secrets must be separated from all non-privileged documents. Each document which is claimed to contain trade secrets must indicate each section or paragraph that contains trade secret information and must have attached a declaration stating with specificity the reason this document contains trade secret information. All emission data is subject to disclosure regardless of any claim of trade secret.

Acknowledgement [initialed] (Please initial) Trade secret documents are included with this application: ☐ Yes ☑ No

9. Pursuant to Section 42301.6(f) of the Health and Safety Code, I hereby certify that emission sources in this permit application:

(Initial appropriate box) ☐ **ARE** OR [initialed] **ARE NOT** within 1,000 feet of the outer boundary of a school

Pursuant to section 42301.9(a) of the Health and Safety Code, "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

10. Required information, analyses, plans and/or specifications needed to complete this application are being collected under authority granted by California Health & Safety Code (CH&SC) section 42303. In addition, CH&SC section 42303.5 states that *No person shall knowingly make any false statements in any application for a permit, or in any information, plans, or specifications submitted in conjunction with the application or at the request of the Air Pollution Control Officer.* Violations of the CH&SC may result in criminal or civil penalties, as specified in CH&SC sections 42400 through 42402.3. By signing below, I certify that all information is true and accurate and complete, to the best of my knowledge and ability.

Please be advised that constructing, installing, or operating air pollutant emitting equipment prior to receiving an Authority to Construct from the Air District is a violation of air pollution regulations and is subject to civil or criminal penalties prescribed in the California Health and Safety Code.

Signature of responsible officer, partner or proprietor of firm [signature]

Printed Name: James Shetler Title: SFA Representative & AGM, Energy Supply Date: 9/10/10

Phone number: (916) 732-6757 Fax number: (916) 732-6563 E-mail address: jshetle@smud.org

11. Contact person for information submitted with this application (if different from above):

Name: Stu Husband Title: Environmental Specialist

Phone number: (916) 732-6246 Fax number: (916) 732-6563 E-mail address: shusban@smud.org

12. Receipt of future rules and planning notices affecting your permit and facility; check one box:

☐ Please send e-mail notices to ____

☐ I will sign up myself at www.airquality.org/listserve/ to receive e-mailed notices.

☐ I want the District to mail notices to the address on this application.

☑ I am already subscribed.

FORM G101
GENERAL INFORMATION

1. **<u>EQUIPMENT LOCATION DRAWING.</u> The drawing or sketch submitted must show at least the following:**

   a. **The property involved and outlines and heights of all buildings on it. Identify property lines plainly.**

      Attached drawing package includes the following:
      - *D010325-100L100, Sheet 1, REV 4, Cosumnes Power Plant Equipment Arrangement Layout*
      - *A071-A1-2, Sheet 1, REV C, General Arrangement Isometric View Membrane Filter System*
      - *A071-A1-2, Sheet 2, REV C, General Arrangement Plan Membrane Filter System*
      - *A071-A1-2, Sheet 3, REV C, General Arrangement Section Membrane Filter System*
      - *A071-A1-2, Sheet 4, REV C, General Arrangement Section Membrane Filter System*
      - *A071-M5-2, Sheet 6, REV A, Membrane Filter System Sections Equipment Installation Drawings*
      - *D-60-15-94476-00, Perlite Storage Silo 0-640-TNK-0016, Columbian TecTank*
      - *B-88-09-4476-54, Perlite Storage Silo 0-640-TNK-0016, Fill Line Assembly, Columbian TecTank*
      - *C-810557, REV A, Perlite Feed Screw Conveyor, Flexicon Conveying System Layout*
      - *24-0-4216, REV B, Cyclonaire 18-DC-36 ARRG III with Drum Dump Kit*
      - *A071-M3-2, Sheet 1, REV C, Process Flow Diagram Membrane Filter System*
      - *A071-M3-2, Sheet 2, REV C, Process Flow Diagram Membrane Filter System*
      - *A071-M4-2, Sheet 8, REV D, P&ID Precoat/Body Feed Handling Membrane Filter System*

   b. **Location and identification of the proposed equipment within the property/building.**

      Refer to the drawing package in item 1a above, Cosumnes Power Plant Equipment Arrangement Layout. The membrane filter water treatment system, which includes the perlite storage silo and dust filter, is located in the northeast quadrant of the facility.

   c. **Location of the property with respect to streets. Indicate direction (north) on the drawing.**

      Refer to drawing package in item 1a, Cosumnes Power Plant Equipment Arrangement Layout. The membrane filter water treatment system, including the perlite storage silo and dust filter, is approximately 1,000 feet due north of Clay East Road.

FORM G101
GENERAL INFORMATION

2. **<u>DESCRIPTION OF EQUIPMENT:</u> State make, model, size, and type for either the entire unit or for its major parts. Equipment specific forms are available for commonly permitting equipment.**

   The equipment associated with this air permit application is a perlite storage silo and dust filter. The perlite storage silo is a carbon steel welded tank supplied by Columbian TecTank. Dimensions are 14'-11" diameter by 31'-6" height. Working volume of the tank to hold perlite is 2,585 cubic feet. At material density of 6.0 lb/cubic foot, the silo holds approximately 7.8 tons of material when full. The silo has a pneumatic fill line, and is vented during filling to a Cyclonaire bin vent/dust collector, which is described on another part of this application package, Form BA-100, Baghouse. Refer to the attached Storage Silo Specification, A071 – 835-1, REV C, 4/23/09, GE Infrastructure, Water & Process Technologies and the following drawings for additional information:

   - *D-60-15-94476-00, Perlite Storage Silo 0-640-TNK-0016, Columbian TecTank*
   - *B-88-09-4476-54, Perlite Storage Silo 0-640-TNK-0016, Fill Line Assembly, Columbian TecTank*
   - *24-0-4216, REV B, Cyclonaire 18-DC-36 ARRG III with Drum Dump Kit (described more fully on Form BA-100, Baghouse)*

3. **DESCRIPTION OF PROCESS: The application must be accompanied by written description of each process to be carried out in the equipment and of the function of the equipment itself in the process. The descriptions must be complete and in detail concerning all operations. Particular attention must be given to explaining all stages in the process where the discharge of any materials might contribute in any way to air pollution. All obtainable data must be supplied concerning the nature, volumes, particle sizes, weights and concentrations of all types of air contaminants that may be discharged at each stage in the process. Similarly, control procedures must be described in sufficient detail to show the extent of control of air contaminants anticipated in the design, specifying the expected efficiency of the control device.**

   The overall purpose of the or membrane filter water treatment system is to remove solids from Cosumnes Power Plant's (CPP) incoming water supply received from the Folsom South Canal. The water treatment process uses perlite as a filter aid to remove solids from the water supply, before that water is used in CPP's power production processes. Operating schedule of the membrane filter system depends on the quality of the water supply, which is primarily dependent on when Sacramento River water is diverted into the Folsom South Canal by other parties. CPP has no control over the Sacramento River water diversion schedule or frequency. When this occurs, CPP will operate the membrane filter system, and receive and use perlite in that water treatment process.

FORM G101
GENERAL INFORMATION

Dry perlite is received from a material supplier in bulk delivery trucks. The delivery truck supply hose is coupled to the silo fill line, and then perlite is pneumatically conveyed into the storage silo using the truck compressor/air mover to provide the motive force. The silo filling process takes one to two hours depending on how much material is delivered and the truck compressor specifications. During silo filling, displaced air in the silo and air from the truck compressor are vented through the top of the silo into a pipe, which is connected to a dust filter installed at ground level. The dust filter removes most of the particulate matter from the air stream before exhausting to the atmosphere. When the dust filter elements are cleaned using compressed air pulse jets, collected particulate is captured in a drum below the dust filter. Particulate collected in the drum is recycled into the water treatment process or disposed off site. Essentially, the silo and dust filter are passive systems. The potential for particulate air emissions occurs primarily during pneumatic filling of the perlite storage silo. Potential fugitive particulate air emissions could occur during handling of the dust filter collection drum.

From the bottom of the storage silo, perlite is conveyed to the precoat/body feed tank in an enclosed mechanical screw conveyor. The precoat/body feed tank mixes the perlite with water to form the filter aid used in the membrane filter tanks. Spent perlite filter aid is backwashed from the membrane filters using compressed air and discharged to sludge container filters, where the spent material is dewatered and ultimately transported off site for disposal.

Originally, the precoat/body feed tank was designed and installed to vent to a dust filter. However, once operational, it was determined that the dust filter was not necessary as no dust is generated from the perlite conveying process. The dust filter was then removed. Drawings included with this application include notations of "Component Deleted" associated with the precoat/body feed tank dust filter.

4. **FACILITY DESCRIPTION: Describe the general nature of the business. Types of products manufactured/produced/mined/recovered or types of services provided.**

   Cosumnes Power Plant is combined cycle power plant, which generates electrical power for the Sacramento Municipal Utility District.

5. **OPERATING SCHEDULE: Specify the hours per day, days per week and weeks per year the equipment is to be operated.**

   The perlite storage silo and dust filter are available to operate 24 hrs/day, 7 days/week, and 365 days/year. However, the primary potential for particulate air emissions from this equipment occurs during pneumatic filling of the silo with perlite delivered in bulk by truck. CPP estimates that maximum perlite bulk deliveries would "average" one per week, 13 perlite deliveries per calendar quarter, and 52 perlite deliveries per year.

FORM G101
GENERAL INFORMATION

6. **PROCESS WEIGHT: Detail types and total weigh of each material charged into the equipment or the process on the basis of pounds per hour of per other specified unit of time.**

   Working volume of the silo to hold perlite is 2,585 cubic feet. At material density of 6.0 lb/cubic foot, the silo holds approximately 7.8 tons of material when full. Hence, process weight of perlite is up to 7.8 tons per delivery. An estimated maximum of 13 deliveries per calendar quarter would equate to 101.4 tons perlite delivered per quarter, and 405.6 tons delivered per year. PM_{10} emission factors for Concrete Batching (EPA Publication AP-42, Table 11.12-2) are 0.46 lb/ton of cement unloaded pneumatically to storage silo (uncontrolled), and 0.00034 lb/ton controlled. Using these PM_{10} emission factors as representative of bulk perlite delivery to CPP results in 46.6 lb/quarter and 186.6 lb/yr of uncontrolled PM_{10} emissions, and 0.034 lb/quarter and 0.14 lb/year of controlled PM_{10} emissions.

7. **FUELS AND BURNERS USED: Indicate for fuel gas – types and cubic feet per hour; for fuel oil – grade and gallons per hour; for solid fuels – type and pounds per hour.**

   There are no fuels and burners associated with this application.

8. **FLOW DIAGRAM: For continuous processes, show the flow of materials either on a separate flow diagram or on the drawings accompanying the application.**

   Refer to drawing package in item 1a above, in particular the following:
   - *A071-M3-2, Sheet 1, REV C, Process Flow Diagram Membrane Filter System*
   - *A071-M3-2, Sheet 2, REV C, Process Flow Diagram Membrane Filter System*
   - *A071-M4-2, Sheet 8, REV D, P&ID Precoat/Body Feed Handling Membrane Filter System*

9. **DRAWINGS OF EQUIPMENT: Supply drawing, to show clearly the design and operation of the equipment and the means by which air contaminants are controlled. The following must be shown:**

   a. **Size and shape of the equipment.**

      Refer to drawing package in item 1a above.

   b. **Locations, sizes and shape details of all features which may affect the production, collection, conveying, or control of air contaminants.**

      Refer to drawing package in item 1a above.

FORM G101
GENERAL INFORMATION

c. Horsepower rating of all electric motors driving the equipment

There are no electric motors associated with pneumatically filling the perlite storage silo and operation of the dust filter.

FORM BA-100
BAGHOUSE

1. **EQUIPMENT LOCATION DRAWING. The drawing or sketch submitted must show at least the following:**

   a. **The property involved and outlines and heights of all buildings on it. Identify property lines plainly.**

      Attached drawing package includes the following:
      - *D010325-100L100, Sheet 1, REV 4, Cosumnes Power Plant Equipment Arrangement Layout*
      - *A071-A1-2, Sheet 1, REV C, General Arrangement Isometric View Membrane Filter System*
      - *A071-A1-2, Sheet 2, REV C, General Arrangement Plan Membrane Filter System*
      - *A071-A1-2, Sheet 3, REV C, General Arrangement Section Membrane Filter System*
      - *A071-A1-2, Sheet 4, REV C, General Arrangement Section Membrane Filter System*
      - *A071-M5-2, Sheet 6, REV A, Membrane Filter System Sections Equipment Installation Drawings*
      - *D-60-15-94476-00, Perlite Storage Silo 0-640-TNK-0016, Columbian TecTank*
      - *B-88-09-4476-54, Perlite Storage Silo 0-640-TNK-0016, Fill Line Assembly, Columbian TecTank*
      - *C-810557, REV A, Perlite Feed Screw Conveyor, Flexicon Conveying System Layout*
      - *24-0-4216, REV B, Cyclonaire 18-DC-36 ARRG III with Drum Dump Kit*
      - *A071-M3-2, Sheet 1, REV C, Process Flow Diagram Membrane Filter System*
      - *A071-M3-2, Sheet 2, REV C, Process Flow Diagram Membrane Filter System*
      - *A071-M4-2, Sheet 8, REV D, P&ID Precoat/Body Feed Handling Membrane Filter System*

   b. **Location of the ductwork and baghouse. Include the outlines of the filter units, pre-cleaners, and any equipment the exhaust system is to serve.**

      Refer to drawing package in item 1a above.

2. **CONTROL EQUIPMENT. Supply the following information and drawings (when standard commercial equipment is to be used, the manufacturer's catalog describing the equipment should be submitted):**

   a. **Make, model, size, type, and capacity of baghouse.**

      Cyclonaire Model #18-DC-36 Bin Vent/Dust Collector, Arrangement III with drum dump kit. Refer to the attached 2-page equipment data sheet from Cyclonaire, photo of installed equipment/nameplate, and Drawing 24-0-4216, REV B, Cyclonaire 18-DC-36 ARRG III with Drum Dump Kit. Note that the specific model number is not listed on the Cyclonaire data sheet. However, Model #18-DC-36 is representative of the same equipment type and configuration as the Cyclonaire data sheet.

FORM BA-100
BAGHOUSE

b. All data and calculations used in choosing or designing the baghouse.

Refer to the attached Storage Silo Specification, A071 – 835-1, REV C, 4/23/09, GE Infrastructure, Water & Process Technologies. Refer to the attached handwritten calculation data sheet A071, Perlite Silo Dust Filter, 7/16/2010.

c. Describe the means of disposal of the collected air contaminants and procedure to be used for preventing losses when cleaning or emptying the filter units.

The dust filter has a self cleaning program that runs after the silo loading pipe flow switch is inactive after being active for bulk loading of the silo. The collected material settles in a 12-inch hose that is connected to the bottom of the filter house. The other end of the hose is a gate valve that is normally closed. After the filter cleaning cycle, the operator opens the gate valve and drains the collected material into a 55-gallon drum. The collected material in the drum is either recycled back into the process or placed in the spent perlite sludge bin.

d. Expected temperature of air gases entering the filter unit.

Air gases entering the filter unit are at ambient conditions.

e. Expected efficiency of the baghouse in controlling the types of air contaminants involved. Supply data to substantiate.

Expected efficiency of the baghouse filter elements in controlling particulate matter is 99.99% or greater. Refer to the following attached information:

- *Cyclonaire Standard Filter Specifications for Dust Collectors,*
- *Cyclonaire Dust Collector Efficiency Statement,*
- *GE Energy web page on the topic of PulsePleast® Pleated Filter Elements, and*
- *GE Energy's brochure on Pleated Filter Elements.*

f. State pressure drop (inches of water) across each filter baghouse at design specifications.

Recommended pressure drop is 4 inches of water. Acceptable pressure drop is 6 inches of water. Maximum not-to-exceed pressure drop is 17 inches of water. Refer to the attached Cyclonaire Operation and Maintenance Manual, Dust Collectors and Filter Receivers.

FORM BA-100
BAGHOUSE

g. **Specify materials from which filter clothes are to be made. State total filtering area.**

The Cyclonaire dust filter has 36 polyester pleated cartridge filter elements, with a total filter area of 352 square feet. Refer to the attached Storage Silo Specification, A071 – 835-1, REV C, 4/23/09, GE Infrastructure, Water & Process Technologies, and drawing 24-0-4216, REV B, Cyclonaire 18-DC-36 ARRG III with Drum Dump Kit.

h. **Describe bag cleaning procedure.**

The dust filter has compressed air pulse jet cleaning system. Refer to the attached 2-page Cyclonaire equipment data sheet and the Cyclonaire Operation and Maintenance Manual, Dust Collectors and Filter Receivers.

i. **Show locations of all fans or blowers.**

There are no fans or blowers installed on the perlite storage silo or dust filter. Air motive force is supplied by compressor on the perlite delivery trucks during pneumatic filling of the storage silo.

FORM HRA100
HEALTH RISK ASSESSMENT INFORMATION

PURPOSE: The purpose of this form is to gather the basic information needed to run an air dispersion model and perform a health risk assessment for a simple emissions unit. Additional information may be needed depending on type of process and potential risk to the public.

STACK/VENT EMISSIONS: Complete this section if pollutants are being released to the atmosphere via a stack or vent (e.g. roof vent).

Stack Height: 14 ft. above ground (Horizontal exit)

Stack Inner Diameter: 12 in.

Exhaust Gas Flow Rate: 585 acfm

Exhaust Gas Temperature Ambient degrees F.

FUGITIVE EMISSIONS: Complete this section if pollutants are being released to the atmosphere without the benefit of a stack or vent (e.g. emissions from windows, eaves and doors, ponds, open tanks, and wind blown emissions from piles and fields).

Source Base Elevation: ______ ft. above ground

Source Height: _______ ft. above ground

Source Width (East/West Dimension): _______ feet

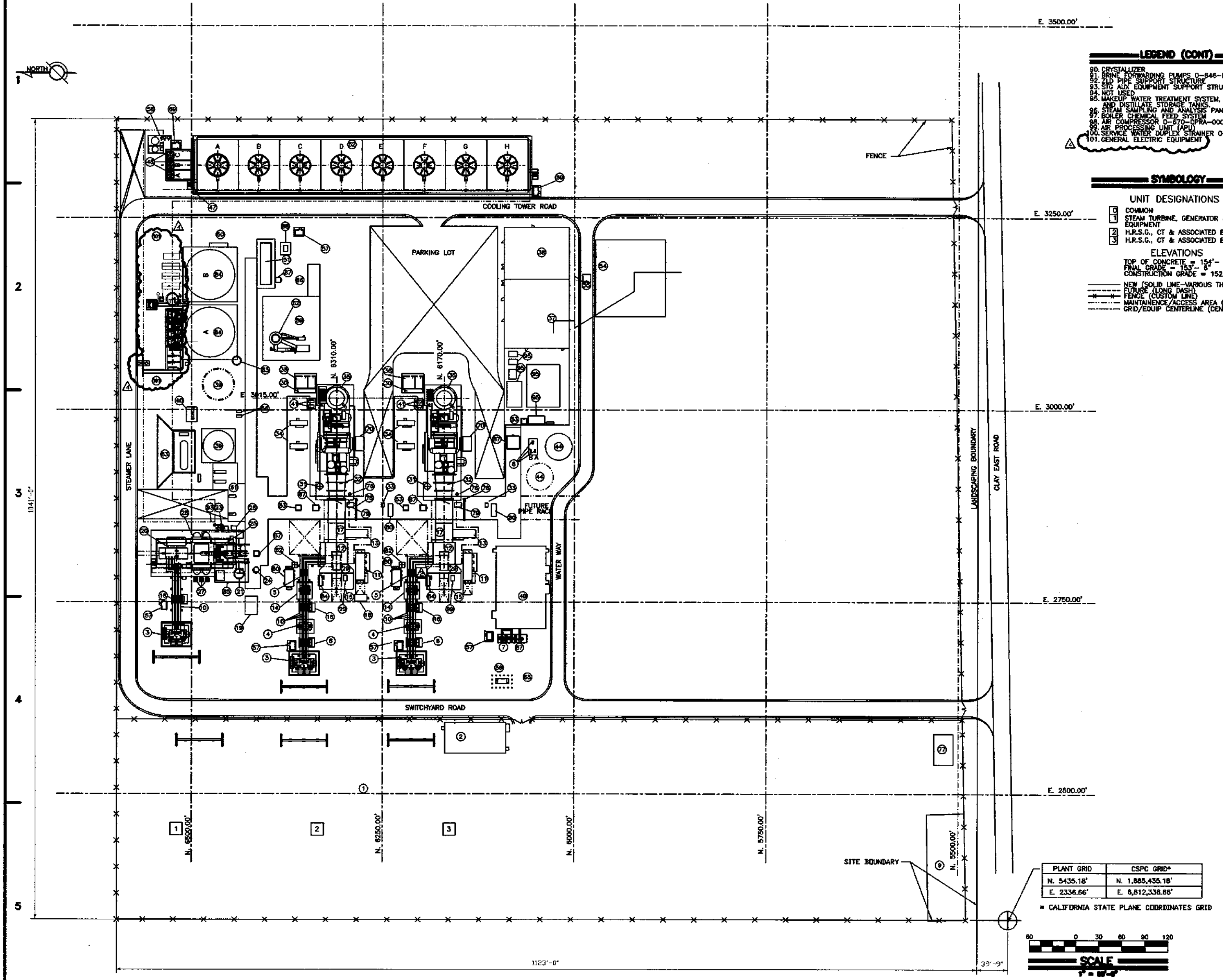
Source Length (North/South Dimension): _______ feet

DRAWINGS REQUIRED: Drawings should be submitted on 8-1/2" X 11" sheets or larger. Drawings must clearly show the required information but do not need to be professionally drawn. All drawings should be drawn with north facing up and to scale.

Nearby Buildings:
Submit a drawing showing all buildings affecting the exhaust stack or point of release. The area of influence for a building is defined as the area within 5 times the lesser of the height or width of a building. For each building, the drawing must show length, width, and height of the building, and distance to exhaust stack or point of release.

Property Line:
Submit a drawing showing the exhaust stack in relation to the property line. The drawing must be drawn to scale, with north facing up, and must show the entire property.

Receptors:
Submit a drawing showing residential and commercial buildings surrounding the property. Indicate the distance from the stack/point of release to the residential/commercial buildings.



PLANT GRID	CSPC GRID*
N. 5435.18'	N. 1,885,435.18'
E. 2336.66'	E. 6,812,338.66'

* CALIFORNIA STATE PLANE COORDINATES GRID

LEGEND

1. ELECTRICAL SWITCHYARD AREA
2. SWITCHYARD CONTROL BUILDING
3. GENERATOR STEP-UP TRANSFORMER
4. UNIT AUX. TRANSFORMER (18/4.16kV)
5. EXCITATION TRANSFORMER
6. UNIT AUX. TRANSFORMER BREAKER
7. 4160V/480V TRANSFORMERS
8. DEMINERALIZED WATER PUMPS 0-220-PMP-0006A, 0006B, 0013
9. CCP METER STATION
10. ISO-PHASE BUS DUCT
11. PACKAGED ELECTRICAL AND ELECTRONIC CONTROL CENTER (PEECC)
12. CT GENERATORS 2-300-GEN-2001, 3-300-GEN-3001
13. CT AUXILIARY PACKAGE
14. ISOLATION TRANSFORMER
15. GAS TURBINE AIR INLET FILTER
16. GENERATOR BREAKER
17. COMBUSTION TURBINE (CT) 2-300-CTG-2001, 3-300-CTG-3001
18. CT WATER WASH SKID
19. STG ELECTRICAL EQUIPMENT ENCLOSURE
20. STEAM TURBINE GENERATOR 1-400-GEN-1001
21. STG LUBE OIL
22. GLAND STEAM SKID
23. GLAND STEAM CONDENSER 1-400-CONG-1001
24. STEAM LINE DRAINS FLASH TANK
25. STEAM TURBINE (ST) 1-400-ST-1001
26. STEAM JET AIR/HOGGER/SJAE
27. CONDENSATE PUMPS 1-221-PMP-1002A, 1002B, 1002C
28. SURFACE CONDENSER 1-420-CON-1001
29. EVAPORATIVE COOLER
30. HRSG N2 CYLINDER STORAGE
31. HRSG BLOWDOWN TANKS 2-205-TNK-2010, 3-205-TNK-3010
32. HEAT RECOVERY STEAM GENERATORS (HRSG) 2-200-HRSG-2001, 3-200-HRSG-3001
33. FUEL GAS DEW POINT HEATER 2-310-HTRE-2001, 3-310-HTRE-3001
34. BOILER FEEDWATER PUMPS 2-222-PMP-2001A, 2001B/3-222-PMP-3001A, 3001B
35. HRSG STACK
36. CEM/HR DPU SHELTER
37. WAREHOUSE AND MAINTENANCE AREA
38. ADMINISTRATION AND CONTROL ROOM
39. SERVICE/FIRE WATER STORAGE TANK 0-640-TNK-0002A
40. FIRE PUMPS 0-650-PMP-0003, 0004, 0005
41. HRSG RECIRCULATING PUMP
42. NOT USED
43. EQUIPMENT DRAIN SUMP (NOT SHOWN)
44. DEMINERALIZED WATER STORAGE TANK 0-220-TNK-0001
45. WATER TREATMENT BUILDING (SEE REF DWG No. 1)
46. DETENTION POND
47. AUXILIARY COOLING WATER PUMP 0-635-PMP-0001
48. CIRC. WATER PUMPS 1-630-PMP-1001A, 1001B, 1001C
49. ELECTRICAL EQUIPMENT BLDG
50. OIL/WATER SEPARATOR 0-645-SEP-0001
51. COOLING TOWER ELECTRICAL EQUIPMENT ENCLOSURE
52. COOLING TOWER 1-630-CTWR-1001
53. DRAIN SUMP 0-645-SMP-0031, 0032, 0033
54. LEACH FIELD
55. SEPTIC TANK 0-645-TNK-0006
56. SERVICE WATER PUMPS 0-640-PMP-0007A, 0007B, 0007C
57. FIRE PROTECTION DELUGE HOUSE
58. COOLING TOWER CHEMICAL STORAGE AREA
59. CO2 SKID PURGE
60. LCI/GENERATOR EXCITATION COMPARTMENT
61. CLOSED LOOP AUX. COOLING WATER HEAT EXCHANGER AND PUMPS
62. DC LINK REACTOR
63. AMMONIA STORAGE AREA
64. CO2 FIRE PROTECTION
65. HYDROGEN TANKS 0-301-TNK-0011
66. ELECTRICAL MANHOLE
67. EMERGENCY FEED TRANSFORMER
68. DELETED
69. COOLING TOWER DELUGE ENCLOSURE
70. SCR SKID
71. COOLING TOWER BLOW DOWN BOOSTER PUMP 630-PMP-0XXX
72. NOT USED
73. STORM DRAIN MANHOLE
74. NOT USED
75. OVER FLOW (DETENTION POND)
76. FUEL HEATER LEAK DETECTION SEPARATOR
77. GAS COMPRESSOR STATION (SEE REF DWG No. 3)
78. FUEL GAS PERFORMANCE HEATER 2-310-HX-2003, 3-310-HX-3003
79. FUEL GAS SCRUBBER 2-310-SCBR-2001, 3-310-SCBR-3001
80. FUEL GAS COALESCING FILTERS 0-310-FL-3001A, 3001B
81. PIPE RACK
82. BRINE CONCENTRATOR
83. NOT USED
84. BRINE HOLDING TANKS
85. OIL CONDITIONER SKID
86. SOLIDS HANDLING AREA
87. OILY/WATER SUMP 0-645-SMP-0034, 0035, 0036, 0037, 0038
88. ZLD 480V TRANSFORMER
89. ZERO LIQUID DISCHARGE AREA

LEGEND (CONT)

90. CRYSTALLIZER
91. BRINE FORWARDING PUMPS 0-646-PMP-0056A/B
92. ZLD PIPE SUPPORT STRUCTURE
93. STG AUX EQUIPMENT SUPPORT STRUCTURE
94. NOT USED
95. MAKEUP WATER TREATMENT SYSTEM, INCLUDING RAW WATER AND DISTILLATE STORAGE TANKS.
96. STEAM SAMPLING AND ANALYSIS PANEL 0-235-SKID-0022
97. BOILER CHEMICAL FEED SYSTEM
98. AIR COMPRESSOR 0-670-CPRA-0001A/B
99. AIR PROCESSING UNIT (APU)
100. SERVICE WATER DUPLEX STRAINER 0-640-DSTR-0070
101. GENERAL ELECTRIC EQUIPMENT (4)

SYMBOLOGY

UNIT DESIGNATIONS

- [0] COMMON
- [1] STEAM TURBINE, GENERATOR & ASSOCIATED EQUIPMENT
- [2] H.R.S.G., CT & ASSOCIATED EQUIPMENT
- [3] H.R.S.G., CT & ASSOCIATED EQUIPMENT

ELEVATIONS

TOP OF CONCRETE = 154'- 0"
FINAL GRADE = 153'- 6"
CONSTRUCTION GRADE = 152'- 6"

- NEW (SOLID LINE-VARIOUS THICKNESSES)
- FUTURE (LONG DASH)
- FENCE (CUSTOM LINE)
- MAINTAINENCE/ACCESS AREA (PHANTOM LINE)
- GRID/EQUIP CENTERLINE (CENTERLINE)

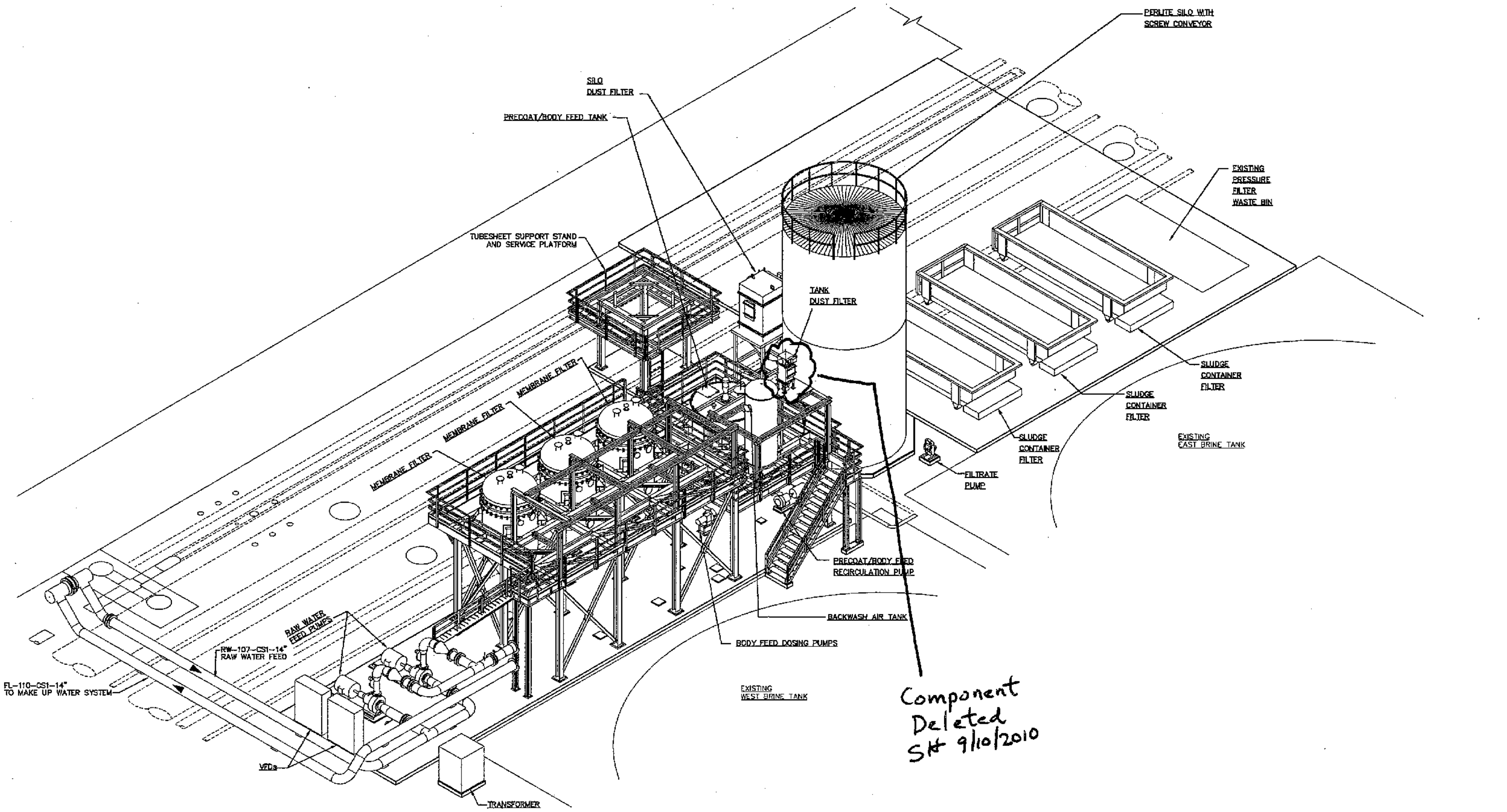
UTILITY ENGINEERING

SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT

COSUMNES POWER PLANT
EQUIPMENT ARRANGEMENT LAYOUT

T. GOOCH | K. WATERS | D. MUGGLI

D010325-100L100 | 01 | 4



GENERAL NOTES:

1. ALL NEW AND EXISTING EQUIPMENT AND PIPING LOCATIONS ARE SUBJECT TO FIELD VERIFICATION.
2. ALL EXISTING UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE AND SUBJECT TO FIELD VERIFICATION.
3. ALL EQUIPMENT AND PIPING IS NEW EXCEPT AS NOTED OTHERWISE.

C EXTENSIVELY REVISED

REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	PRELIMINARY – FREEPORT CRYSTALLIZER MODIFICATION TO PROJECT 895		MG	MKR	2/6/09	JNH
B	ISSUED FOR ENGINEERING (NEW SHEET)		MG	MKR	2/6/09	JNH
C	ISSUED FOR CONSTRUCTION		MG	MKR	3/5/09	JNH

TOLERANCES UNLESS NOTED: DECIMALS .X ± .XX ± .XXX ±; ANGLES ±; FRAC ±

		DATE
DRAWN BY	M. GIRARD	2/6/09
CHECKED BY	E. KRAVETSKY	2/6/09
APPROVED BY	J. HOLLINGSWORTH	2/6/09
APPROVED BY	M. RAISOR	2/6/09

GE Infrastructure
Water & Process Technologies
11113 NE 33RD PLACE BELLEVUE, WA 98004 USA (425) 828-2400 WWW.GEWATER.COM

CLIENT/JOB: EQUIPMENT AND SERVICES CONTRACT FOR COSUMNES POWER PLANT ZLD WTS CRYSTALLIZER MODIFICATIONS AND PLANT MWT FILTRATION SYSTEM

FILE: RESOURCES CONSERVATION COMPANY

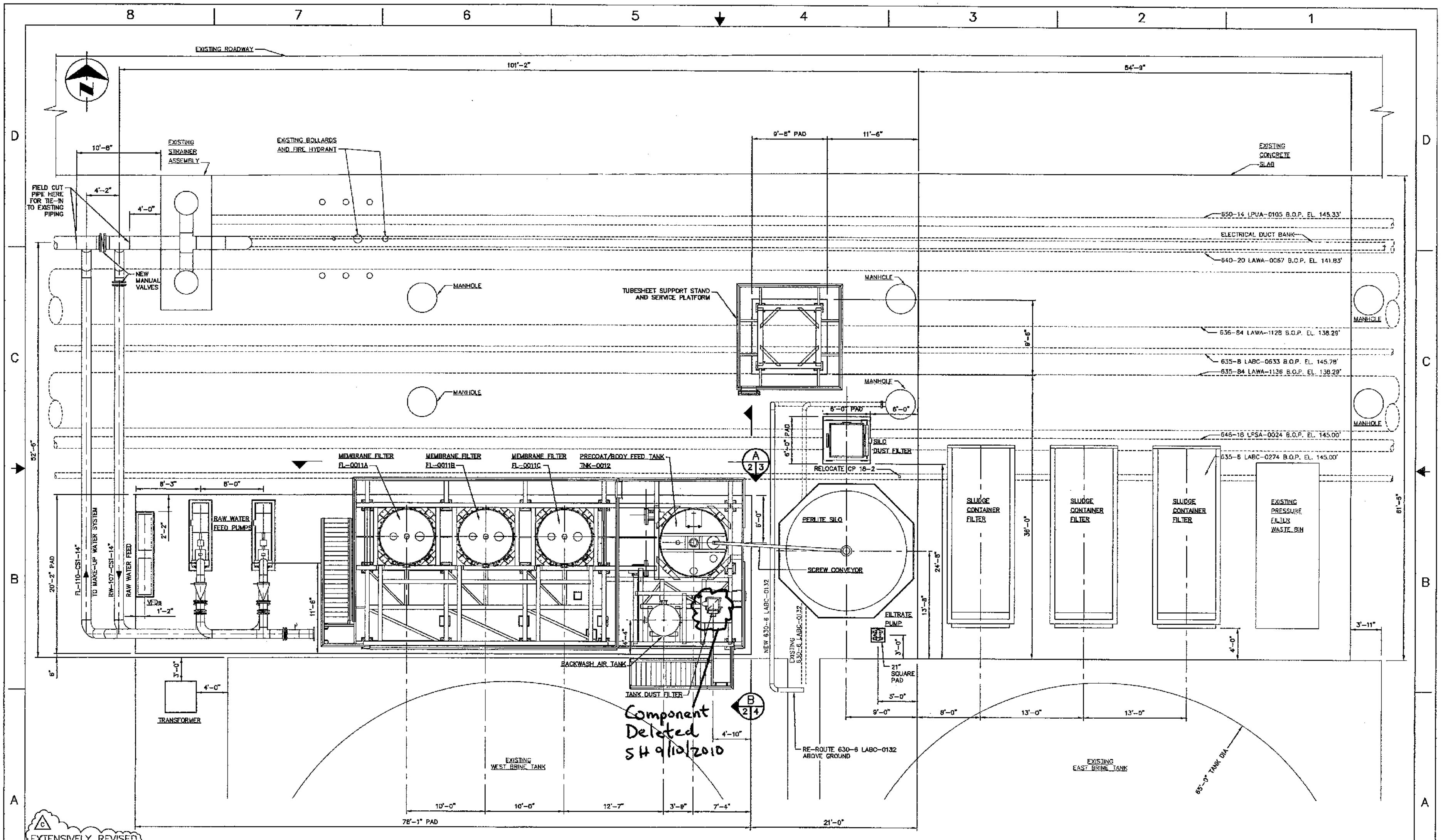
DWG DESCRIPTION: GENERAL ARRANGEMENT ISOMETRIC VIEW MEMBRANE FILTER SYSTEM

MATERIAL/BOM NO.

SIZE	DRAWING NO.	REV
D	A071-A1-2	C

PROJECT: W.O. 20026857

SCALE: 1:75 SHEET: 1 OF 4



REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	PRELIMINARY – FREEPORT CRYSTALLIZER MODIFICATION TO PROJECT 896		TJH	MKR	11/13/08	JNH
B	ISSUED FOR ENGINEERING		MG	MKR	2/6/09	JNH
C	ISSUED FOR CONSTRUCTION		MG	MKR	3/5/09	JNH

TOLERANCES UNLESS NOTED: DECIMALS .X ± .XX ± .XXX ± ; ANGLES ± ; FRAC ±

DRAWN BY: J. GALLOWAY, 11/13/08
CHECKED BY: E. KRAVETSKY, 11/13/08
APPROVED BY: J. HOLLINGSWORTH, 11/13/08
APPROVED BY: M. RAISOR, 11/13/08

GE Infrastructure
Water & Process Technologies

CLIENT/JOB: EQUIPMENT AND SERVICES CONTRACT FOR COSUMNES POWER PLANT ZLD WTS CRYSTALLIZER MODIFICATIONS AND PLANT MWT FILTRATION SYSTEM

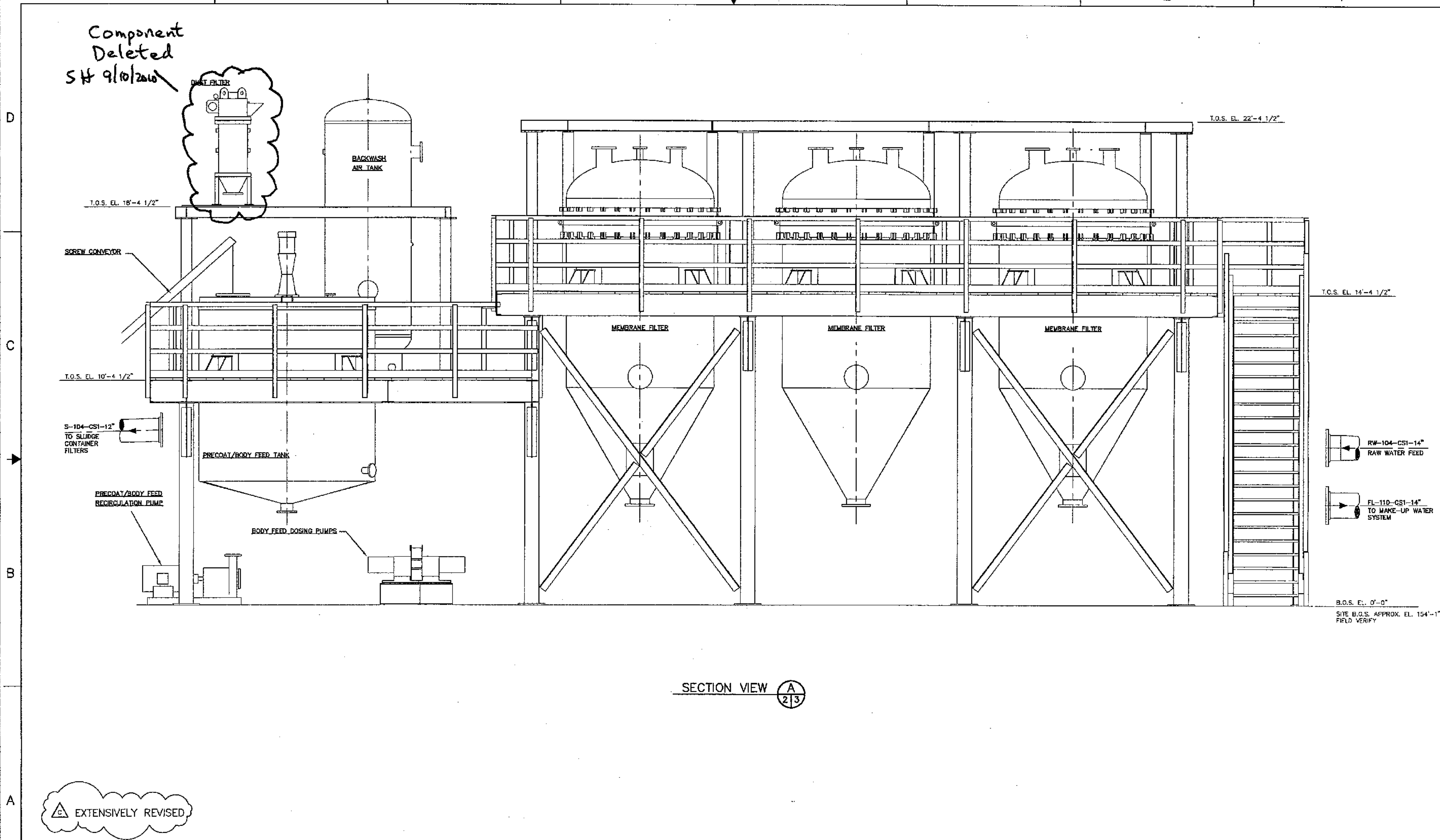
FILE: RESOURCES CONSERVATION COMPANY

DWG DESCRIPTION: GENERAL ARRANGEMENT PLAN MEMBRANE FILTER SYSTEM

SIZE: D | DRAWING NO.: A071-A1-2 | REV: C

PROJECT: W.O. 20026957

SCALE: 3/16" = 1'-0" | SHEET: 2



REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	PRELIMINARY – FREEPORT CRYSTALLIZER MODIFICATION TO PROJECT 896		TJH	MKR	11/13/08	JNH
B	ISSUED FOR ENGINEERING		MG	MKR	2/6/09	JNH
C	ISSUED FOR CONSTRUCTION		MG	MKR	3/5/09	JNH

TOLERANCES UNLESS NOTED: DECIMALS .X ± .XX ± .XXX ± ANGLES ± FRAC ±

DRAWN BY J. GALLOWAY DATE 11/13/08
CHECKED BY E. KRAVETSKY DATE 11/13/08
APPROVED BY J. HOLLINGSWORTH DATE 11/13/08
APPROVED BY M. RAISOR DATE 11/13/08

GE Infrastructure
Water & Process Technologies

CLIENT/JOB: EQUIPMENT AND SERVICES CONTRACT FOR COSUMNES POWER PLANT ZLD WTS CRYSTALLIZER MODIFICATIONS AND PLANT MWT FILTRATION SYSTEM

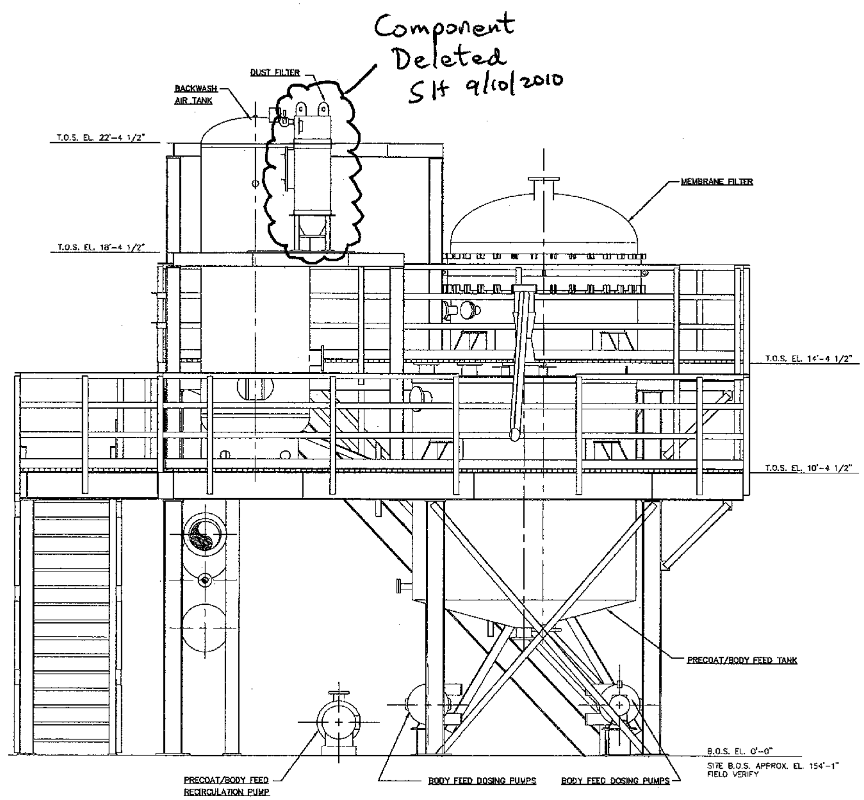
FILE: RESOURCES CONSERVATION COMPANY

DWG DESCRIPTION: GENERAL ARRANGEMENT SECTION MEMBRANE FILTER SYSTEM

SIZE: D | DRAWING NO.: A071–A1–2 | REV: C

PROJECT: W.O. 20026957

SCALE: 1/2" = 1'-0" | SHEET 3



SECTION VIEW B 2|4

C EXTENSIVELY REVISED

REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	PRELIMINARY – FREEPORT CRYSTALIZER MODIFICATION TO PROJECT 595		MG	MKR	2/6/09	JNH
B	ISSUED FOR ENGINEERING (NEW SHEET)		MG	MKR	2/6/09	JNH
C	ISSUED FOR CONSTRUCTION		MG	[signature]	3/5/09	[signature]

TOLERANCES UNLESS NOTED	DECIMALS .X ± .XX ± .XXX ± ; ANGLES ± ; FRAC ±
DRAWN BY	M. GIRARD, DATE 2/6/09
CHECKED BY	E. KRAVETSKY, DATE 2/6/09
APPROVED BY	J. HOLLINGSWORTH, DATE 2/6/09
APPROVED BY	M. RAISOR, DATE 2/6/09

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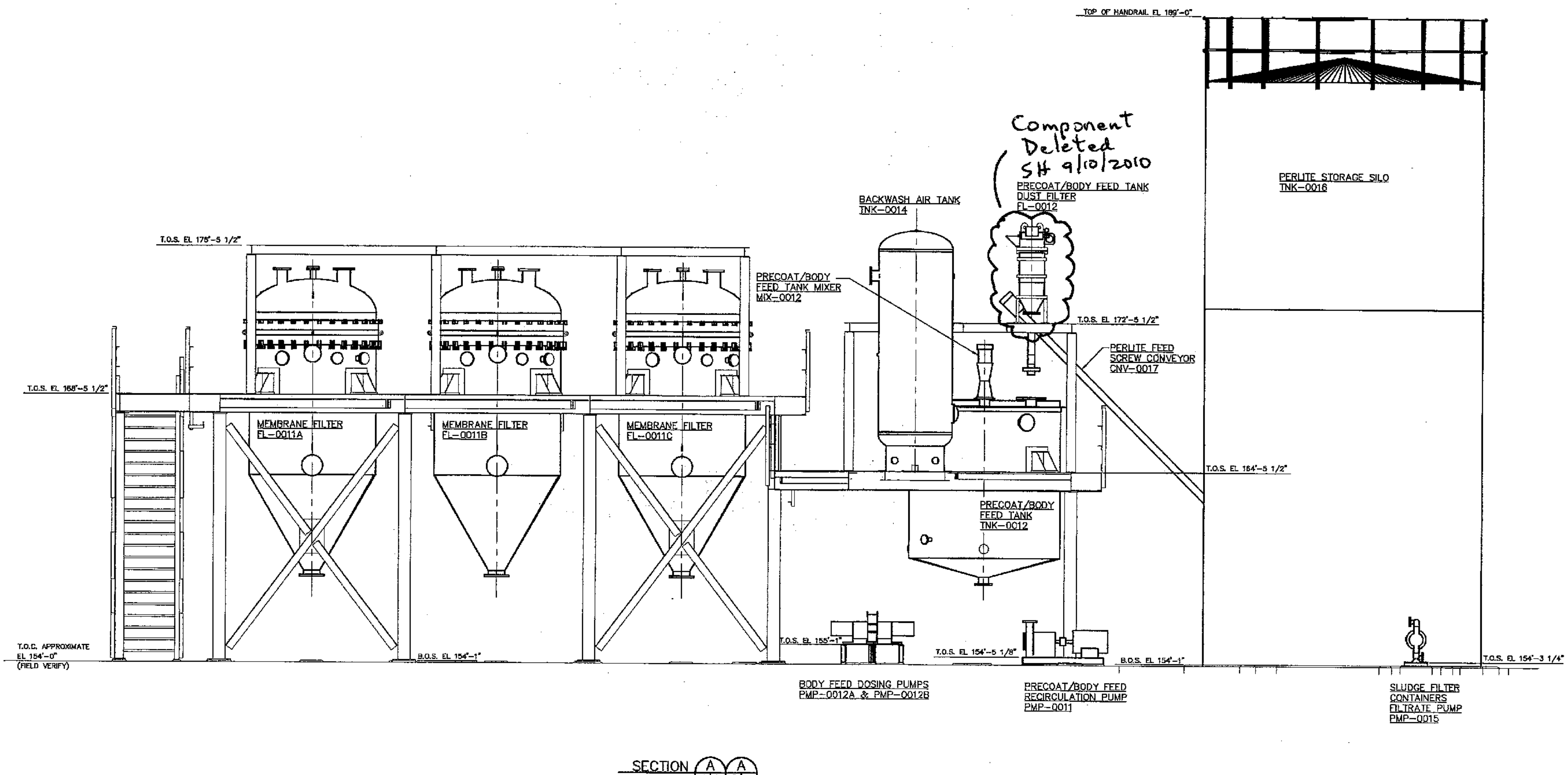
CLIENT/JOB	EQUIPMENT AND SERVICES CONTRACT FOR COSUMNES POWER PLANT ZLD WTS CRYSTALLIZER MODIFICATIONS AND PLANT MWT FILTRATION SYSTEM
FILE	RESOURCES CONSERVATION COMPANY
DWG DESCRIPTION	GENERAL ARRANGEMENT SECTION MEMBRANE FILTER SYSTEM
MATERIAL/BOM NO.	
SIZE	D
DRAWING NO.	A071-A1-2
REV	C
PROJECT	W.O. 20026957
SCALE	1/2" = 1'-0"
SHEET	4

P/N 1300471-R4P61



REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	ISSUED FOR ENGINEERING		GMC	JNH	4/02/09	SDF

TOLERANCES UNLESS NOTED: DECIMALS .X ± .XX ± .XXX ± ; ANGLES ± ; FRAC ±

DRAWN BY G. COSTANZO	DATE 4/02/09
CHECKED BY S. FRANKLIN	DATE 4/02/09
APPROVED BY J. HOLLINGSWORTH	DATE 4/02/09
APPROVED BY M. RAISOR	DATE 4/02/09

GE Infrastructure
Water & Process Technologies

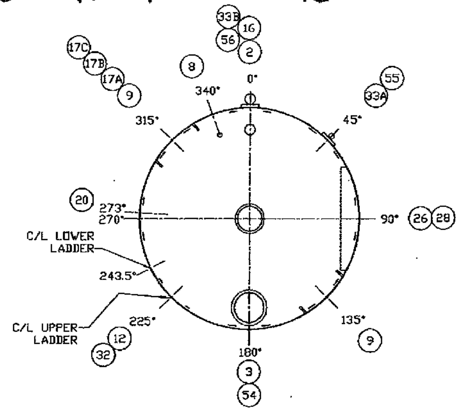
CLIENT/JOB: EQUIPMENT AND SERVICES CONTRACT FOR COSUMNES POWER PLANT ZLD WTS CRYSTALLIZER MODIFICATIONS AND PLANT MWT FILTRATION SYSTEM

FILE: RESOURCES CONSERVATION COMPANY

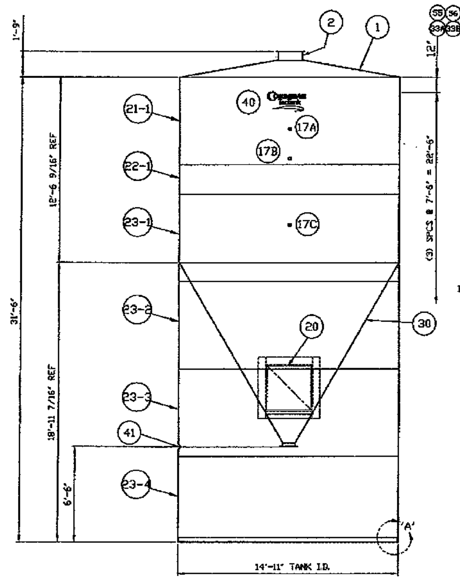
DWG DESCRIPTION: MEMBRANE FILTER SYSTEM SECTIONS EQUIPMENT INSTALLATION DRAWINGS

SIZE	DRAWING NO.	REV
D	A071-M5-2	A
PROJECT	W.O. 20026957	
SCALE 3/8"=1'-0"	SHEET 6	

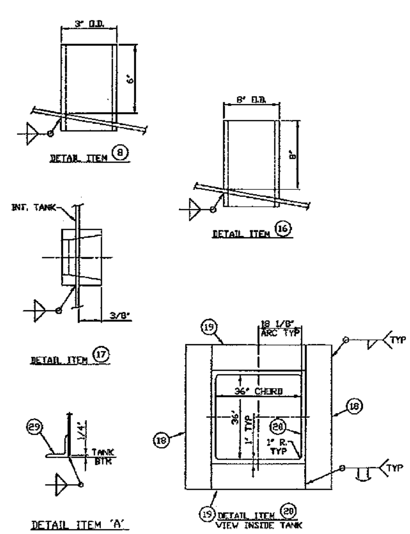
PERLITE STORAGE SILO
0-640-TNK-0016



DECK PLAN



ELEVATION



ACCESSORY ORIENTATION CHART									*** THESE COLUMNS FOR SHOP USE ONLY ***				
DESCRIPTION	ITEM#	DEGREE LOCATION	RADIUS FROM CENTER OF TANK	X-COORDINATE	Y-COORDINATE	ELEVATION FROM EAVE TO C/L OF ITEM	ELEVATION FROM BOTTOM OF TANK STEEL TO C/L OF ITEM	PROJECTION FROM EAVE TO TOP OF ITEM	SLOPE DIMENSION C/L OF ITEM TO EDGE OF DECK	REFERENCE C/L	ARC/DECK MEASURED FROM REFERENCE C/L	ARC/SHELL MEASURED FROM REFERENCE C/L	ARC TYPICAL BOTH SIDES OF DEGREE LOCATION
20" CENTER DOME NECK	2	0.0	—	—	—	—	—	—	—	—	—	—	—
24" MANWAY/PRV	3/54	180	—	—	—	—	—	—	—	—	—	—	—
3" PIPE STUB	8	340	—	—	—	—	—	—	—	—	—	—	—
LIFT LUGS	9	135/315	—	—	—	—	—	—	—	—	—	—	—
4HL CLPS/LADDER STUD LAYOUT	12/32	225	—	—	—	—	—	—	—	—	—	—	—
8" PIPE STUB	16	0	—	—	—	—	—	—	—	—	—	—	—
1 1/2" 3000# HALF COUPLING	17A	315	—	—	—	—	—	—	—	—	—	—	—
1 1/2" 3000# HALF COUPLING	17B	315	—	—	—	—	—	—	—	—	—	—	—
1 1/2" 3000# HALF COUPLING	17C	315	—	—	—	—	—	—	—	—	—	—	—
36" SQ SKIRT OPENING	20	273	—	—	—	—	—	—	—	—	—	—	—
6'-0" X 6'-8" DOOR ASSY	26/28	90	—	—	—	—	—	—	—	—	—	—	—
FILL LINE BRACKET STUDS	33A/55	45	—	—	—	—	—	—	—	—	—	—	—
VENT LINE BRACKET STUBS	33B/56	0	—	—	—	—	—	—	—	—	—	—	—
CTT LOGO	40	90	—	—	—	—	—	—	—	—	—	—	—

IMPORTANT:

PLEASE PROVIDE THE FOLLOWING INFORMATION WHEN RETURNING APPROVAL DRAWINGS NO LATER THAN 05/08/09. FAILURE TO MEET THIS DATE WILL AFFECT THE SHIPPING SCHEDULE.

PLEASE PROVIDE ALL INFORMATION (DEGREE & RADIUS OR ELEVATION) IN THE ACCESSORY ORIENTATION CHART.

SPECIFY/VERIFY OUTLET I.D. AND FLANGE PATTERN. (SIZE AND QTY. OF HOLES AND DIAMETER OF BOLT CIRCLE)

SPECIFY NORTH (0 DEG. WILL ALWAYS BE TO TOP IN DECK PLAN)

CUSTOMER SUPPLIED PARTS (IF ANY) MUST ARRIVE IN WINCHESTER, TN PLANT 30 DAYS PRIOR TO SHIP DATE.

FOR CENTER FILL, LOCATE FILL NOZZLE NO MORE THAN 1/3 RADIUS FROM CENTER OF TANK.

ITEM #28 DOUBLE DOOR MUST BE CENTERED BETWEEN BACK TO BACK LEG ANGLES.

SPECIFY UPPER LADDER OPENING LOCATION AT DECK. THE LOWER LADDER, AT GRADE, WILL BE ___ DEGREES TO THE RIGHT OR LEFT (SPECIFY) OF THE UPPER LADDER.

REFERENCE DRAWINGS	
FILL LINE ASSEMBLY	B-88-09-4476-54
VENT LINE ASSEMBLY	B-88-09-4476-56
24" MANWAY/PRV +2.0/-0.5	B-50-80-0548-42
20" TARGET BOX	B-88-09-4476-59
DBL DOOR FIELD PROCEDURES	A-60-00-2000-40
HANDRAIL ASSEMBLY	B-88-08-6486-40
LADDER ASSEMBLY	B-60-20-3200-11
ANCHOR BOLT LAYOUT	B-67-00-7000-00
HOPPER ASSEMBLY	B-88-09-4476-30

SAFETY/OPERATIONAL NOTES:
1) THIS TANK IS DESIGNED FOR LOADS FROM A DRY FREE FLOWING PRODUCT OF THE INDICATED DENSITY AND FLOW PATTERN, AND IS NOT DESIGNED FOR BRIDGING OR MASS FALLING CONDITIONS.
2) DO NOT FIELD CUT ANY OPENINGS IN TANK WITHOUT WRITTEN CONSENT FROM THE ENGINEERING DEPARTMENT OF COLUMBIAN TECTANK.
3) APPLICATION OF LOADS TO TANK FROM EQUIPMENT, OTHER THAN NOTED ON THIS DRAWING, MUST BE APPROVED IN WRITING BY COLUMBIAN TECTANK PRIOR TO INSTALLATION.
4) WIND BRACING TO BE FURNISHED BY CUSTOMER AS REQUIRED FOR EQUIPMENT ON TOP OF TANK.
5) TANK FOUNDATIONS SHALL BE LEVEL WITHIN 1/8" IN ANY 30 FT. CIRCUMFERENCE UNDER THE SHELL. LEVELNESS ON THE CIRCUMFERENCE SHALL NOT VARY MORE THAN 1/4" FROM AN ESTABLISHED PLANE.
6) CUSTOMER TO ASSURE PROPER TANK VENTILATION IS PROVIDED AND MAINTAINED.
7) IF ANCHOR BOLTS ARE NOT PROVIDED BY COLUMBIAN TECTANK OR IF TANK IS SUPPORTED BY LOAD CELLS, PROPER ANCHORING FOR ALL WIND AND SEISMIC LOADS IS THE RESPONSIBILITY OF THE CUSTOMER.
8) THIS TANK IS DESIGNED FOR SYMMETRICAL LOADING (CENTER DISCHARGE) UNLESS DESIGNED FOR SIDE DISCHARGE. SOME DISCHARGE EQUIPMENT CONFIGURATIONS MAY CAUSE A NON-SYMMETRICAL DISCHARGE PATTERN WITH CERTAIN BULK SOLIDS WHICH COULD RESULT IN STRUCTURAL DAMAGE TO THE TANK. PRECAUTIONS SHOULD BE TAKEN TO INSURE THE PRODUCT FLOWS IN A SYMMETRICAL, CENTER DISCHARGE PATTERN. COLUMBIAN TECTANK IS NOT RESPONSIBLE FOR DAMAGE TO THE TANK AS A RESULT OF A PRODUCT FLOW PATTERN OTHER THAN THE INTENDED FLOW PATTERN.
9) FOR TANKS WITH HOPPERS, ALLOWANCE FOR UNRESTRICTED EXPANSION AND CONTRACTION OF THE HOPPER IS REQUIRED. FLEXIBLE CONNECTIONS OR OTHER DEVICES TO BE DESIGNED, FURNISHED, AND INSTALLED BY OTHERS.

FIELD NOTES:
1) CUSTOMER MUST ALLOW 100 FT. PLUS TANK HEIGHT CLEAR SPACE FOR UNLOADING.
2) TERRAIN MUST BE PHYSICALLY MANEUVERABLE.
3) TOUCH-UP ALL SCRATCHES WITH PROVIDED TOUCH-UP PAINT.
4) FOR TANKS SUPPORTED ON STRUCTURAL STEEL, SHIMS MAY BE REQUIRED BETWEEN THE TANK BASE AND STRUCTURE TO ACHIEVE COMPLETE SUPPORT. SHIMS ARE TO BE FURNISHED AND INSTALLED BY OTHERS.

TANK DATA:
1) TANK IS DESIGNED FOR 100 PERCENT PERIMETER SUPPORT.
2) BLAST REQUIREMENTS: INORGANIC ZINC AND TT700+ SSPC SP10 NEAR-WHITE BLAST ALL OTHER COATINGS SSPC SP6 COMMERCIAL BLAST UNLESS NOTED.
3) HARDWARE: HOT DIPPED GALVANIZED
4) GASKETING: EPDM
5) ALL FILLET WELDS ARE 3/16 INCH, UNLESS NOTED.
6) UNLESS NOTED OTHERWISE, HANDRAIL CLIPS ARE LOCATED 14 1/4" EACH SIDE OF MAJOR CENTERLINES, 45°, 135°, 225°, & 315° & LADDER OPENINGS TO CENTER OF 9/16"DIA HOLE IN CLIP.
7) LIFT LUGS ARE LOCATED 21" EACH SIDE OF CENTERLINE.
8) TAG NUMBER: NOT REQ'D

9) EST. WEIGHT: LOWER SECTION	18,100 LBS. (TANK EMPTY)
10)	
11) OVERALL SHIPPING LENGTH:	33'-0"
12) SHIPPING WINDOW:	15'-0" SQ.

TANK COATING	
1) INTERIOR PRODUCT ZONE	AR-LON 6101
2) INTERIOR SKIRT	EPOXY
3) EXTERIOR	EPOXY
	W/ SADDLE TAN PERFORMANCE URETHANE

DESIGN DATA:	
1) PRODUCT	PERLITE
2) PRODUCT COMPACTED BULK DENSITY	25 PCF
3) ESTIMATED VOLUME	2585 CU. FT. @ 25 DEG. ANGLE OF REPOSE
4) FLOW PATTERN	FUNNEL FLOW
5) CENTER FILL, CENTER DISCHARGE	
6) GRIND REQUIREMENTS	SMOOTH NOT FLUSH
7) DESIGN PRESSURE POSITIVE	14.0 POSITIVE OZ. PER SQ. IN.
8) DESIGN PRESSURE NEGATIVE	1.0 NEGATIVE OZ. PER SQ. IN.
9) MAX OPERATING PRESSURE POSITIVE	2.0 POSITIVE OZ. PER SQ. IN.
10) MAX OPERATING PRESSURE NEGATIVE	0.5 NEGATIVE OZ. PER SQ. IN.
11) DECK LIVE LOAD	100 PSF
12) WIND LOAD PER ASCE 7-98	90 MPH EXP.C I = 1.0
13) SEISMIC PER IBC 2003: SS=46.0% S1=21.0%	
GROUP 2 CLASS D R=3 CAT. D I=1.3 V=0.183W	

ITEM	REV	PART NUMBER	QTY	DESCRIPTION	MAT'L GR	EST. WT.	
1	-	88-09-4476-01	1	DECK 10DEG 5/16 PL X 15'-2 3/4"O.D.	A36	2327	
2	B	60-12-5010-21	1	DOME NECK 20" DIA 28HL			
3	A	60-12-5016-54	1	DOME NECK 24" DIA 20HL FOR PRV			
P/L 4	A	60-12-5020-99	1	HDWR & GSKT ASSY 20"DIA 28HL	A36	30	
5							
6							
7							
8	-	03-10-0080-71	1	PIPE 3" SCH10 X 8"LG. SS	A304	4	
9	A	60-12-1002-92	4	LIFT LUG 3/4" X 6" X 33" LG	A36	112	
10							
11	A	60-12-8007-43	14	HANDRAIL CLIP 6HL	A36		
12	A	60-12-8007-81	2	HANDRAIL CLIP 4HL	A36		
13							
14							
15							
16	-	08-10-0080-70	1	PIPE 8" SCH10 X 8"LG. CS	A36	9	
17	-	04-05-0324-08	3	COUPLING 1 1/2" 3000# HALF CS			
18	-	06-12-0050-00	2	F.B. 1/2"X 6" X 50"	A36		
19	-	06-12-0038-00	2	F.B. 1/2"X 6" X 38"	A36		
20	B	88-09-4476-17	1	36" SQ SKIRT OPENING			
21	-	------------	1	RING 3/16PL X 69.84" X 562.934"	A36	2094	
22	-	------------	1	RING 3/16PL X 24" X 562.934"	A36	720	
23	-	------------	4	RING 3/16PL X 71" X 562.934"	A36	2129	
24							
25							
26	-	88-08-6486-26	2	ANGLE L4" X 4" X 1/2" X 120" LG	A36	77	
27							
28	B	88-08-5952-28	1	DBL DOOR ASSY 6'-0" X 6'-8"	A36		
29	A	88-06-5348-10	1	BASE ANGLE 4" X 4" X 1/2"	A36	1061	
30	B	88-09-4476-30	1	HOPPER 60 DEG 3/16"PL W/10" OUTLET	A36		
31	B	10-09-0654-34	1	NAMEPLATE			
32	B	60-89-3200-11	1	32" LADDER STUD/PAD LAYOUT LH			
33	-	99-00-0216-09	16	STUD BOLT 1/2"DIA. X 1 1/4"LG. SS			
34							
35							
36							
37							
38							
39							
40	-	10	1	LOGO CTT			
* 41	A	60-12-5005-53	1	SHELL TO HOPPER ACCESS ASSEMBLY			
42							
43							
44							
45	-	EEA0086	X	GAL. AR-LON 6101 BASE			
46	-	CEC0114	X	GAL. AR-LON 6101 CATALYST			
47	-	EEA0072	X	GAL. EPOXY PRIMER 2.8 MILS			
48	-	CEC0114	X	GAL. EPOXY PRIMER C.A.			
49	-	V01726-515	X	GAL. SADDLE TAN URETHANE ENAMEL			
50	-	CTC0073	X	GAL. URETHANE CATALYST			
				SHIP LOOSE ITEMS	COATING		
51							
52	B	60-20-3200-11	1	32" LADDER ASSY GALVANIZED LH	HDG		
53	B	88-04-6936-40	1	HANDRAIL ASSY	HDG		
54	B	50-80-0548-42	1	MANWAY/PRV 24" +2.0/-0.5			
55	B	88-09-4476-54	1	4" FILL LINE KIT ASSY			
56	B	88-09-4476-56	1	8" VENT LINE KIT ASSY			
57							
58	L	60-95-0000-00	1	SHIM KIT			
59	-	EEA0086T	1	PT. AR-LON 6101 BASE TU			
60	-	CEC0114T	1	1/4PT. FDA EPOXY C.A. TU			
61	-	EEA0072T	1	12.33 OZ. EPOXY PRIMER BASE TU			
62	-	CEC0114T	1	2.67 OZ. EPOXY PRIMER C.A. TU			
63	-	V01786-515T	2	20 OZ. SADDLE TAN URETHANE ENAM. TU			
64	-	CTC0073T	2	4 OZ. URETHANE CATALYST TU			
65	-	99-99-9999-95	3	PAINT BRUSH			

* ITEM #41 IS REQ'D FOR FABRICATION PURPOSES ONLY

FOR APPROVAL
DO NOT USE
FOR CONSTRUCTION

PROJECT NAME: SMUD
PROJECT NUMBER: A071
EQUIPMENT PURCHASE ORDER NUMBER: 37423
EQUIPMENT NAME/ DESCRIPTION: STORAGE SILO
EQUIPMENT TAG: 0-640-TNK-0016

REV	REVISION	BY	CHKD	APR.	DATE
△					
△					
△					
△					
△					

COLUMBIAN TecTank

ELEVATION, DECK & BILL OF MATERIAL
14'-11"Ø X 31'-6" CARBON STEEL WELDED TANK
GE IONICS, INC.
PO# 37423

BY RC	DATE 04/27/09	ORDER NO. 09-4476	DRAWING NO. D-60-15-94476-00
CHKD	DATE		
APPR.	DATE		

Project A071-SMUD

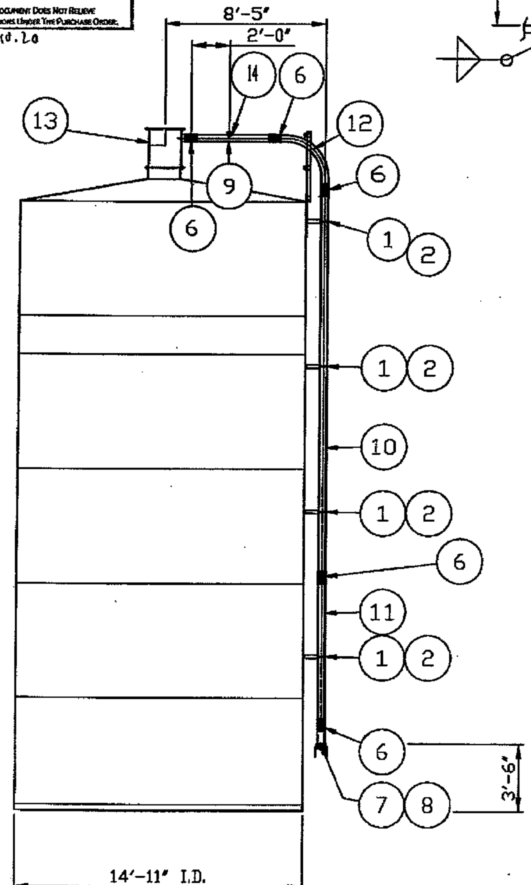
GE Infrastructure
Water & Process Technologies

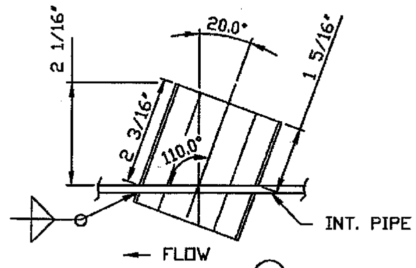
This document is:
- [x] APPROVED AS IS
- [ ] APPROVED AS NOTED — Revise as noted and resubmit. Do NOT hold fabrication or construction
- [ ] DISAPPROVED — Revise as noted and resubmit. HOLD FABRICATION OR CONSTRUCTION
- [ ] FOR REFERENCE AND INFORMATION ONLY

BY: [signature] DATE: 6-11-09

GE Approval Of This Document Does Not Relieve Supplier Of Its Obligations Under The Purchase Order.

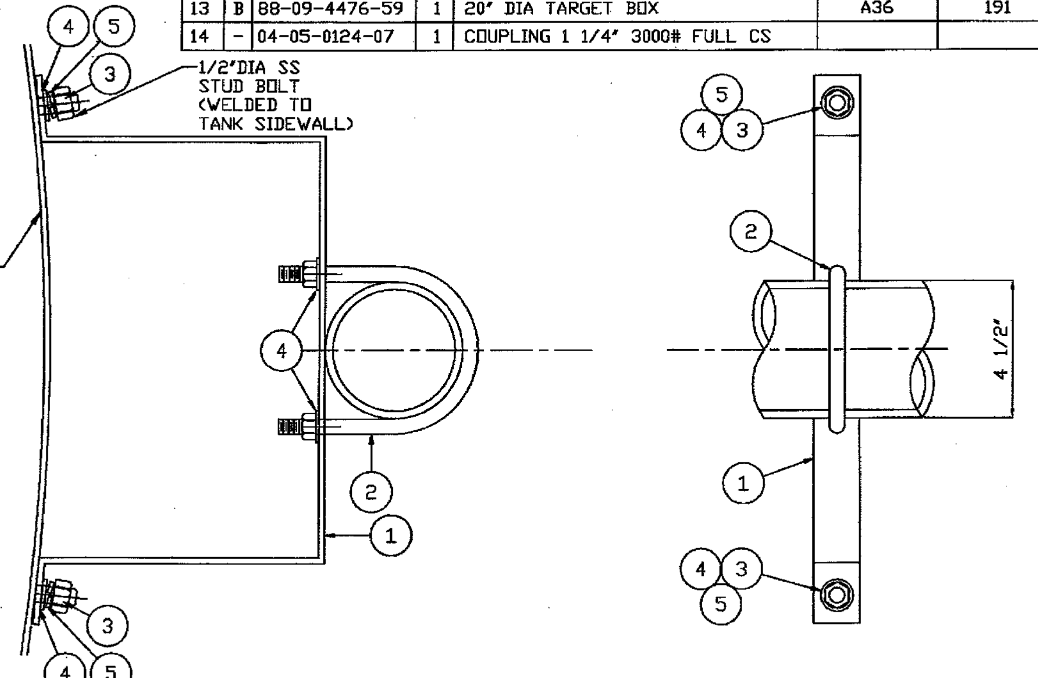
PR# 18:0210.20





DETAIL ITEM (14)

ITEM	D/S	PART NO.	QTY	DESCRIPTION	MAT'L. GR.	EST. WT.
1	A	88-09-4476-51	4	4" FILL BRACKET	A36	2
2	-	50-88-0547-03	4	U-BOLT 4" W/ NUTS		
3	-	782G00800	9	NUT 1/2 HEX HDG		
4	-	791M04125	18	WASHER 1/2" SAE FLAT HDG		
5	-	33-00-0000-23	9	WASHER 1/2" LOCK M/G		
6	-	99-00-0001-37	5	MORRIS COUPLING 4" 4-BOLT		
7	-	99-00-0811-71	1	QUICKIE LINE ADAPTER 4" SS		
8	-	99-00-0001-40	1	DUST CAP-4" PIPE		
9	-	04-40-0524-70	1	PIPE 4" SCH40 X 52 1/2" CS	A500	48
10	-	04-40-2400-70	1	PIPE 4" SCH40 X 20'-0" CS	A500	216
11	-	04-40-0915-70	1	PIPE 4" SCH40 X 7'-7 9/16" CS	A500	83
12	-	99-00-0013-05	1	ELBOW 4"SCH40 24"R 8" TAN CER BA	A500	48
13	B	88-09-4476-59	1	20" DIA TARGET BOX	A36	191
14	-	04-05-0124-07	1	COUPLING 1 1/4" 3000# FULL CS		



FILL LINE BRACKET ASSEMBLY

ASSY WT = 594#

PROJECT NAME:	SMUD
PROJECT NUMBER:	A071
EQUIPMENT PURCHASE ORDER NUMBER:	37423
EQUIPMENT NAME/ DESCRIPTION:	PERLITE STORAGE SILO
EQUIPMENT TAG:	0-640-TNK-0016

REV.		BY	CHK.	APP.	DATE
D					
C					
B					
A					

SCALE NTS
DRN. RC 04/27/09
CHK. CBR 05/28/09
APP. MS 05/28/09

COLUMBIAN TecTank

FILL LINE ASSY

REL. NO. 09-4476 | B | 88-09-4476-54

PERLITE FEED SCREW CONVEYOR   0-640-CNV-0017

EQUIPMENT WEIGHTS:

HOPPER ASSEMBLY: 55 LBS.
10" SLIDEGATE VALVE: 75 LBS
DRIVE ASSMBLY: 160 LBS
6" SLIDEGATE: 55 LBS

NOTES:

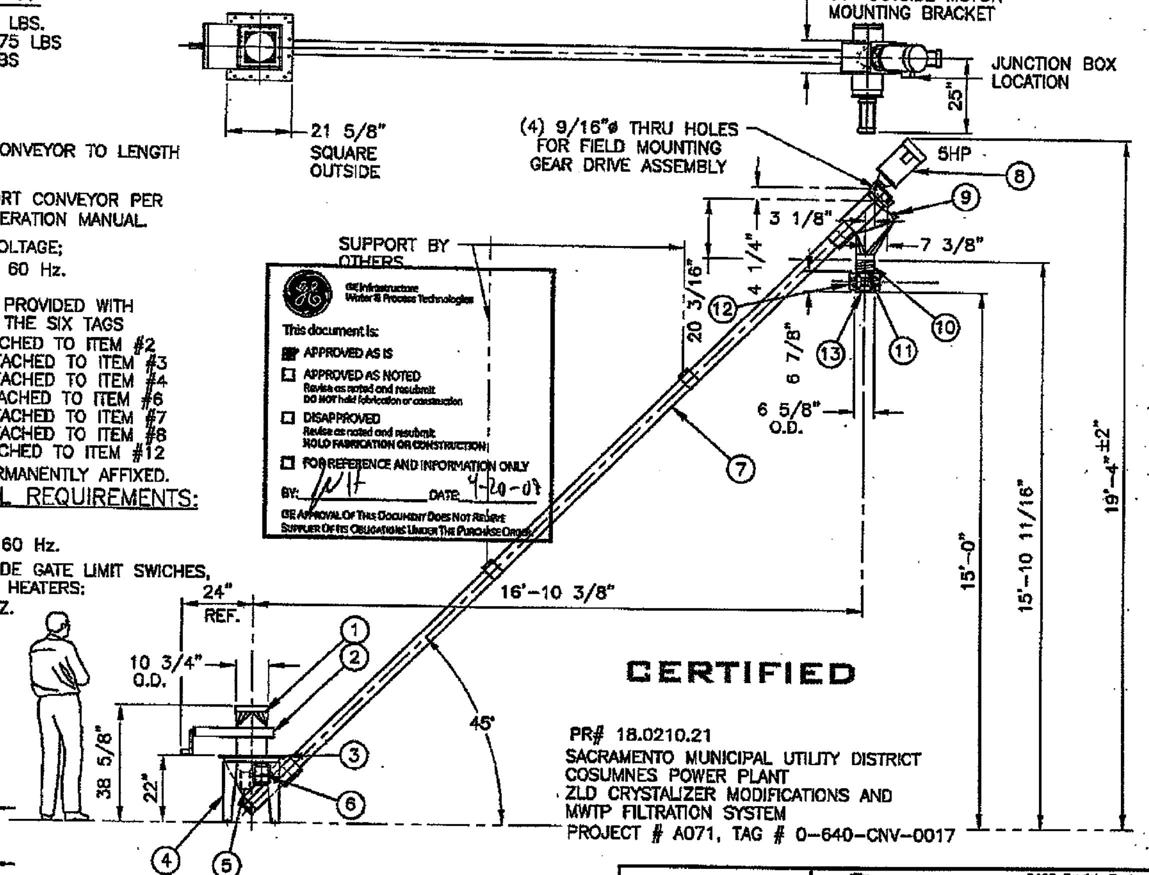
- CUSTOMER TO CUT CONVEYOR TO LENGTH IN FIELD TO SUIT.
- CUSTOMER TO SUPPORT CONVEYOR PER INSTALLATION AND OPERATION MANUAL.
- SYSTEM OPERATING VOLTAGE; 230/460 VAC, 3 PH, 60 Hz.

SIX SS TAGS WILL BE PROVIDED WITH 1/2" TALL LETTERING. THE SIX TAGS
0-640-XV-0902 ATTACHED TO ITEM #2
0-640-CNV-0017 ATTACHED TO ITEM #3
0-640-CNV-0017 ATTACHED TO ITEM #4
0-640-LSL-0913 ATTACHED TO ITEM #6
0-640-CNV-0017 ATTACHED TO ITEM #7
0-640-CNV-0017 ATTACHED TO ITEM #8
0-640-XV-0900 ATTACHED TO ITEM #12
THE TAGS WILL BE PERMANENTLY AFFIXED.

SYSTEM ELECTRICAL REQUIREMENTS:

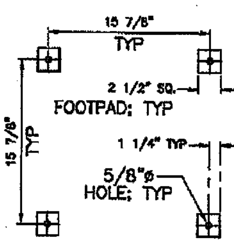
-FOR DRIVE MOTOR:
230/460 VAC, 3 PH, 60 Hz.
-FOR LEVEL SWITCH, SLIDE GATE LIMIT SWICHES, SOLENOIDS AND MOTOR HEATERS:
115 VOLT, 1 PH, 60 HZ.

(14) IS NOT SHOWN SEE B.O.M. FOR MORE INFO



CERTIFIED

PR# 18.0210.21
SACRAMENTO MUNICIPAL UTILITY DISTRICT
COSUMNES POWER PLANT
ZLD CRYSTALIZER MODIFICATIONS AND
MWTP FILTRATION SYSTEM
PROJECT # A071, TAG # 0-640-CNV-0017



HOPPER FOOTPRINT
NOT TO SCALE

SYSTEM AIR REQUIREMENTS:

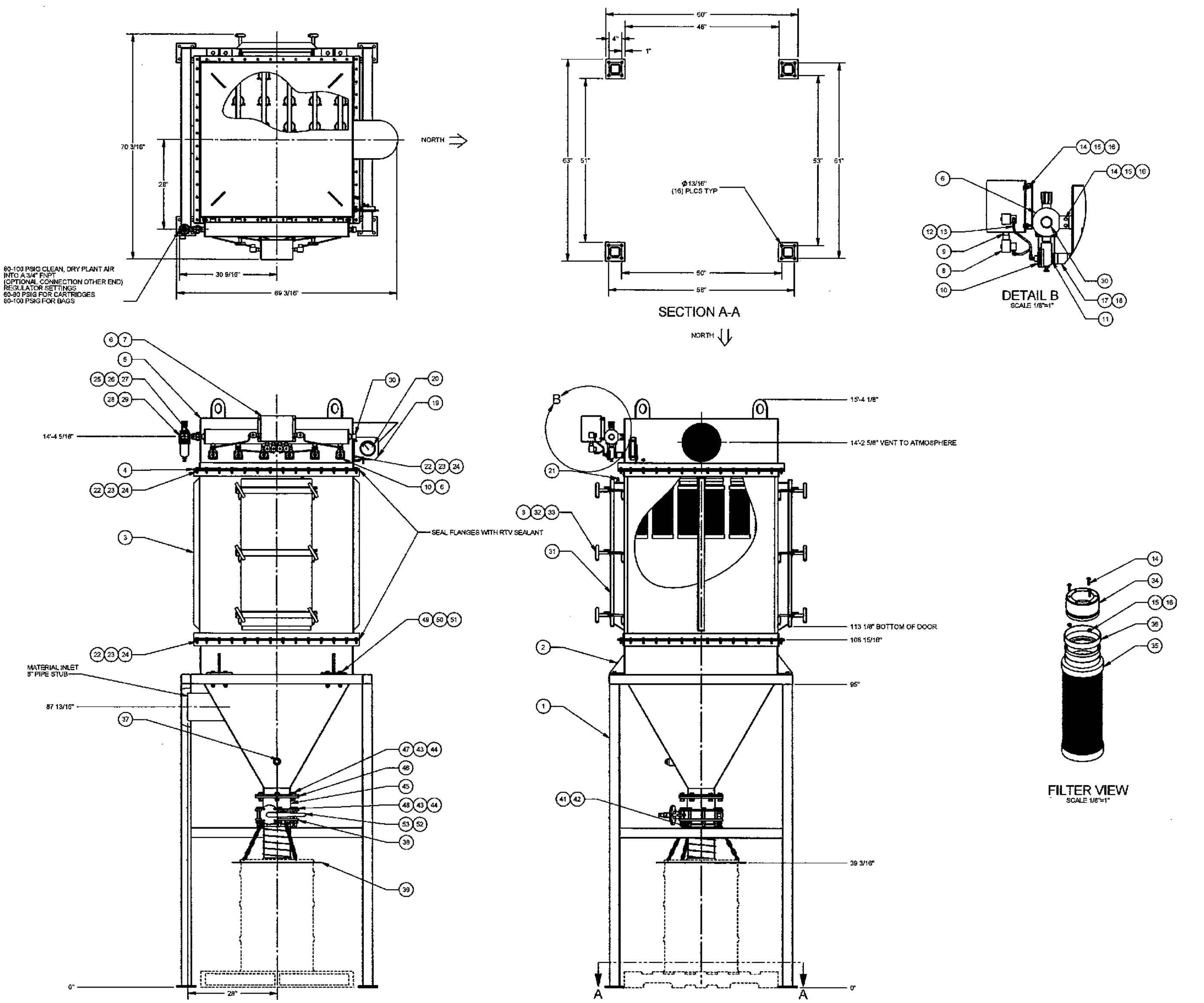
ALL PNEUMATIC SYSTEMS REQUIRE CLEAN, DRY PLANT AIR DELIVERED AS FOLLOWS:

-SLIDEGATE:
2 CFM, 80-100 psi, THRU 3/8" NPT PORT ON FILTER REGULATOR.

Flexicon
Flexicon Corporation
www.flexicon.com
2400 Emrick Boulevard
Bethlehem, PA 18020-8006
USA
Tel: 1-888-FLEXICON
Tel: 1-610-814-2400
Fax: 1-610-814-0600

DRN. BY: DLC	REV. BY: DLC 4/06/09	JOB No. 81164	QUOTE No.
DATE: 3/30/09	TITLE: FLEXICON CONVEYING SYSTEM LAYOUT		
SCALE: 1/2"=12"			
CUSTOMER: GE WATER & PROCESS	DWG No. C-810557	REV A	SHEET 1 of 1

41



ITEM	QTY	DESCRIPTION	PART NO.	DWG NO.	ID	REV
1	1	FRAME WELDMENT, 18-DC-36 WITH DRUM DUMP KIT, CS	-	24-2-2965	50	A
2	1	HOPPER WELDMENT, 84-DC-36 W/ 8" INLET, CS	-	24-2-2970	50	
3	1	DIRTY AIR PLENUM, 36-DC-36, CS	-	24-2-1875	50	A
4	1	TUBE SHEET, DC-36 SERIES, CS	907-09000	22-3-0408	00	A
5	1	WELDMENT, DC-36 SERIES CLEAN AIR PLENUM, CS	-	23-2-2267	50	A
6	1	HEADER, DC-36 SERIES, CS	-	24-2-0490	50	E
7	1	ELECTRICAL SCHEMATIC	-	22-1-0146	00	
8	6	VALVE, 1/8" SOLENOID, 115 VAC, 2-WAY (SEE ELECTRICAL SCHEMATIC)	-			
9	6	NIPPLE, 1/2" CLOSE, CS	905-00124			
10	6	VALVE, 1" SINGLE DIAPHRAGM FM25	905-01496A			
11	6	NIPPLE, HALF OF A 1" X 3" NIPPLE, CS	905-00847			
12	14	COMPRESSION ELBOW 1/8" MNPT X 1/4" OD TUBE	905-04106			
13	1	TUBING, 1/4" OD X 128" LG, BLACK NYLON (CUT TO FIT)	905-05086			
14	116	BOLT, 1/4" X 1" UNC, HEX HEAD, PLTD	900-00004			
15	116	WASHER, 1/4" SPG LOCK, PLTD	900-10011			
16	116	NUT, 1/4" UNC, HEX, PLTD	900-05000			
17	6	HOSE, 1 1/4" X 3' LG, GENERAL PURPOSE	905-05085			
18	12	CLAMP, 1 1/4" HOSE	900-28111			
19	1	DIFFERENTIAL PRESSURE GAUGE BRACKET, CS	907-01062	21-3-0418	00	D
20	1	GAUGE, DIFFERENTIAL PRESSURE, 2030 (0-30" H2O)	905-09356			
21	2	COMPRESSION ELBOW 1/4" MNPT X 1/4" OD HOSE	905-04085			
22	106	BOLT, 3/8" X 1 1/2" UNC, HEX HEAD, PLTD	900-00136			
23	106	WASHER, 3/8" SPG LOCK, PLTD	900-10015			
24	106	NUT, 3/8" UNC, HEX, PLTD	900-05005			
25	1	UNION, 1"	905-00846			
26	1	BUSHING, 1" X 3/4", HEX REDUCER, CS	905-00250			
27	1	NIPPLE, 3/4" CLOSE	905-00252			
28	1	FILTER REGULATOR, 3/4" FNPT	905-01255			
29	1	GAUGE, 0-160 PSI	905-09516			
30	1	CAP, 1" PIPE	905-00336			
31	2	DOOR WELDMENT, 22 1/4" X 46", CS	-	23-2-2356	50	C
32	12	WASHER, 1/2" FLAT	900-10007			
33	12	TEE HANDLE, CS	-	22-2-1714	50	B
34	36	FILTER CUP	904-01207			
35	36	FILTER, CARTRIDGE 5 3/4" X 18', BOTTOM REMOVABLE, PTFE	904-01446			
36	36	FILTER CLAMP, SS	904-01209			
37	1	PLUG, 1 1/2" MNPT, CS	905-00240			
38	1	WELDMENT, 8" FLANGE X 8" TUBE STUB X 4" OAH, CS	-	21-2-0291	50	
39	1	WELDMENT, BARREL COVER WITH 8" TUBE INLET, CS	-	22-2-2682	50	
40	3	CHAIN, 1/2" X 12" LONG	903-02046			
41	1	HOSE, Ø8" X 14" LG, CLEAR DUCT	905-05262			
42	2	CLAMP, 8" POWER LOCK, 100B	900-28178			
43	14	WASHER, 3/4" SPG LOCK, PLTD	900-10040			
44	14	NUT, 3/4" UNC, HEX, PLTD	900-05037			
45	1	ADAPTER, CYCLOLOK INLET, CS	-	22-2-0592	50	E
46	1	GASKET, 1/8" X 13 1/2" OD X 10 1/4" ID, BLK NEO	905-03014	21-3-0378	01	-
47	6	BOLT, 3/4" X 2" UNC, HEX HEAD, PLTD	900-00247			
48	8	BOLT, 3/4" X 5 1/2" UNC, HEX HEAD, PLTD	900-00294			
49	8	BOLT, 5/8" X 4 1/2" UNC, HEX HEAD, PLTD	900-00382			
50	8	WASHER, 5/8" SPG LOCK, PLTD	900-10019			
51	8	NUT, 5/8" UNC, HEX, PLTD	900-05012			
52	1	VALVE, 8" BUTTERFLY	905-01039A			
53	1	HANDLE, 8" BFV	905-11056			

Equipment Name SILO DUST FILTER
Equipment Tag # 0-840-FL-0016
Sacramento Municipal Utility District
Cosumnes Power Plant
ZLD Crystallizer Modifications and MWTP Filtration System
GE IONICS Project Number - A071
GE IONICS Purchase Order Number - 37417

NOTES:
1. ANY ITEM NOT INCLUDED IN THE BILL OF MATERIALS IS BY OTHERS.
2. REFER TO THE EQUIPMENT ID FOR PAINT SPECIFICATIONS.
3. WEIGHT: APPROXIMATELY 1950 LBS EMPTY, 2510 LBS FLOODED. (ASSUMING EXPANDED PERLITE AT 7 LBS/CUBIC FT.)

REV. NO.	DR'N. BY	CK'D. BY	DATE	
B	JH			REVISED DRAWING PER CUSTOMER REQUEST
A	JH			REVISED DRAWING PER CUSTOMER REQUEST, REMOVED CYCLOLOCK CONTROL BOX (NOT NEEDED)

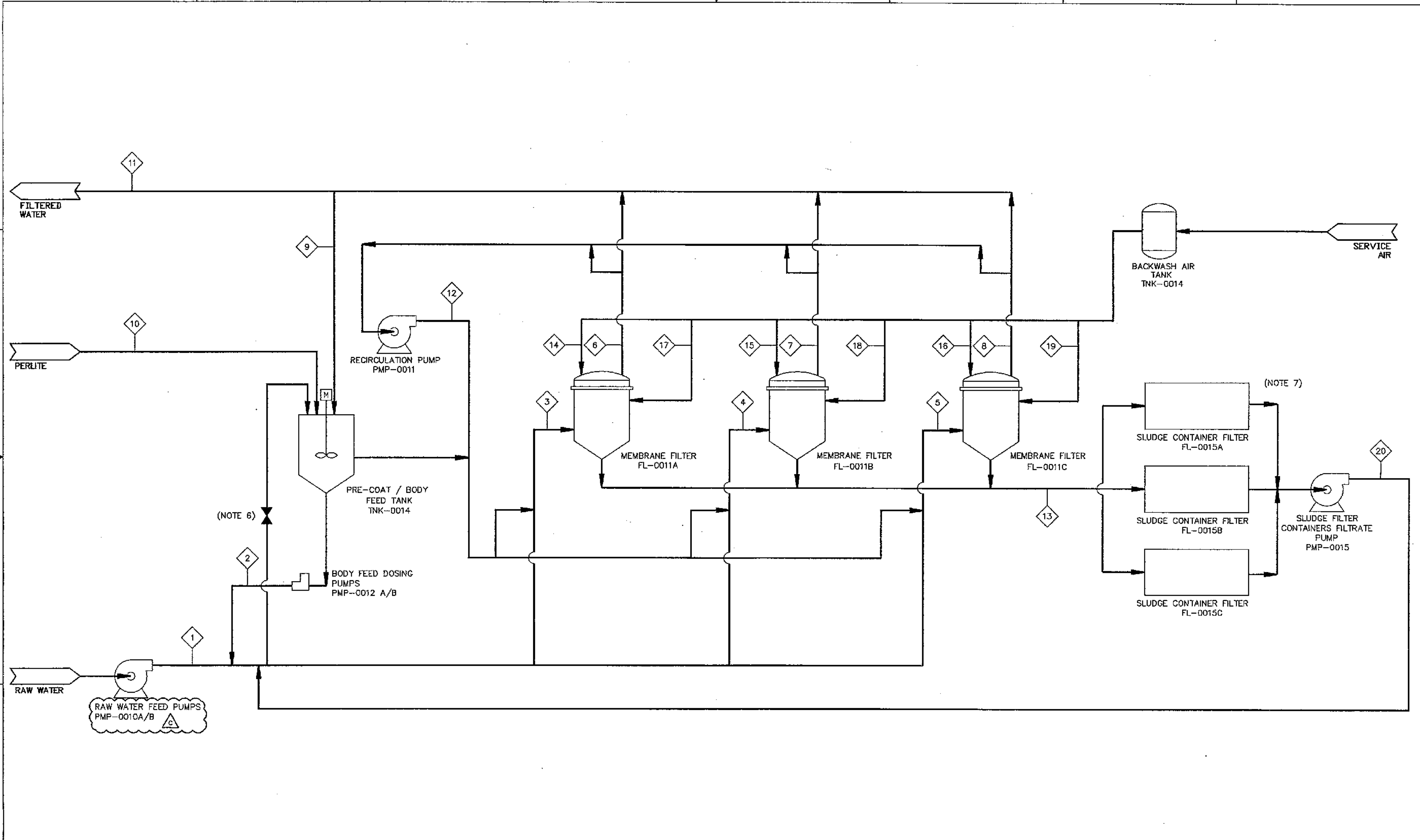
SHEET SIZE: D
DRN BY: J HABLITZEL
CHK BY:
SCALE: 1:16
CAD FILE NAME: 24-0-4216
REFERENCE DRAWING
APVD BY
DATE

cyclonaire CORPORATION BOX 366 YORK, NEBR.

18-DC-36
ARRG III WITH DRUM DUMP KIT
CS CONSTRUCTION

DRAWING NO.: 24-0-4216 | SHEET: 1 OF 1 | REV.: B

TOLERANCE UNLESS OTHERWISE NOTED
.X/X = ± 1/16
.XXX = ± .005
ANGLES = ± 1



REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	PRELIMINARY – MEMBRANE FILTRATION SYSTEM		DCH	MKR	11/24/08	JNH
B	REVISED FOR ENGINEERING		DCH	MKR	2/6/09	JNH
C	ISSUED FOR CONSTRUCTION		LVA	[illegible]	3/5/09	[illegible]

TOLERANCES UNLESS NOTED: DECIMALS .X ± .XX ± .XXX ± ; ANGLES ± ; FRAC ±

DRAWN BY	L. ABEN	11/24/08
CHECKED BY	N. MILLER	11/24/08
APPROVED BY	J. HOLLINGSWORTH	11/24/08
APPROVED BY	M. RAISOR	11/24/08

GE Infrastructure
Water & Process Technologies

CLIENT/JOB: EQUIPMENT AND SERVICES CONTRACT FOR COSUMNES POWER PLANT ZLD WTS CRYSTALLIZER MODIFICATIONS AND PLANT MWT FILTRATION SYSTEM

FILE: RESOURCES CONSERVATION COMPANY

DWG DESCRIPTION: PROCESS FLOW DIAGRAM MEMBRANE FILTER SYSTEM

SIZE	DRAWING NO.	REV
D	A071–M3–2	C

PROJECT: W.O. 20026957

SCALE: NONE — SHEET 1 OF 2

STREAM NUMBER	1	2	3	4	5	6	7	8
DESCRIPTION	RAW WATER	BODY FEED	FILTER A FEED	FILTER B FEED	FILTER C FEED	FILTER A FILTRATE	FILTER B FILTRATE	FILTER C FILTRATE
MASS FLOW, LB/HR	1,376,100	1,251	688,050	688,050	688,050	688,050	688,050	688,050
VOLUME FLOW, GPM	2,750	2.5 (MAX)	1,375	1,375	1,375	1,375	1,375	1,375
PRESSURE, PSIG	80	80	75	75	75	35	35	35
TOTAL SUSPENDED SOLIDS, mg/L	72 (MAX)	10 WT%	72 (MAX)	72 (MAX)	72 (MAX)	5 (MAX)	5 (MAX)	5 (MAX)
NOTES			2	2	2			

STREAM NUMBER	9	10	11	12	13	14	15
DESCRIPTION	PERLITE SOLUTION WATER	PERLITE	FILTERED WATER	PRECOAT RECIRCULATION	BACKPULSE SLUDGE	FILTER A BACKPULSE AIR	FILTER B BACKPULSE AIR
MASS FLOW, LB/HR	1,051	1,100	1,376,100	500,400	750,600	—	---
VOLUME FLOW, GPM	2.1	--	2,750	1,000	1,500	406 CFS	406 CFS
PRESSURE, PSIG	35	--	35	30	---	15 -30	15 -30
TOTAL SUSPENDED SOLIDS, mg/L	5 (MAX)	--	5 (MAX)	100	5-8 WT%	--	---
NOTES	3	4		5	8	9	9

STREAM NUMBER	16	17	18	19	20
DESCRIPTION	FILTER C BACKPULSE AIR	FILTER A DRAIN AIR	FILTER B DRAIN AIR	FILTER C DRAIN AIR	FILTRATE RETURN
MASS FLOW, LB/HR	---	---	---	--	25,020
VOLUME FLOW, GPM	406 CFS	1 CFS	1 CFS	1 CFS	50
PRESSURE, PSIG	15 -30	15	15	15	80
TOTAL SUSPENDED SOLIDS, mg/L	---	---	---	--	TBD
NOTES	9	10	10	10	11

NOTES:

1. ALL EQUIPMENT TAG NUMBERS ARE PREFIXED WITH "0-640-".
2. FILTERS ARE A 3 X 50% CONFIGURATION.
3. CONTINUOUS FLOW RATE SHOWN. TANK FILLED ON A BATCH BASIS WITH APPROXIMATELY 3000 GALLONS OF FILTERED WATER WHEN PREPARING PERLITE SOLUTION.
4. BATCH FLOW RATE SHOWN. TANK FILLED ON A BATCH BASIS WITH 2200 POUNDS OF PERLITE WHEN PREPARING PERLITE SOLUTION.
5. RECIRCULATION IS REQUIRED ONLY DURING THE PRECOAT OF AN INDIVIDUAL FILTER.
6. REQUIRED FOR START-UP WITH AN EMPTY FILTER SYSTEM.
7. SLUDGE CONTAINER FILTER DEWATERED SOLIDS DISPOSAL "BY OTHERS".
8. BACKPULSE SLUDGE TRANSFERRED ON A BATCH BASIS FROM EACH FILTER. APPROXIMATELY 3000 GALLONS OF SLUDGE PER BATCH.
9. BACKPULSE AIR FLOW RATE FOR ONE FILTER SHOWN. AIR IS ONLY REQUIRED DURING THE BACKPULSE STEP.
10. DRAIN AIR FLOW RATE FOR ONE FILTER SHOWN. AIR IS ONLY REQUIRED DURING THE DRAIN STEP.
11. FILTRATE IS RETURNED ON A BATCH BASIS AT A FLOW RATE OF APPROXIMATELY 50 GPM.

REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	PRELIMINARY – MEMBRANE FILTRATION SYSTEM		DCH	MKR	11/24/08	JNH
B	REVISED FOR ENGINEERING		DCH	MKR	2/6/09	JNH
C	ISSUED FOR CONSTRUCTION (NO CHANGES THIS SHEET)		LVA	[illegible]	3/5/09	[illegible]

TOLERANCES UNLESS NOTED: DECIMALS .X ± .XX ± .XXX ± ANGLES ± FRAC ±

DRAWN BY	L. ABEN	DATE 11/24/08
CHECKED BY	N. MILLER	DATE 11/24/08
APPROVED BY	J. HOLLINGSWORTH	DATE 11/24/08
APPROVED BY	M. RAISOR	DATE 11/24/08

GE Infrastructure
Water & Process Technologies

CLIENT/JOB: EQUIPMENT AND SERVICES CONTRACT FOR COSUMNES POWER PLANT ZLD WTS CRYSTALLIZER MODIFICATIONS AND PLANT MWT FILTRATION SYSTEM

FILE: RESOURCES CONSERVATION COMPANY

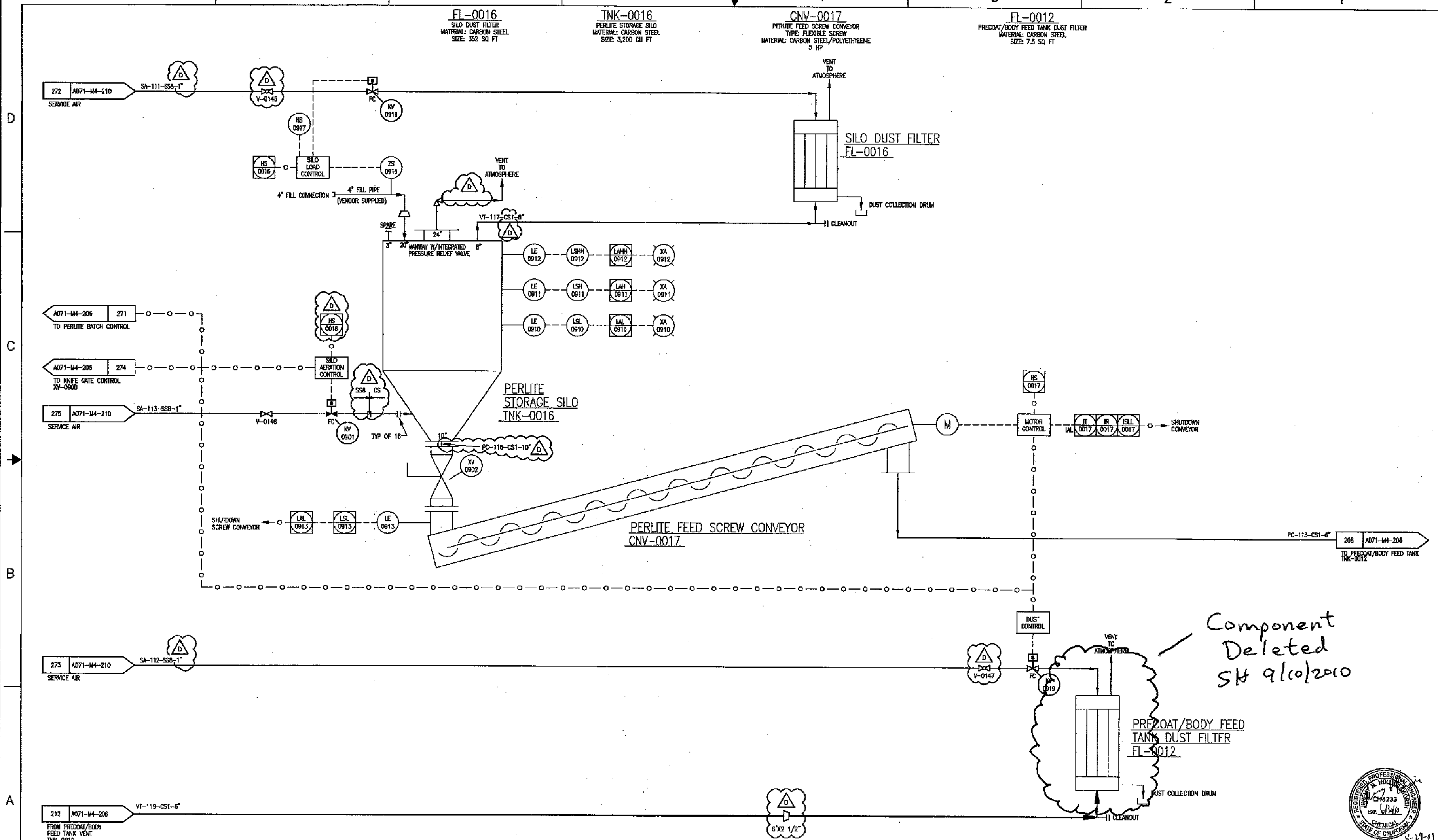
DWG DESCRIPTION: PROCESS FLOW DIAGRAM MEMBRANE FILTER SYSTEM

MATERIAL/BOM NO.

SIZE: D | DRAWING NO.: A071-M3-2 | REV: C

PROJECT: W.O. 20026957

SCALE: NONE | SHEET: 2



REV	DESCRIPTION	ECO	DWN	APVD	DATE	CHKD
A	PRELIMINARY		LVA	MKR	11/24/08	JNH
B	REVISED FOR ENGINEERING (NEW SHEET)		DCH	MKR	2/6/08	JNH
C	ISSUED FOR CONSTRUCTION		RLL	MKR	3/03/09	JNH
D	REVISED FOR CONSTRUCTION		LVA		4/30/09	

TOLERANCES UNLESS NOTED: DECIMALS .X ± .XX ± .XXX ± ; ANGLES ± ; FRAC ±

DRAWN BY: D.HOAG — DATE 1/16/09
CHECKED BY: J. HOLLINGSWORTH — DATE 1/16/09
APPROVED BY: M. RASOR — DATE 1/16/09
APPROVED BY: — DATE

GE Infrastructure
Water & Process Technologies

CLIENT/JOB: EQUIPMENT AND SERVICES CONTRACT FOR COSUMNES POWER PLANT ZLD WTS CRYSTALLIZER MODIFICATIONS AND PLANT MWT FILTRATION SYSTEM

FILE: RESOURCES CONSERVATION COMPANY

DWG DESCRIPTION: P. & I. D. PRECOAT/BODY FEED HANDLING MEMBRANE FILTER SYSTEM

SIZE: D — DRAWING NO. A071-M4-2 — REV D

PROJECT: W.O. 20026957

SCALE: – — SHEET 8

2922 North Division Avenue • PO Box 366 • York, NE 68467 • 402-362-2000 • 800-445-0730 • Fax 402-362-2001 • sales@cyclonaire.com • www.cyclonaire.com

PNEUMATIC CONVEYING SYSTEMS

BIN VENT / DUST COLLECTOR

APPLICATIONS

- Air filtration and dust control at material destination

MATERIALS / CHARACTERISTICS

- Any dry bulk material conveyed pneumatically

CAPACITY

- Up to 549 ft^2 of filter area (standard)
- Pressure rated to 17" H_2O

BENEFITS AND FEATURES

- Pulse jet cleaning to maintain media effectiveness
- Hinged door for easy bag access
- Differential pressure gauges for filter service indication
- Standard:
  - Carbon steel (10 gauge, welded)
  - NEMA 4 timer controls
  - 16 oz. polyester bags / bottom removable
  - Smooth wire cages and safety grid
  - Support legs and hopper (dust collector only)
- Specify:
  - Stainless steel
  - Timer controls in NEMA 4X, 7/9, 24V DC
  - Outlet size and style
  - Cartridge filter elements
  - Top removable design
  - Exhaust fan
  - High temperature design
  - Custom sizes and features

REQUIREMENTS

- 120 VAC, 50-60 Hz
- 90-100 PSIG; 3-10 SCFM air

OVERVIEW

Cyclonaire brand bin vents and dust collectors provide excellent filtration at destination points such as bins, hoppers and silos.

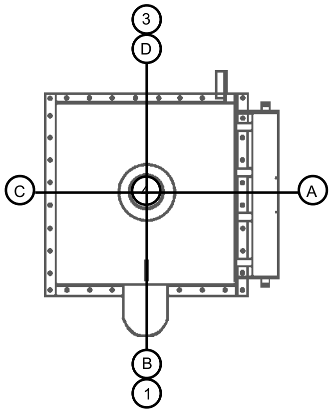
Installation is quick and easy with flanged outlet and dust discharge.

Automatic timers clean the filter media with pulse jet reverse flow air; dropping retained material back into the process.

Wide array of sizes available; custom sizes and features are also available.

Quality, custom built at competitive prices.

BIN VENT / DUST COLLECTOR



ORIENTATION

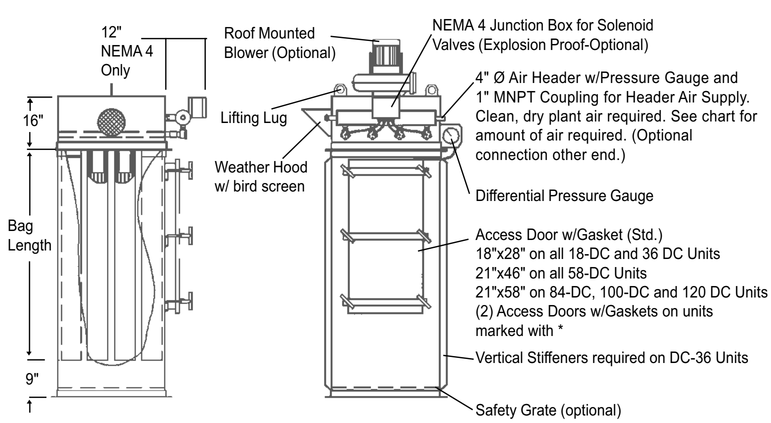
LOCATIONS AVAILABLE					STD.
Access Door	A	B	C	D	A
Weather Hood	1	-	3	4	1
Level Sensor	A	B	C	D	B
Hand Hole	A	B	C	D	B

NOTE:
1) 1, 3 & 4 are in Clean Air Plenum.
2) A,B,C,D are in Dirty Air Plenum.
3) 6" Material discharge is standard but not mandatory.
4) Material inlet size is based on customer requirements.

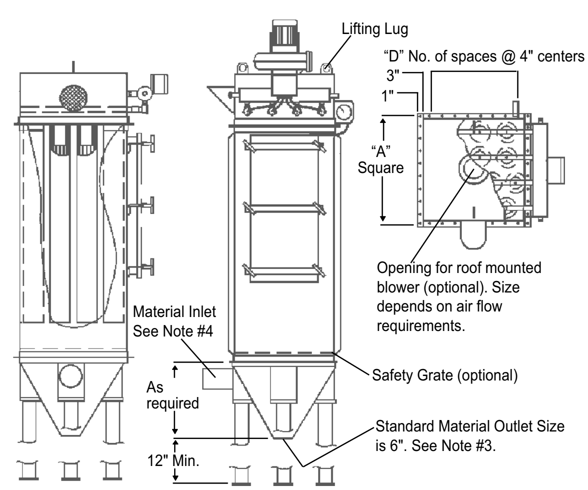
DATA						DIMENSIONS			
MODEL NO.	ARRG.	FILTER AREA SQ. FT.	NO. OF BAGS	BAG LENGTH	AIR REQ'D SCFM@ PSIG	A	D	OUTLET VENT SIZE	WEIGHT
18-DC-9	II	17	9	18	4.0 @50-60	24	5	8	450
	III	17	9	18	4.0 @50-60	24	5	8	550
36-DC-9	II	39	9	36	4.2 @70-80	24	5	8	560
	III	39	9	36	4.2 @70-80	24	5	8	660
58-DC-9	II	65	9	58	4.5 @90-100	24	5	8	675
	III	65	9	58	4.5 @90-100	24	5	8	775
84-DC-9	II	95	9	84	5.0 @90-100	24	5	10	825
	III	95	9	84	5.0 @90-100	24	5	10	925
18-DC-16	II	30	16	18	5.2 @50-60	32	7	10	525
	III	30	16	18	5.2 @50-60	32	7	10	650
36-DC-16	II	69	16	36	5.5 @70-80	32	7	10	525
	III	69	16	36	5.5 @70-80	32	7	10	650
58-DC-16	II	115	16	58	5.8 @90-100	32	7	10	825
	III	115	16	58	5.8 @90-100	32	7	10	950
84-DC-16	II	170	16	84	6.2 @90-100	32	9	10	1000
	III	170	16	84	6.2 @90-100	32	9	10	1125
*18-DC-25	II	54	25	18	6.3 @50-60	40	9	10	500
	III	54	25	18	6.3 @50-60	40	9	10	675
*36-DC-25	II	108	25	36	6.5 @70-80	40	9	10	600
	III	108	25	36	6.5 @70 80	40	9	10	775
*58-DC-25	II	180	25	58	6.7 @90-100	40	9	12	1000
	III	180	25	58	6.7 @90-100	40	9	12	1175
*84-DC-25	II	265	25	84	7.0 @90-100	40	9	12	1225
	III	265	25	84	7.0 @90-100	40	9	12	1400
*100-DC-25	II	318	25	100	7.5 @90-100	40	9	12	1200
	III	318	25	100	7.5 @90-100	40	9	12	1375
*36-DC-36	II	156	36	36	7.5 @70-80	48	11	12	1450
	III	156	36	36	7.5 @70-80	48	11	12	1675
*58-DC-36	II	260	36	58	8.0 @90-100	48	11	12	1475
	III	260	36	58	8.0 @90-100	48	11	12	1700
*84-DC-36	II	382	36	84	8.5 @90-100	48	11	12	1700
	III	382	36	84	8.5 @90-I00	48	11	12	1925
*100-DC-36	II	457	36	100	9.0 @90-100	48	11	12	1725
	III	457	36	100	9.0 @90-100	48	11	12	1950
*120-DC-36	II	549	36	120	10.5 @90-100	48	11	12	2025
	III	549	36	120	10.5 @90-100	48	11	12	2250

NOTE: Dimensional data for reference only. Subject to change without notice.
All weights are in pounds, all dimensional units are in inches, unless noted.
* (2) access doors with gaskets (optional)

ARRANGEMENT II



ARRANGEMENT III




EQUIPMENT NAME: SILO DUST FILTER
EQUIPMENT TAG NUMBER: 0-640-FL-0016
MANUFACTURER: CYCLONAIRE CORPORATION
MANUFACTURER MODEL NUMBER: 18-DC-36
MANUFACTURER ORDER NUMBER: 2864076
MANUFACTURER SERIAL NUMBER: 24-0-4216-00
APPROXIMATE WEIGHT: 1950 LBS (EMPTY) 2510 (FLOODED)


ADLER

GE Infrastructure Water & Process Technologies 3006 Northup Way, Bellevue, WA 98004 Phone: 425-828-2400 FAX: 425-828-0526	Storage Silo Specification A071 - 835-1	REV	BY	CKD	REVISION	DATE
		A	JNH	SHT	Issued for Bid	2/20/09
PROJECT: ZLD Crystallizer Modifications and MWTP Filtration System, Cosumnes Power Plant, Sacramento Municipal Utility District, RCC Project No. A071	SHEET 1 of 2	B	JNH	SHT	Issued for Purchase	3/23/09
	PR Number 18.0210.20	C	JNH	SHT	Revised for Engineering	4/23/09
	PO Number					

1. Tag: 0-640-TNK-0016 | 2. Service: Perlite Storage Silo | 3. Reference: A071-00103, -01410, -M24-2

4	MATERIAL PROPERTIES	Material	Expanded Perlite	24	SILO CONNECTIONS	Manway Diameter [in.]	20, w/Cover Plate
5		Specific Gravity	2.3	25		Manway Location	Roof
6		Density [lb/ft³]	5.5 - 6.0	26		Pneumatic Fill Pipe Diameter [in.]	4, Flanged
7		Moisture [%]	0.2 - 0.5	27		Pneumatic Fill Pipe Location	See Note 5
8		Median Particle Diameter	55 - 62	28		Discharge Diameter [in.]	10, Flanged
9		pH	7	29		Discharge Location	Center, Bottom
10		Chemical Reactivity	Stable, Not Reactive	30		Vent Diameter [in.]	8, Flanged
11	DESIGN CRITERIA	Inside Diameter [ft]	14.92	31		Vent Location	See Note 6
12		Eave Height [ft]	31.5	32		Aeration Diameter [in.]	13/16
13		Hopper Slope [degrees]	60	33		Aeration Location	See Note 7
14		Roof Deck Slope [degrees]	10	34		Level Sensor Diameter [in.]	1 1/2, NPT (See Note 9)
15		Outlet Elevation [ft]	6.5	35		Level Sensor Location	See A071-M24-2
16		Minimum Working Capacity [ft³]	2,575	36	ACCESSORIES	Ladder w/Safety Cage	See Note 8
17		Design Pressure [oz./in.²]	14 / 1 vacuum	37		Manway/Pressure Relief Valve	24"
18		Material of Construction	Coated Carbon Steel	38		Aeration Equipment	See Note 10
19		Internal Coating	MFG Standard (See Note 2)	39		Level Sensors	See Note 11
20		Silo Support	Steel Skirt	40		Silo Dust Filter	See Note 12
21		Site Location	Herald, CA	41		Tank Dust Filter	See Note 13
22		Site Conditions	See Note 3	42		Nameplate	See Note 14
23		Seismic Design Criteria	See Note 4	43		Skirt Access	6'-0"W x 6'-8"H Double Door
				44		Skirt Opening	36" Square, Reinforced

Notes:

1. Vendor shall provide all applicable data in this form with proposal. Filled form required for bid to be considered. Vendor shall supply a complete package as specified in this datasheet.
2. Internal coating shall be manufacturer standard, with a minimum 5 mil dry film thickness. External coating shall be manufacturer standard, with a minimum 2 mil primer coat and 2 mil topcoat. External coating color shall be approved by GE.
3. Refer to Specification A071-00103 for site conditions.
4. Silo manufacturer shall design the silo in accordance with the seismic conditions described in Specification A071-00103 and the following: Site Class D, $S_s = 0.46$, $S_1 = 0.21$, $F_a = 1.432$, $F_v = 1.982$, Importance Factor = 1.25.
5. Silo manufacturer shall provide a complete pneumatic fill pipe assembly with piping to roof, support brackets, camlock coupling connectors, quickie line adaptor, and dust cap. Pneumatic fill line assembly shall be disassembled for shipment and field installation. Fill piping shall be Sch. 40 CS. Elbows shall be ceramic lined. Fill pipe shall discharge into a target box located on the center of roof.
6. Silo manufacturer shall provide a Sch. 10 CS vent duct assembly from the roof to 3.5' above BOS. Vent duct shall be disassembled for shipment and field installation. Vent pipe will be connected to the Silo Dust Filter 0-640-FL-0016.
7. Silo manufacturer shall provide sixteen (16) evenly spaced holes in the hopper for installing aeration equipment (supplied by vendor). Silo manufacturer shall provide welded mounting pads for field connection of aeration equipment.

PRICE:	SHIPPING:	DELIVERY:
MANUFACTURER: Columbia Tec Tank	MODEL NO.:	WEIGHT:

Cyclonaire

GE Infrastructure Water & Process Technologies
3006 Northup Way
Bellevue, WA 98004
Phone: 425-828-2400
FAX: 425-828-0526

Storage Silo Specification	REV	BY	CKD	REVISION	DATE
A071 - 835-1	A	JNH	SHT	Issued for Bid	2/20/09
SHEET 2 of 2	B	JNH	SHT	Issued for Purchase	3/23/09
PR Number 18.0210.20	C	JNH	SHT	Revised for Engineering	4/23/09
PO Number					

PROJECT:
ZLD Crystallizer Modifications and
MWTP Filtration System
Cosumnes Power Plant
Sacramento Municipal Utility District
RCC Project No. A071

1. Tag: 0-640-TNK-0016	2. Service: Perlite Storage Silo	3. Reference: A071-00103, -01410, -M24-1

Notes (continued):

8. Silo manufacturer shall provide a ladder with safety cage, intermediate platform and access platform with handrail per applicable OSHA safety regulations. Silo deck shall be designed for a live load of 20 lbs/ sq. ft and a dead load of 100 lbs/ sq. ft.
9. Inner bore on the level sensor connection shall be bored to 1.75" to accommodate the level sensor.
10. Vendor shall supply sixteen (16) Cyclonaire Vibrapad assemblies complete with mounting hardware, gaskets, 2-way solenoid 120VAC, carbon steel air header, NEMA 4 junction box, filter/regulator, manual shutoff valve, and nylon tubing. C
11. Vendor shall supply three Binmaster vibratory probe type level sensors, 120 VAC. Sensors shall be side mounted.
12. Vendor shall supply one (1) Cyclonaire Dust Collector. Dust collector shall be supported with 4 legs. Inlet shall be 8" Sch. 10 CS. Dust collector shall have 352 sq. ft. of filter area, 60° hopper, 36 polyester filter cartridges, pressure gauge, and compressed air pulse jet filter cleaning assembly. The equipment name and number are: Silo Dust Filter 0-640-FL-0016.
13. Vendor shall supply one (1) Cyclonaire Dust Collector. Dust collector shall be supported with 4 legs. Inlet shall be 2.5" Sch. 10 CS. Dust collector shall have 7.5 sq. ft. of filter area, 60° hopper, 4 polyester filter bags, pressure gauge, and compressed air pulse jet filter cleaning assembly. The equipment name and number are: Precoat/Body Feed Tank Dust Filter 0-640-FL-0012.
14. All equipment shall be supplied with nameplates as specified in Specification A071-00103.
15. No field welding on the Perlite Storage Silo shall be required.
16. See A071-M24-2 for silo arrangement configuration drawing.
17. Silo manufacturer shall provide design calculations and drawings for CBO approval stamped by a licensed California Structural PE. Calculations and drawings shall be reviewed and approved by the Engineer prior to beginning fabrication.
18. Silo manufacturer shall include a 3" spare nozzle with blind flange on the top of the silo as shown on A071-M24-2.
19. Silo manufacturer shall install hardboard covers over all openings prior to shipment. Openings for aeration equipment shall be taped prior to shipment.
20. All welds shall be made by AWS or ASME Section IX qualified welders.
21. Vendor shall provide a switch that indicates perlite flow in the silo fill pipe, 120 VAC.

MBS

DUST FILTER SIZING

→ Target Air to Cloth ratio = 2.5-3.0 : 1

Typical for Pleated Filter Elements (cartridges)

ASSUMPTIONS

450 ACFM – typical flow from pneumatic displacement truck

1.3 surge factor – typical pressure correction factor from blower curves relating to ACFM

450 ACFM × 1.3 = **585 ACFM** max flow to dust collector

CYCLONAIRE DUST COLLECTOR

→ Model 18-DC-36 ARRG III

→ Cartridges: 5.75" diameter, 18" long, quantity = 36

→ Cloth area = 11.25 ft² per cartridge

= 11.25 ft² × 36 = **405 ft²** cloth area

AIR TO CLOTH RATIO

$$\text{Air : Cloth} = \frac{585\ \text{ACFM}}{405\ \text{ft}^2} = 1.4 : 1 \ ✓$$

* 1.4:1 < 2.5:1 ⟶ lower Air:Cloth because perlite is lighter than most materials

∴ SELECT MODEL 18-DC-36

CYCLONAIRE STANDARD FILTER SPECIFICATIONS
FOR DUST COLLECTION

Specifications:	**Standard Bags**	**Standard Cartridges**
Construction[1]:	Polyester felt	100% non-woven Spunbond Polyester
Finish:	Plain – no finish	Calendered, heat set
Fabric Weight:	16 oz. ± 1 oz./yd^2	8 oz./yd^2 (271 g/$m^{2)}$
Air Permeability[2]:	20-40 cfm @ .5" W.G.	13-25 cfm @ .5" W.G.
Max. Operating Temperature:	275°F (135°C)	180°F
Filter Efficiency[3]:	N/A	N/A

[1]Other types of filter media are available
[2]Air permeability is defined as the pressure drop across clean filter media
[3]The filter manufacturer does not generally offer specific efficiency guarantees on their polyester media. Such efficiencies are affected by many variables such as grain loading, operating pressure, cleaning frequency and dust characteristics. These variables cannot be controlled by the manufacturer of the media or that of the filter bag. In general, these fabrics will filter with efficiencies up to 99.99% particulate that is 2.5 micron or larger, providing the dust collector is operated under optimal conditions and per the specified design criteria.

Cyclonaire Dust Collector Efficiency Statement

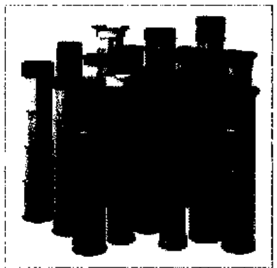
"Cyclonaire Corporation warrants that the particulate matter concentration in the effluent gas will not exceed an average of 0.02 grains per actual cubic foot. The guarantee is based on particles two microns and over in diameter and on the equipment being properly installed and maintained according to standard Cyclonaire instructions.

Effluent testing, if required, will be conducted generally in accordance with the procedures as outlined in Title 40, Part 60 of the Code of Federal Regulations. The effluent tests shall not take into consideration condensables."

Cyclonaire Corporation · 2922 N. Division Avenue · P.O. Box 366 · York, NE 68467
800-445-0730 · 402-362-2000 · Fax 402-362-2001 · www.cyclonaire.com

GE Energy

PulsePleat® Pleated Filter Elements



PulsePleat® - the Simple Solution for Industrial Systems
GE offers PulsePleat filter elements for baghouses: a combination of pleated high-efficiency filtration media and an inner support core that forms a one-piece element that fits directly into your existing baghouse tubesheet, replacing traditional filter bags and cages.

PulsePleat elements are the original pleated technology, and are designed and manufactured to operate in the harshest of industrial environments. With 20 years of experience, more than three million PulsePleat pleated filters have been sold for industrial air filtration systems.

Features

- Entire family of products to meet your specific needs for industrial baghouses
- 100% spunbond polyester media, with specialty finishes available, including Preveil™ media
- Wide open pleat spacing; shallow pleat depth
- Variety of construction styles and components available
- Offers 99.99+% efficiency
- One piece design allows for simple, easy installation and maintenance
- Fits most standard tubesheet designs

Benefits

- Requires less compressed air pressure to pulse clean
- Operates across a wide range of temperatures and applications
- Increases filtration area 2-3 times
- Dramatically reduces air-to-cloth ratios
- Reduces operating pressure differential
- Reduces collection operational energy costs
- Direct replacement for bags and cages
- Substantially reduces installation time
- Shorter length keeps the elements out of the inlet gas stream, reducing abrasion
- Significantly more efficient than standard felt media
- iPLAS® "formed-in-place" system anchors the pleat tips , providing evenly spaced and straight pleat alignment - critical to proper cleaning and dust discharge (Available on selected elements)

Learn more about Filtration Technologies from GE Energy.

More about PulsePleat Pleated Filter Elements

Spunbond media efficiency
Tested performance
Integrated Pleat Alignment System (iPLAS®)
Pick the right PulsePleat for your process
ThermoPleat® for High Temperature applications (>375° F)
Proven applications in multiple industries
Case Study: Are your baghouse filters saving you time and money?

Related Information

Customer Resource Center
Preveil™ media

For More Information

Call: 800-821-2222
GE
8800 East 63rd ST
Kansas City, MO USA

GE
Energy

Pleated Filter Elements

BHA PulsePleat®

imagination at work

a product of
ecomagination℠

Controlling particulate matter by utilizing existing assets is important in achieving your production and profitability goals. GE Energy's Environmental Services team offers flexible and integrated air quality solutions to help you achieve these goals.

Many dust collectors are being pushed past their design limits. With increased production demands and tighter emissions limits, many dust collection systems are failing to keep up with today's demands. As an option to costly rebuild or replacement of industrial air filtration systems, GE Energy offers the proven performance and time-tested durability of BHA PulsePleat® filter elements.

With more than one million units sold, BHA PulsePleat® elements are proven pleated filter technology for industrial air filtration. Developed to replace traditional filter bags and cages, each element is designed and manufactured to optimize challenging dust collection applications. BHA PulsePleat® technology combines high efficiency filtration media with an inner support core into a one-piece element that can significantly reduce installation time and costs. Each BHA PulsePleat® filter element is custom manufactured with the proper top, media, core, and bottom to fit your existing dust collector and tubesheet to provide maximum benefits to your unique process. BHA PulsePleat® filter elements may provide double or triple the filtration area inside your baghouse, and dramatically reduce your differential pressure and air-to-cloth ratios. This provides increased airflow, reduced cleaning energy costs, and improved performance.

By combining advanced emissions control technology with trusted application expertise, GE Energy can be your preferred choice for fine filtration solutions.

Cover Photo: PSP30585-11.

It took four years, 25 engineers and 180,000 hours to create a solution this simple.

BHA PulsePleat® filter elements can be used in new systems or as a retrofit in existing dust collection equipment.

1 Molded urethane top is available in a variety of styles and sizes to fit a wide range of tubesheet holes. Other materials or designs are available for higher temperatures and unique applications.

2 One-piece design eliminates the need for filter bags and cages, significantly reducing installation time.

Spunbond polyester media provides 99.99+% filtering efficiency.

Inner core is constructed from polypropylene or metal, depending on your application needs.

Pleat depth and spacing are customized for specific applications to allow for improved dustcake releases. The pleated design increases filtration surface area up to 2-3 times.

Quality controlled manufacturing ensures pleats are evenly spread.

Specialty finishes available, including BHA-TEX® ePTFE membrane.

3 iPLAS® “formed-inplace” design anchors pleat tips firmly, keeping the evenly spaced and straight pleats aligned while element is in operation.

4 Molded bottom helps resist abrasive wear at the bottom of the elements.

BHA PulsePleat® Filter Elements are covered under one or more of the following Patent Numbers:
U.S. Patent Numbers. 5,730,766; 5,746,792; 5,885,314; 6,017,378; 6,508,934; 6,375,698; 6,233,790; 6,203,591; 6,726,735; 6,858,052; 6,911,144; 6,787,031; 6,110,249; 6,409,787; 6,752,847; RE37,163 and Patent Pending

iPLAS® pleat alignment and retention system replaces conventional strapping methods (utilizing fabric straps and adhesive) that are susceptible to chemical and hydrolytic attack.

iPLAS keeps the pleated media placed firmly against the inner core, virtually eliminating failure of the filter element due to over-flexing and pleat reversal. iPLAS is available only on BHA PulsePleat® filter elements.

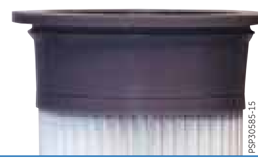
Technology options

Media

Each fabric filter dust collector operates under a unique set of characteristics and system parameters. Because of this, it is important to evaluate each of the following variables in order to choose a fabric and design best suited to the application: temperature, moisture level, particulate size, gas stream chemistry, air-to-cloth ratio, particulate abrasiveness, and mechanical factors (such as cleaning style, installation, etc.). Some of the available base fabrics are listed at the right. GE Energy also offers many specialty finishes to fit particular applications.

Tops

— Molded Polyurethane for Top-and Bottom-Load Styles



— Injection Molded EPDM for Top-and Bottom-Load Styles

(white available for food grade applications)

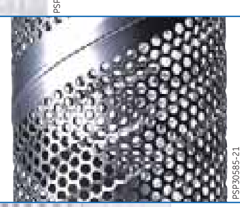
— Hard Polyurethane *(top-load styles only)* installed with Snapband Cuff or EPDM Cuff
— Galvanized or Stainless Steel Metal *(top-load styles only)* installed with Snapband Cuff
— Flange-Style Top-Load

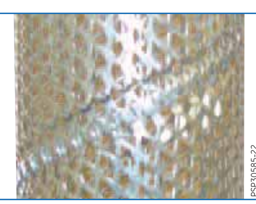
Inner Cores

— Polypropylene

— Perforated Metal
— Expanded Metal

(Each available in galvanized or stainless steel)

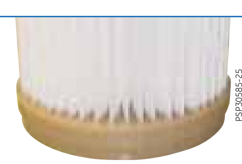




Bottoms

— Molded Polyurethane Puck

— Galvanized or Stainless Steel Pan
— Hard Polyurethane Puck



180°F (83°C)	225°F (107°C)	265°F (130°C)	375°F (191°C)	450°F (232°C)
• Spunbond Polyester • Stiffened Acrylic • Stiffened Polypropylene	• Spunbond Polyester • Stiffened Acrylic	• Spunbond Polyester • Stiffened Acrylic	• Aramid • PPS	• Stiffened Fiberglass
●	●			
●	●	●		
●	●	●	●	●
●				
●	●	●	●	●
●	●			
●	●	●	●	●

Element sizes available

Standard top-load tubesheet hole diameters are available in sizes ranging from 4.5 in. (114.3 mm) to 8 in. (203.2 mm) for 3/16 in. and 1/4 in. thick tubesheets.

Bottom-load styles for common bag cup/venturi configurations such as: MikroPul®, Flex-Kleen®, Wheelabrator®, Fuller®, and United Conveyor styles.

Note: Not all designs are available in all sizes.

Special top designs available

Elements designed to fit Wheelabrator® recessed hole, MikroPul® and Aeropulse® "3-Notch", Euro MikroPul, General Resources™, Reimelt 3-Bolt, Reimelt 4-Bolt, and Oval RF (Carter Day®, Donaldson®, Howden®). Custom construction designs are also available upon request.

Media options

- Spunbond polyester (standard)
- Spunbond polyester with oleophobic treatment
- Spunbond polyester laminated with BHA-TEX® ePTFE membrane
- Spunbond polyester with carbon impregnation (static dissipation)
- Spunbond polyester with BHA-TEX® ePTFE membrane and carbon impregnation (static dissipation)
- Spunbond polypropylene
- Stiffened aramid felt (can also be laminated with BHA-TEX® ePTFE membrane)
- Stiffened PPS felt (can also be laminated with BHA-TEX® ePTFE membrane)
- Stiffened acrylic
- Stiffened fiberglass

Construction options

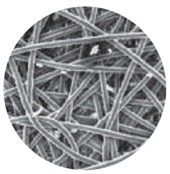
- Higher temperature components
- Customized lengths and diameters
- Customized pleat counts
- iPLAS® is standard on all elements up to 375°F (191°C)

Spunbond media

The unique BHA PulsePleat® media is unlike traditional felt or woven fabrics in that it has a tight pore structure which resists penetration of particulate and has rigid physical properties that allow it to hold a pleat without the need for supporting backing material. The media is pleated and molded into a filter element that can increase filtration surface area 2 to 3 times compared to conventional filter bags, dramatically increasing filtration efficiency while operating at significantly lower differential pressures.

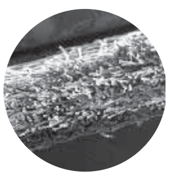
Spunbond Media vs. Traditional Needle Felt

Tight calendering of spunbond media fibers resists particulate penetration into the media.



Face view of spunbond polyester magnified 100 times.

Face view of standard polyester magnified 100 times.

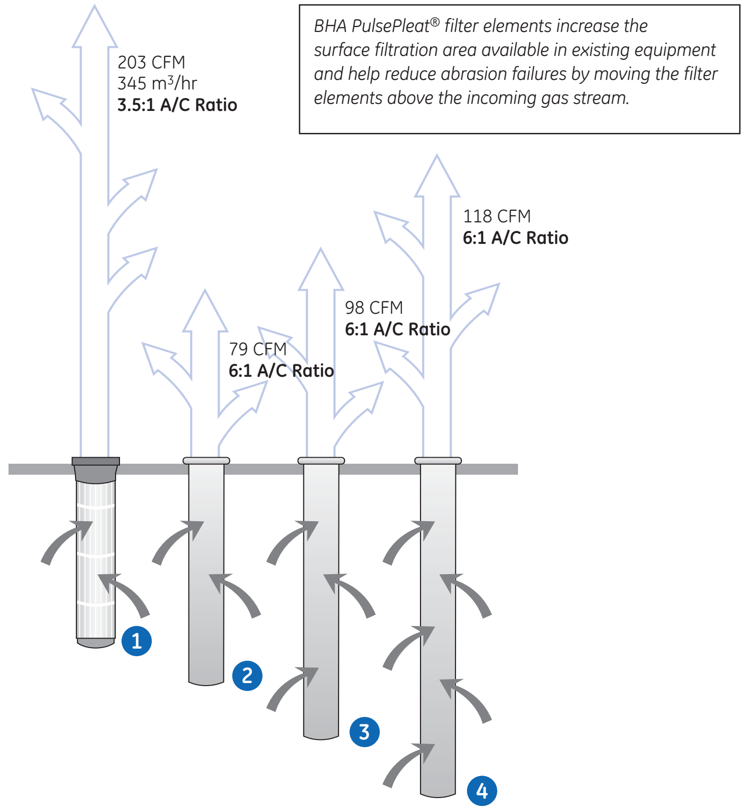


Side view of spunbond polyester magnified 50 times.

Side view of standard polyester magnified 50 times.

Spunbond media is manufactured by layering fine denier fibers from multiple spinning heads onto a moving mat. This depth of fibers is then calendered under heat and pressure. Spunbond media can withstand temperatures up to 275° F (135° C).

Typical Air Handling Capacities
BHA PulsePleat® Filter Elements vs. Filter Bags



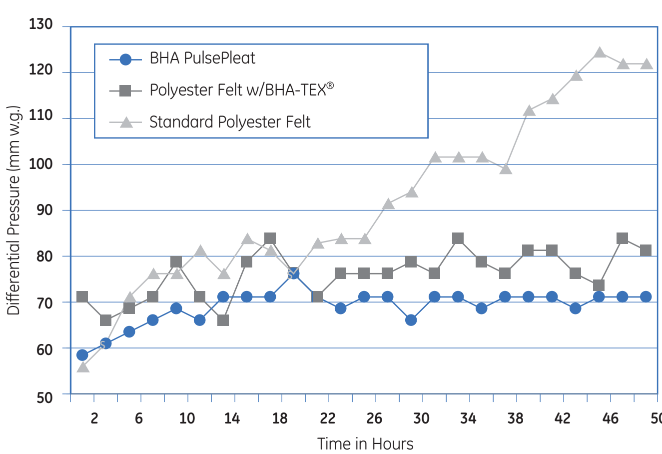
1 Filter Element, 6.25" dia., 2 meters (79"), 45 pleats, (58 ft.² 5.4 m²)

2 Filter Bag, 6.25" dia., 8' length, (13.1 ft.² 1.2 m²)

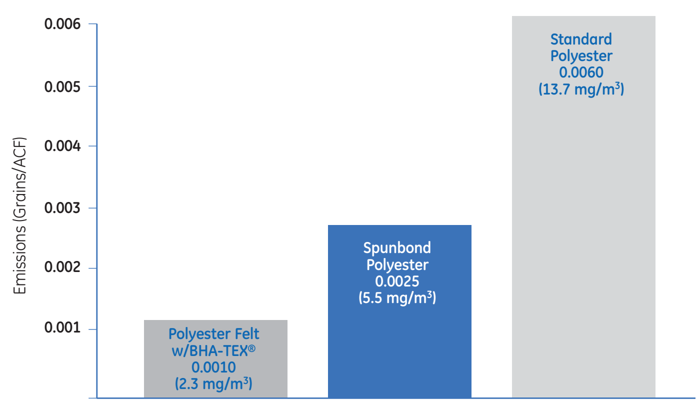
3 Filter Bag, 6.25" dia., 10' length, (16.4 ft.² 1.5 m²)

4 Filter Bag, 6.25" dia., 12' length, (19.6 ft.² 1.8 m²)

Differential Pressure Comparison



Outlet Emissions (Grains/ACF)



CRITERIA: *Air-to-cloth ratio: 5:1 ft./min. (1.5 m/min.); Mean particle size: 0.5 micron; Inlet dust loading: 30 grains/ACF (69 g/m³); Pulse cleaning: 80 PSI (5.5 bar); Frequency and duration: 15 min. intervals for 50 hrs.*

VESA TESTING: *In a controlled VESA (Variable Environmental Simulation Analysis) test, the spunbond media was tested against traditional 16 ounce (500 g) polyester felt media and 16 ounce (500 g) polyester felt media laminated with BHA-TEX® expanded PTFE membrane.*

Media images (L-R) Top Row: PSP30585-26, PSP30585-27, Bottom Row: PSP30585-28, PSP30585-29.

BHA ThermoPleat® filter elements

BHA ThermoPleat® high temperature filter elements provide superior quality and performance for upgrading and improving existing dust collection systems that operate at high temperatures. The BHA ThermoPleat® filter element is a pleated product constructed from a patented stiffening resin system with aramid and PPS (polyphenylene sulfide) media that can withstand operating temperatures as high as 375° F (191° C). BHA ThermoPleat® filters are a direct replacement for standard filter bags and cages.

Unique high temperature filter media

The BHA ThermoPleat® media is unlike other stiffened needle felts. GE Energy's patented stiffening resin system was developed specifically for endurance in high temperature environments, where in these applications, the substrate fabric maintains its excellent physical properties and dimensional stability. The media is unaffected by small amounts of water vapor at high temperatures and can withstand mild minerals, organic acids, and mild alkalis. It resists surface penetration of particulate, dramatically increasing efficiencies while operating at significantly lower differential pressures.

BHA ThermoPleat® filter elements allow for increased airflow in high temperature applications.

Extreme temperature filter elements

BHA ThermoPleat® EXT extreme temperature filter elements provide superior quality and performance for upgrading and improving existing dust collection systems that operate at extremely high temperatures. BHA ThermoPleat® EXT is a pleated product constructed from a patented stiffening resin system with fiberglass and other high-temperature fibers along with high temperature potting compounds. Designed to operate in temperatures reaching as high as 450° F (232° C), BHA ThermoPleat® EXT filter elements provide significant additional filtration area in high temperature pulse-jet baghouses, and are a direct replacement for aramid or other high temperature filter bags and cages. (See right for Features, Benefits and Construction Features.)

BHA ThermoPleat® construction features

- Strong, heat-resistant media
- Wide open pleat spacing and shallow pleat depth
- High filtration efficiency
- Perforated metal inner core
- Metal top and bottom construction
- Customized lengths and diameters
- Customized pleat counts

Additional features and benefits

- Stiffened (aramid or PPS) media allows for higher temperature operating range
- Designed to eliminate filter bags and cages, reducing installation time
- Reduces air-to-cloth ratios dramatically
- Metal tops and snapband cuff assemblies are designed to fit most standard tubesheet holes
- Silicone top is available for bottom access bag cup/venturi designs
- Specialty finishes available
- Shorter length keeps the filter element out of the inlet gas stream, reducing abrasion problems and providing for a larger drop-out area
- Additional filtration area reduces operating differential pressure

Applications

The following are just a few of the many different applications where BHA PulsePleat® filter elements have improved system performance. Contact your GE Energy sales representative to discuss your particular application. We custom manufacture BHA PulsePleat® and BHA ThermoPleat® elements to fit nearly any OEM style of pulse-jet baghouse. GE Energy engineers can help you select the right media, size, and construction to fit your collector – without capital modifications.

Primary Aluminum
Fluid Bed Dry Scrubbers
Venturi Injection Dry Scrubbers
Carbon Bake Dry Scrubbers
Alumina Handling/Unloading
Green Mill Carbon Handling
Anode Crushing Ventilation
Reacted/Unreacted Ore Silos

Cement and Rock Dust
Clinker Cooler
Crushing/Grinding
Raw Mill/Finish Mill
Packing Machines
Kaolin Processing
Material Loading
Material Handling/Transport
Coal Mill
Clay Grinding
Bentonite Crushing
Silo Bin Vents

Food/Pharmaceutical
Food Additive Processing
Protein Spray Drying
Flour Milling
Pharmaceutical Pill Coating
Cereal Drying
Grain
Animal Vitamins

Combustion
Boiler
Coal Handling
Fly Ash Handling

Chemical
Fertilizer Spray Dryers
Calcium Hypochlorite
Polyethylene Resins
Coke-Briquetting Process
Tire/Specialty Rubbers
Catalyst Manufacturing
Plastic Fibers
Cellulose Fibers
Polystyrene Fluff
Packaging
PVC

Paint/Pigments
Toner Mixing/Blending
Pneumatic Conveying
Pigment Blending
Micronizers
Packaging
Paint Mixing
Spray Dryers

Metals
Electric Arc Furnace
Desulphurization Furnace
Induction Furnaces
Mold Cooling Lines
Shot Blast/Grinding
Ladle Melt Furnace
Sand Shakeout/Sand Reclaim
BOF Furnace
Caster

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+44.1254.268.900

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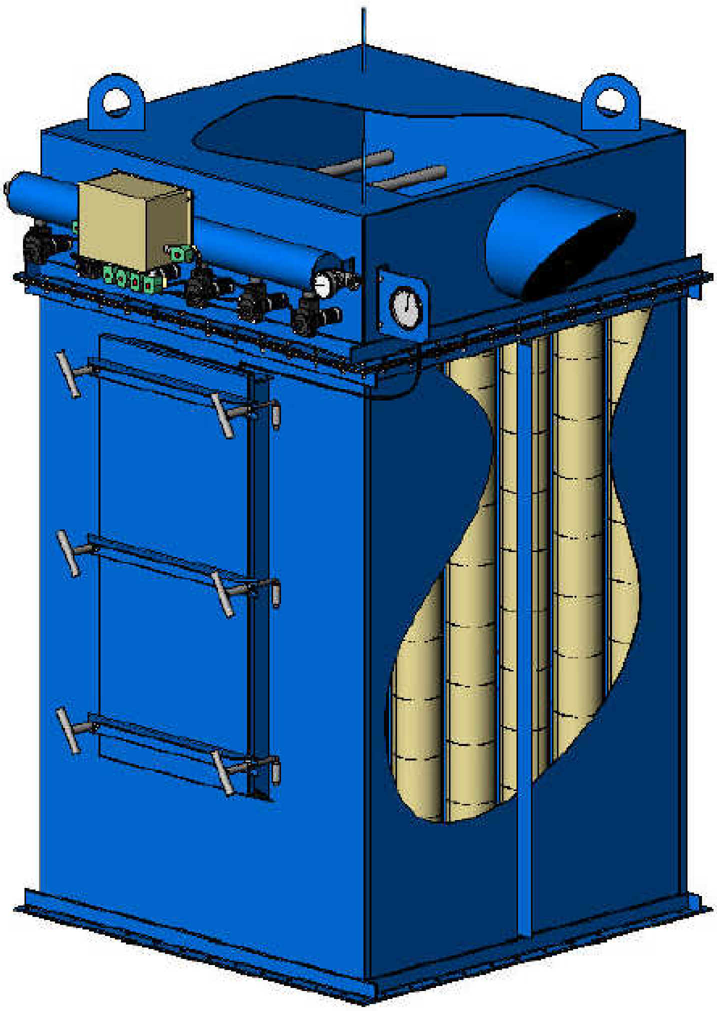
GEA 14234 (08/05)

OPERATION AND MAINTENANCE MANUAL
DUST COLLECTORS AND FILTER RECEIVERS



Cyclonaire Corporation P.O. Box 366, York, NE 68467
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sales@cyclonaire.com   www.cyclonaire.com

TABLE OF CONTENTS

SECTION 1: INTRODUCTION

RECEIVING YOUR DUST COLLECTOR

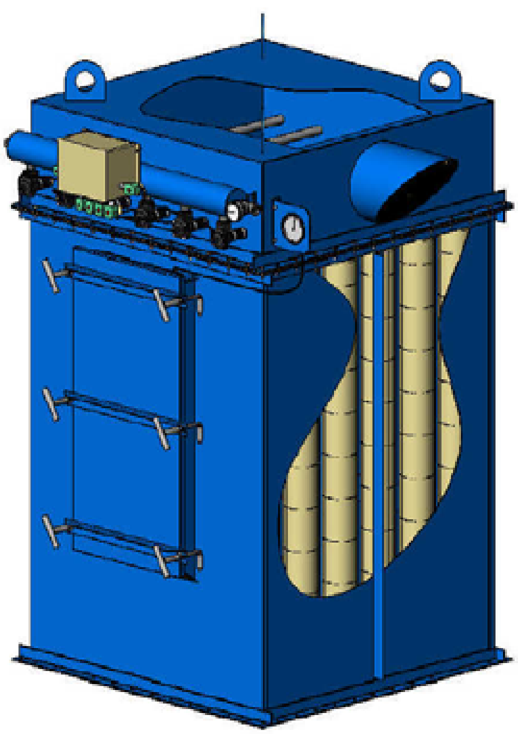
As soon as the equipment is received, it should be carefully inspected to make certain the unit is in good condition and all items listed on the packing list are received. Even though the equipment is mounted on heavy shipping skids at our plant, it should be possible for it to be damaged in shipment. All damages or shortages should be noted on the Bill of Lading. Purchasers should take immediate steps to file reports and damage claims with the carrier. Any damage incurred to a unit in transit is the responsibility of the common carrier since it is the manufacturer's policy to make shipments F.O.B. its factory: i.e., ownership passed to the purchaser when the unit is loaded and accepted by the trucker. Any claims for the in transit damage or shortage must be brought against the carrier by the Purchaser.

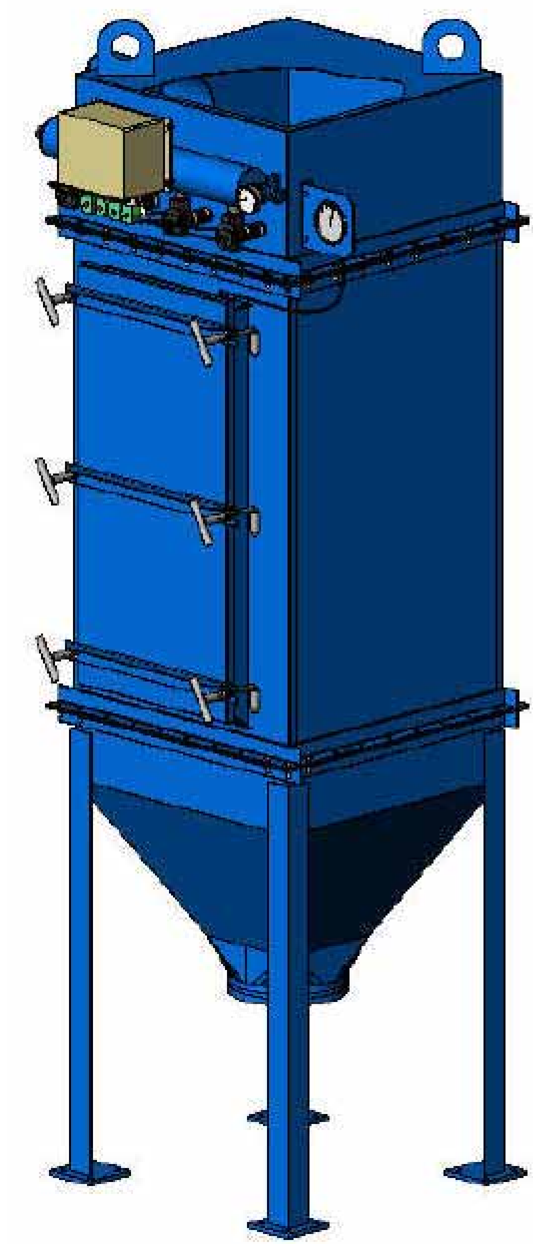
STORAGE

Mild steel Dust Collectors with factory primer should not be exposed to rain or excessive dampness for more the one month, otherwise rust spots may appear. Units may be finish coated to prevent rust during prolonged periods of outside storage in damp climates. All openings should be covered with suitable materials to protect interior surfaces from corrosion.

ARRANGEMENTS

II **III**

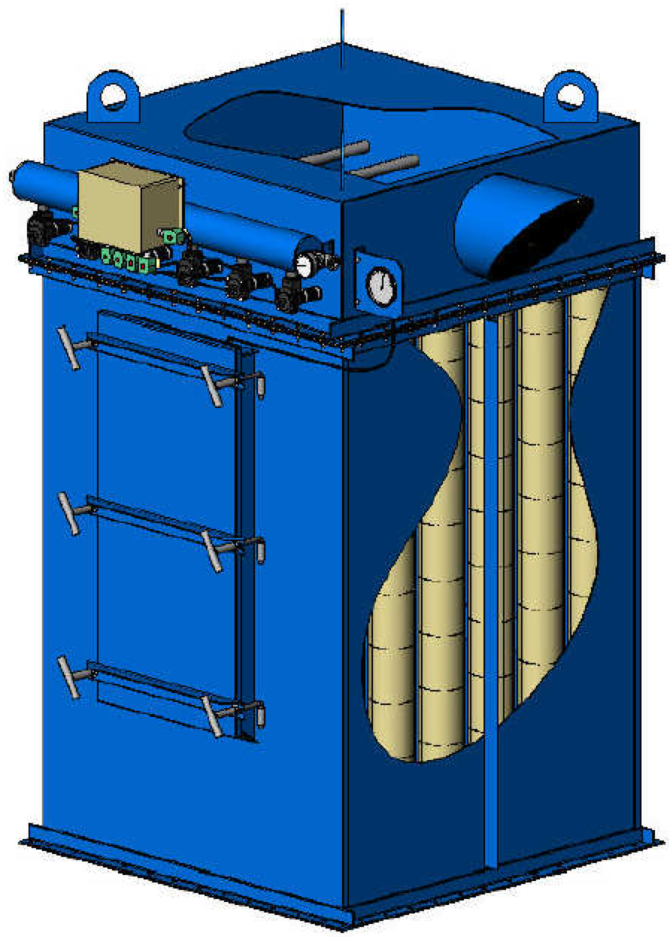




Top Removal

BAG ACCESS FROM TOP OF HOUSING
(REMOVABLE CLEAN AIR PLENUM)

Bottom Removal

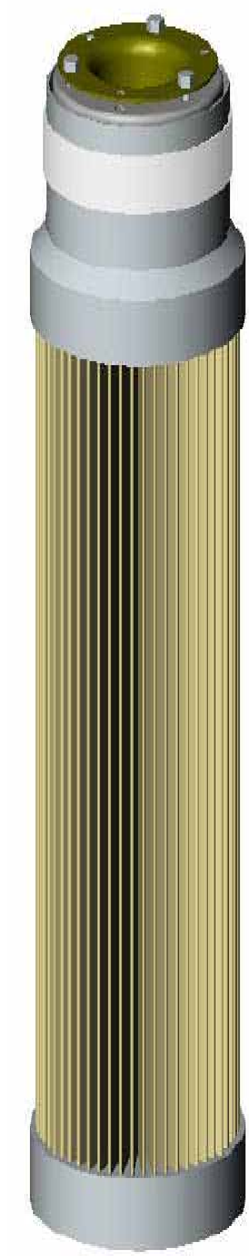


BAG ACCESS FROM SIDE DOOR
(ACCESS VIA DIRTY AIR PLENUM)

FILTER MEDIA

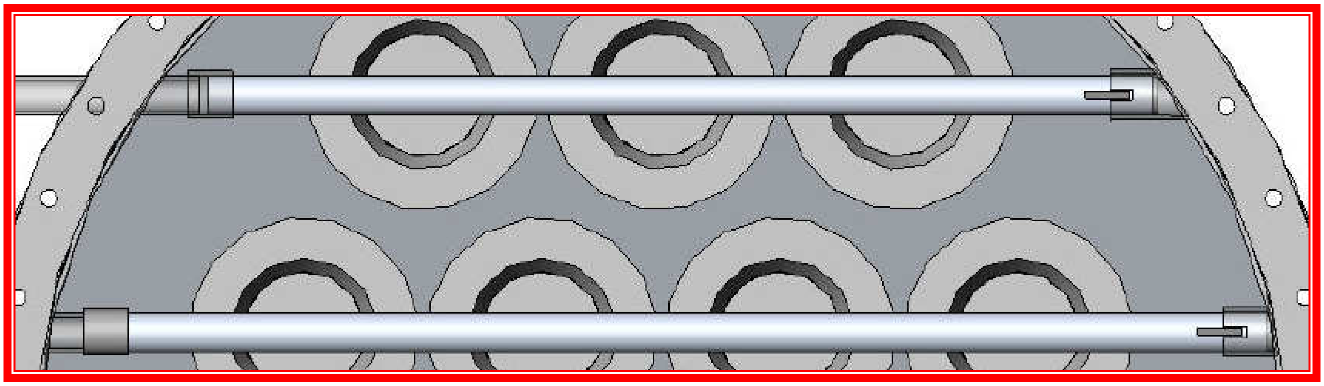
Filter Bag

Filter Cartridge



Accessing Filter Bags/ Cartridges

A.) TOP REMOVABLE TYPE:



To access the filter bags or cartridges the pulse jet tubing must be removed.

1. Slide the coupling so the end of the tubing is free to move. (The coupling will be tight due to the sealing o-rings).
2. Slide the tubing out of the mounting supports to allow access to the filled elements below.
3. For bags, pull the cage from the top to remove.

   For cartridges, remove the internal snap band to loosen the element from the tubesheet. Then lift the cartridge to remove.

B.) BOTTOM REMOVABLE – BAG TYPE:

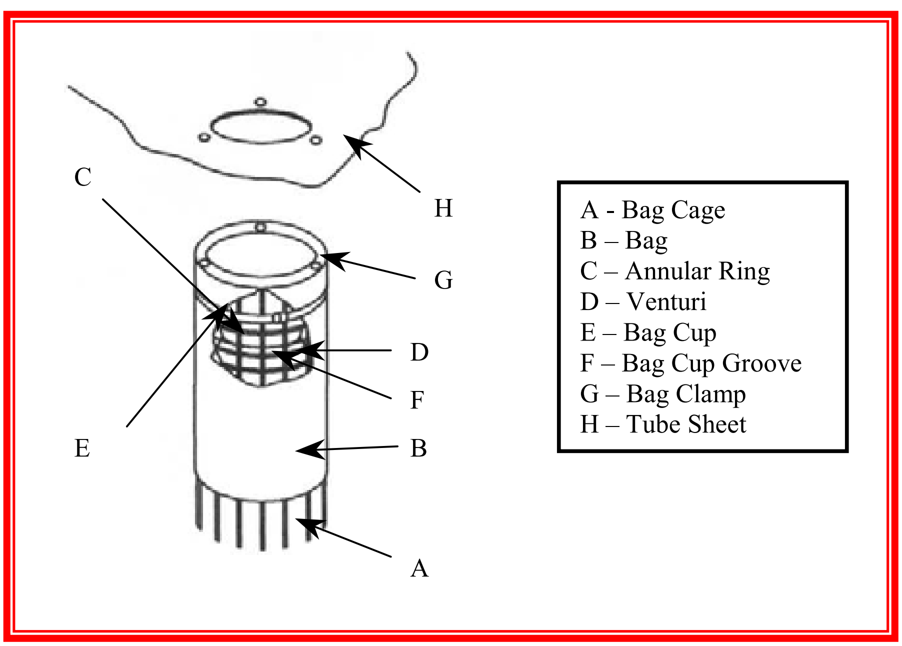
1. Be sure bag cage has a solid plate on the bottom. Slip bag over bag cage.

2. Fold top 2 inches of bag over seal ring at the top of cage, smoothing out all folds on interior. Bag material must not overlap annular ring.

3. Slide bag and bag cage onto bag cup until the annular ring on the cage snaps into corresponding groove on the bag cup.

4. Place a clamp around the bag 1 to 1 ½ inches below the tube sheet, and feed the slotted end of the clamp under the worm screw. The bag clamp must be in the right position, or a poor dust seal may result.

5. Tighten the clamp with a 3/8-inch socket until the bag cannot be rotated about the bag cup by hand. When bags and cages are correctly installed in accordance with these instructions, additional tightening of the bag clamps normally unnecessary. However, it is good practice to check accessible bags for tightness after 30 days of operation. In the event there is any indication of loosening, further investigation should be made. If necessary, all bags should be retightened.



C.) BOTTOM REMOVABLE – CARTRIDGE TYPE:

IMPORTANT: Handle pleated filter cartridges with care to avoid damaging the filter medium.

I. Initial Filter Installation:

a. Slide cartridge filter cup over the tube sheet cup until retaining bead engages groove in cup.

b. Fasten clamp around groove of tube sheet cup and secure with 3/8" socket.

c. Continue with steps 1 and 2 until adaptors are in place on all filters to be installed.

II. Filter Removal:

a. To remove filter, loosen and remove clamp.

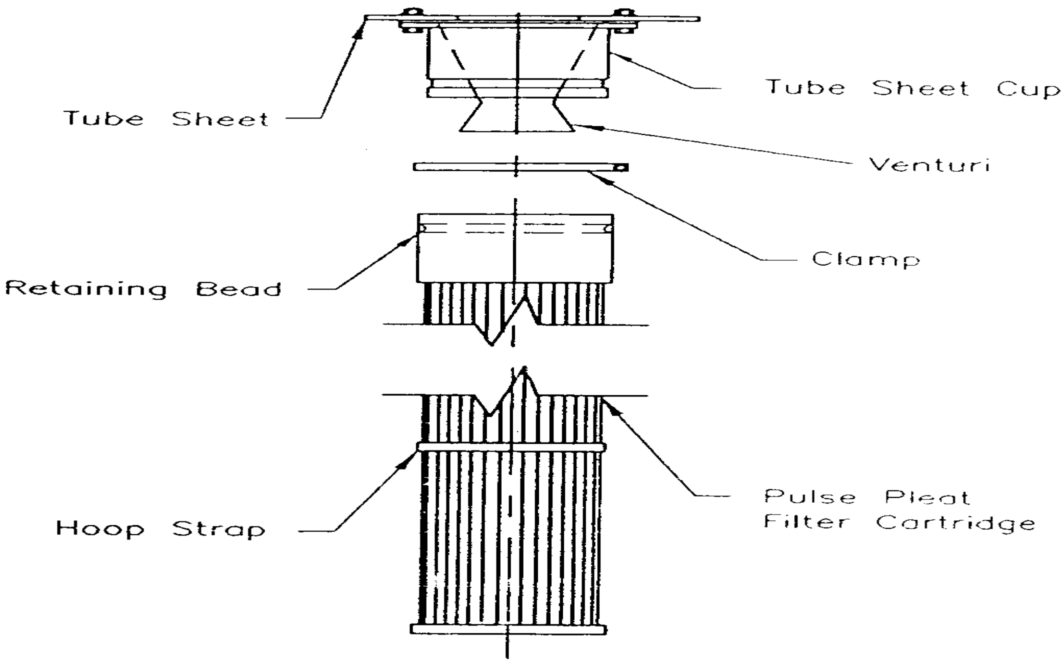
b. Gripping filter at the top end, gently work filter cup off tube sheet cup.

III. Replacement Filter Installation:

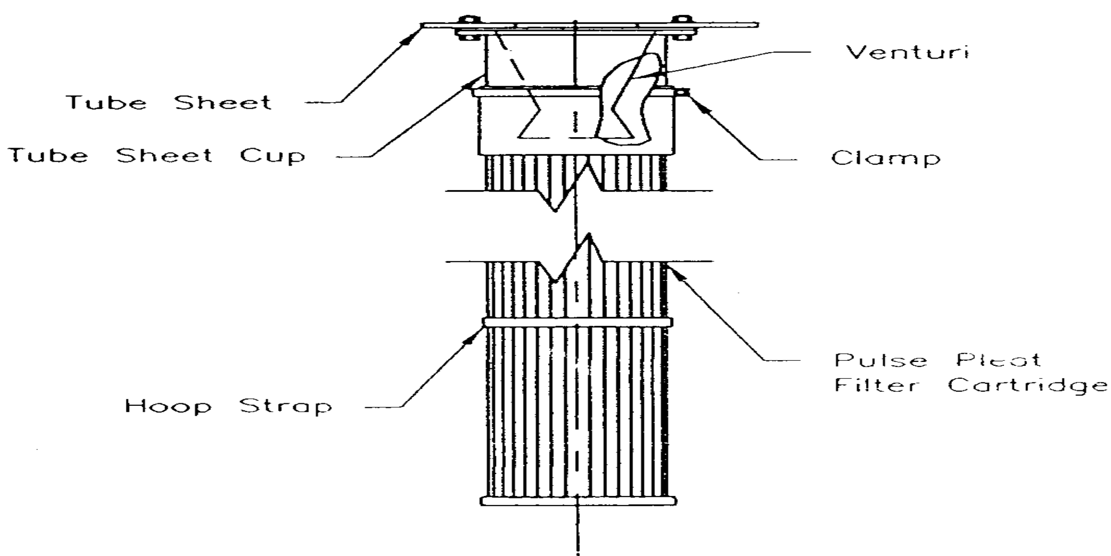
a. Make sure filter cup is installed correctly on tube sheet cup and that clamp is snug.

b. Grip filter at top end and slide filter cup up until retaining bead engages groove in cup.

c. Fasten clamp around groove of tube sheet cup and secure with 3/8" socket. Check assembly for straightness.



Exploded View
(Bottom Removal)



Final Assembly
(Bottom Removal)

SECTION 2: COMPONENTS AND OPERATION

FILTERING

As the dust-laden air enters the fabric filter, the air velocity drops allowing large particles to fall into the hopper. Fine particles are borne into the bag area. The air passes through the felt media, depositing the dust on the outside of the bag. The filtered air continues up the inside of the bag into the clean air plenum and then out of the collector. **See Fig 1.**

CLEANING THE BAGS

Accumulated dust on the exterior of the bag is periodically removed by directing a short pulse of compressed air down the inside of the bag. An aerodynamically designed venturi at the top of each bag causes the pulse of compressed air to induce a flow of clean air into the bag. A shock wave is set up that travels down the bag and hits a solid plate at the bottom. The shock wave momentarily pressurizes the bag, stops the flow of dust-laden air into it and flexes the fabric; the plate at the bottom enhances the effect. The dust falls off and drops into the hopper for discharge. This instantaneous cleaning action proceeds row by row while the flow of dust-laden air into the filter continues uninterrupted. Each row being cleaned off is off-line for 1/20 of a second or less; the entire fabric area of a pulse jet filter is in virtually continuous operation. **See Fig. 1.**

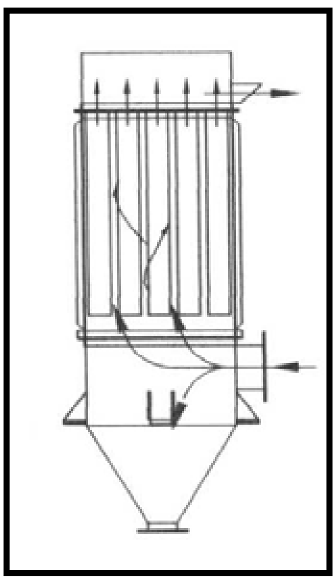


Fig. 1

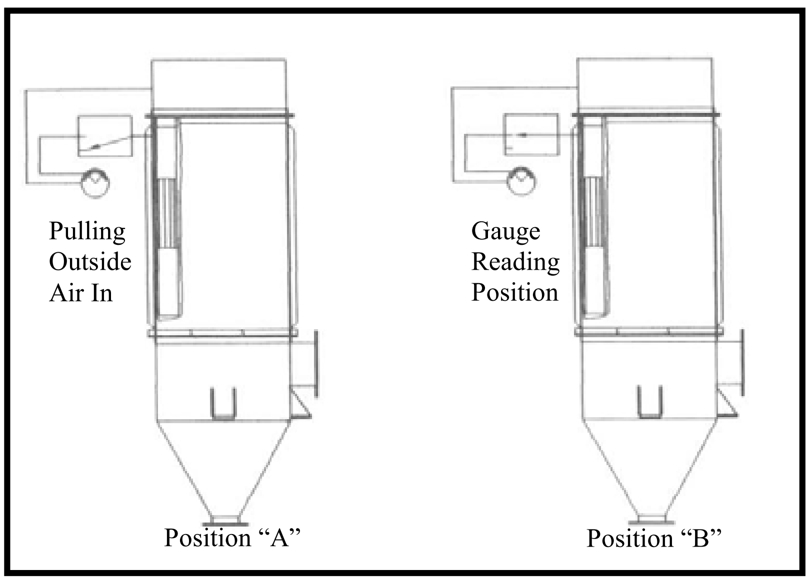
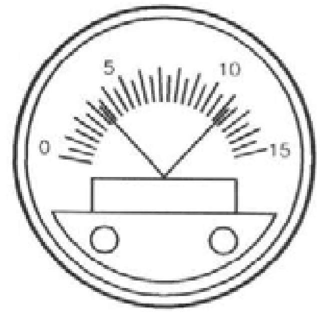


Fig. 2

DIFFERENTIAL PRESSURE GAUGE

Negative pressure collectors may incorporate a three-way valve in the high-pressure line near the gauge to keep the tubing free from dust. Normally, clean outside air is pulled through the line by collector suction. **Position A.** When a gauge reading is to be taken, the valve is actuated to connect the gauge to the collector. **Position B.** A pushbutton valve that will automatically return to position "A" is recommended. **See Fig. 2.**

TO ZERO THE GAUGE



1. Locate the external adjust screw on the cover at the bottom,
2. Set the indicating pointer exactly on the zero mark
3. **NOTE:** The zero check or adjustment can only be made with the high and low pressure taps both open to atmosphere.
4. Should unusual gauge readings be observed:
   A. Check the tubing for holes, kinks, or blockage. If a line is packed with dust, disconnect it at the gauge and apply compressed air to clean the line.
   B. If the gauge and tubing connection are in good condition and unusual readings persist: **See** " Troubleshooting The Dust Collector"

NCC SOLID STATE TIMER

Description

The timer board measures approximately 6.5"x 8.5". Because the timer is the "heart" of your collector, we strongly recommend that you keep an extra timer board in your Spare Parts Inventory

Operation

The timer sends electrical signals to the solenoid pilot valves and triggers the momentary jet-pulses of compressed air for sequential filter bag cleaning. The duration of "on-time" of each pulse is factory set at 1/20 second. In special situations, the "on-time" can be increased to 0.10 seconds by adjusting the potentiometer, but this results in increased compressed air consumption and should only be done on advice from the factory.

The time between pulses, called the "off-time is adjusted between 3 seconds and 60 seconds by adjusting the potentiometer. **Note:** decreasing "off-time" increases compressed air consumption; therefore, conservative settings are recommended: **See**, "Start-up Checklist" and "Troubleshooting the Dust Collector".

Collectors with One Header

Collectors with one compressed air header can have up to 10 solenoids, and they should be wired sequentially, as described in the paragraph above, beginning with terminal #1. The slide switch on the timer board should correspond to the highest terminal number use. For instance, a collector with six solenoids will therefore use output terminals 1,2,3,4,5 and 6, (besides L1,L2 and SOL COM). The slide switch should be positioned at #6.

Pulsing on Demand

The timer board has a feature, called "Demand Pulse" that allows the output terminals to be energized and de-energized by the high and low set point of a differential pressure switch indicator-controller, such as a Dwyer Photohelic Series 3000. When the pulse timer operates in the "Demand" mode, the output terminals are energized when the high differential set point is reached. The pulse solenoids will then be activated in sequence until the differential pressure drops to the low differential set point, at which time the output terminals are de-energized and pulsing stops. When the output terminals are again energized, the pulsing will pick up from where it last left off and will continue again in sequence.

AIR HEADER INSTALLATION

Inspection – All Models

Cyclonaire air headers are shipped mounted to the dust collector, complete with diaphragm and solenoid valves. **See: Figure 3**, for typical air header assembly.

Air Header

All dust collectors have blowpipes that pass through the dust collector wall. The hose and clamps fit over a nipple connected to the diaphragm valve and over the ends of the blowpipes. The header assembly is secured to the support brackets by means of 4 bolts supplied with the collector.

Pressure Gauge

Every Cyclonaire dust collector is provided with one pressure gauge if specified on purchase order.

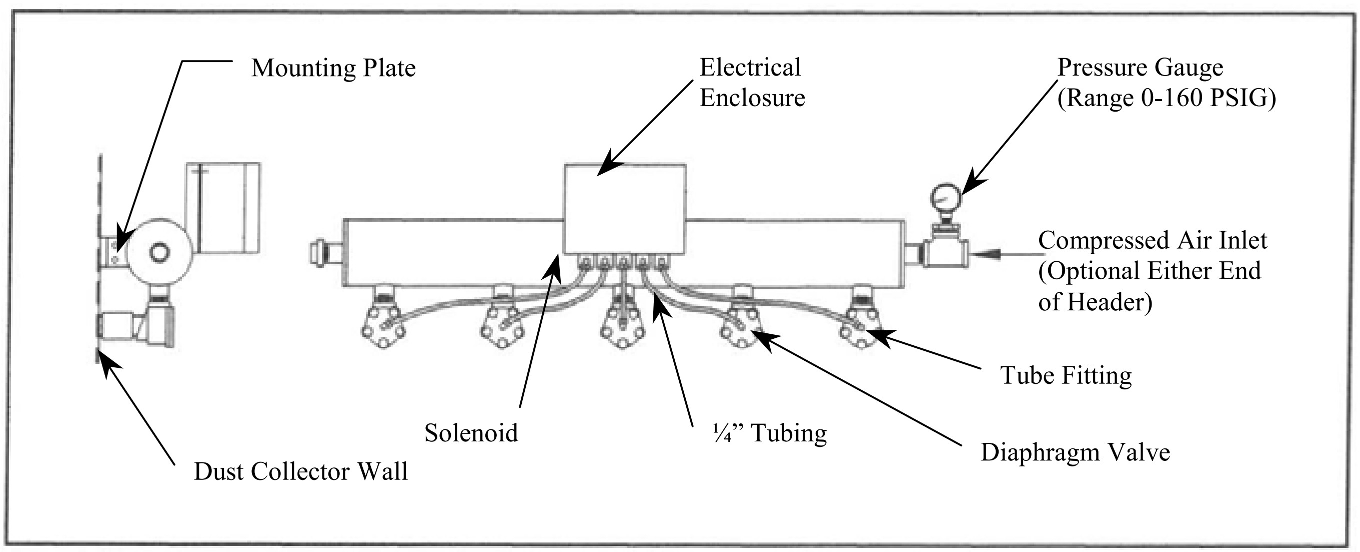


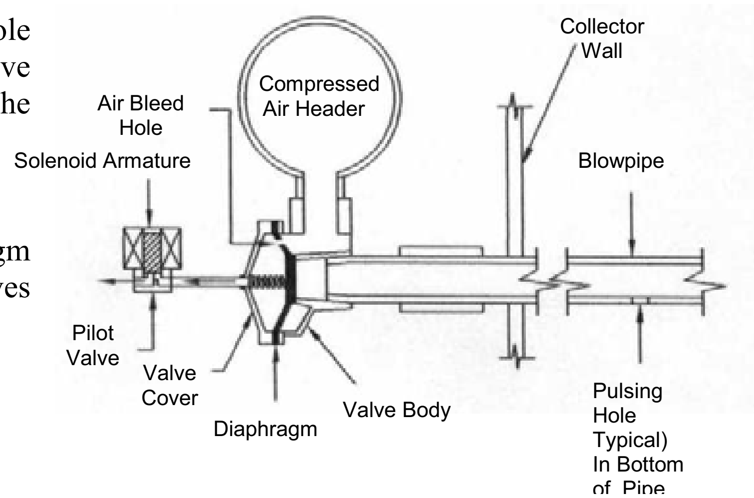
Fig 3, Typical Air Header Assembly

PULSING SYSTEM

Normally Closed Position

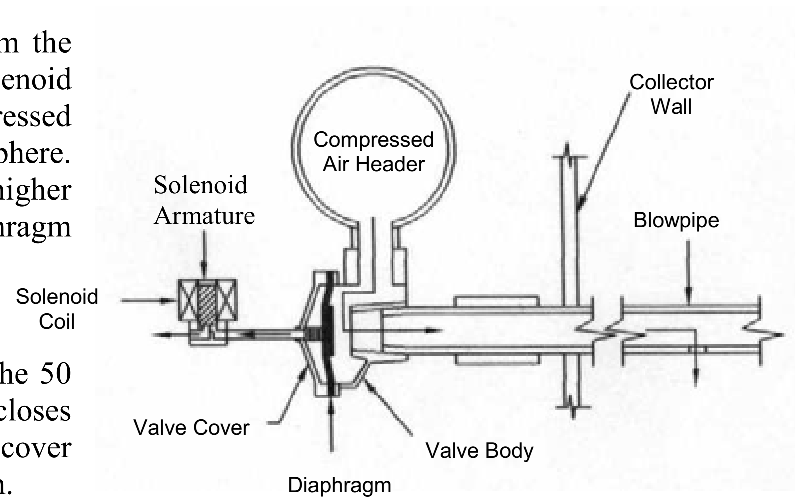
Compressed air passes through a small bleed hole in the diaphragm or air bleed passage in the valve body, and is checked at the pilot valve by the solenoid armature. Pressure in the valve cover increases until it equals the pressure in the air header. Since the pressure is considerably lower in the blowpipe, the diaphragm seats tightly against the valve body (most valves use a spring to assist in seating the diaphragm).

NOTE: Solenoid box and timer not shown.
¾" valves are similar.



Pulsing Position

When a 50 millisecond electrical pulse from the timer energizes the solenoid coil, the solenoid armature lifts off its seat and allows compressed air to flow through the pilot valve to atmosphere. Pressure drops in the valve cover, and the higher pressure in the valve body moves the diaphragm into the open position. Air flows from the compressed air header through the blowpipe to clean the filter bag. (8 to 12 filters per blowpipe). At the conclusion of the 50 millisecond electrical pulse, the pilot valve closes and pressure rises again in the in the valve cover to return the diaphragm to the closed position.



COMPRESSED AIR GUIDELINES

Consumption

The amount of compressed air required for your collector is given on the engineering document in (SCFM) standard cubic feet per minute. In specifying SCFM requirements, calculations are based on the following:

- Number of headers
- Final delivery pressure (usually 90 to 100 psig)
- 1/20 second Timer "on time"
- Timer "off time" (usually 6 to 8 seconds)
- Special considerations

Total Free Air Consumption	
Pipe Length	Up to 50 SCFM
Up to 100 ft.	1" Diameter
100 to 1000 ft.	1 1/4" Diameter

Pressure

For most applications, compressed air at 90 to 100 psig header pressure provides adequate filter bag cleaning. Higher pressures, except in special applications, could shorten the life of the filter bag. Lower pressure requires special considerations in the design and sizing of the dust collector or poor filter bag cleaning may result. Cyclonaire Corporation should be consulted whenever special air pressure requirements are encountered.

Quality

Dirt, rust, and scale in compressed air piping can cause the pulsing system to malfunction. Moisture and oil cause deterioration of pulsing system components, as well as potential filter plugging: in cold weather, moisture may freeze in valves. It is essential that the air supply be clean, dry, and oil free.

A simple dirt leg installed in the airline at the header, or a commercially available strainer is usually sufficient to trap heavy particles of dirt, rust, and scale.

An automatic moisture drain should be installed on the compressed air collector.

In line air filters with automatic drains will handle small amounts of moisture. Large amounts of moisture require a centrifugal separator followed by a desiccant or mechanical dryer. For removal of oil mist and condensed oil, in line desiccant filters or packed beds of granular absorbing polymer are commercially available.

Cyclonaire Corporation and/ or your air compressor supplier may be contacted for additional information pertaining to compressed air system requirements.

SECTION 3: START-UP CHECK LIST

A Cyclonaire field service representative is available for start-up service, and we recommend that customers not already familiar with Cyclonaire equipment make arrangements for this service by calling the factory or their local sales representative. If factory assistance is not required, then, a competent engineer should inspect the Dust Collector at start-up time using the checklist below:

DIRTY AIR PLENUM

1. There should be no cracks, gaps, or pin holes in the dust air house.
2. For bottom removal collectors, inspect the filter bag assemblies referring to the: Final assembly bottom removal instructions of this manual. Improperly installed filter bag may allow dusty air to enter the clean air plenum and shorten filter bag life.
3. Make sure that the filter bag assemblies hang straight and the bottoms do not touch other filter bag assemblies or any part of the Dust Collector interior.
4. Air or gas inlets should be located below the filter bag or equipped with inlet baffles so that direct dust particles impingement will not cause excessive filter bag wear.
5. Interior walkways, safety grids and housing sections not supplied with the collector must be designed to allow the product to flow freely to the dust discharge.
6. High level alarms should be sufficiently below the air inlet(s) to prevent the inflow of air from sweeping dust back up onto the filter bag. Correct positioning of high level alarms will prevent overloading of the filter bag and insure maximum filter life

CLEAN AIR PLENUM

1. There should be no cracks, gaps, or pin holes in the clean air housing.
2. On panelized units, all bolts between tube sheets must be in place and properly tightened.
3. Any piping (e.g. water or carbon dioxide for fire extinguishing) that passes through the tube sheet must be seal welded at the tube sheet. This prevents dusty air from entering the clean air plenum.
4. The pulsing holes in the compressed air piping must be centered over the venturis within ¼” of center.
5. The compressed air piping must be rigidly welded or bolted in place.

Start-Up Checklist (cont'd)

EXTERIOR of DUST COLLECTOR

1. The magnehelic differential gauge and differential pressure switches (when used) must be correctly piped, and the pointer on the gauge should be zeroed before start-up. If a manometer is used to measure differential pressure, make sure it is level and contains the correct fluid.

2. Access doors and spring loaded relief vents should seat effectively to prevent leakage. Inspect rupture disc type relief vents (when used) for damage.

3. All bolts must be properly tightened.

4. Operate any equipment connected to the dust discharge of the dust collector. Check the rotation of any motor driven equipment such as rotary air locks, horizontal unloading valves, live bottom bin activators, and screw conveyors. Check slide gates and butterfly valves for binding. Check counter- weighted gravity valves, neoprene vacu-valves, and hopper lock valves, as required, for correct adjustment.

PULSING SYSTEM

1. The timer pin wire must be positioned over the number corresponding to the highest numbered timer output terminal in use

2. The diaphragm valves, header connection, pressure gauge, and air piping should be visually inspected to insure that there are no loose or missing parts.

3. All the ¼" O.D. tubing connections between the diaphragm and solenoid pilot valves must be tight and tubing must not be crimped.

4. Open the solenoid pilot valve enclosure(s) and check that all solenoid valve stem retainers are tight (these sometimes loosen in transit). Check wiring for correct routing, and for short or open circuits.

5. Your compressed air piping to the air header(s) should be sized according to the table in "*Compressed Air Requirements".* The compressed air system must be equipped to deliver clean, dry air to the pulsing air system. At this time, make sure that there is a suitable air pressure gauge on the air header for readings 90-100 psig.

6. Start the compressed air supply system and check for air leaks in all parts of the system. If air is heard escaping through one or more blowpipes (with timer off), please refer to item 3 of "Troubleshooting the Puling Air System" To locate and correct the condition. Gauge pressure at the air header(s) should be 90-100 psig.

Start-Up Checklist: Pulsing System (cont'd)

7. With the compressed air system operating, energize the timer to begin pulsing. Check that all solenoids are firing by placing a finger over the exhaust port of the solenoid valve. It is helpful to set the timer " off time" control to it's minimum setting (fully counterclockwise) to check collectors with large numbers of solenoid valves.

8. Allow the pulsing to continue as long as possible to clear the system of dirt, rust, scale, welding slag, and metal chips that can cause the diaphragm or solenoid valves to stick. Stuck valves can be easily corrected by referring to item **3, C** and **D,** or: Troubleshooting the Compressed Air System".

9. After checking the pulsing air system, set the timer "off time" to provide 6 to 10 seconds between successive pulses.

10. The pressure at the air header must recover to 90-100 psig before each pulse. Make sure there is adequate compressed air delivery for full pressure recovery when all other systems connected to the same air supply are operating at full capacity.

FAN or BLOWER SYSTEM

1. Start the fan or blower and check rotation.

2. Check dust pickup points for proper suction; balance airflow in individual ducts.

3. With the main fan running, the compressed air system running, and the timer energized, look inside the collector and note the action of the filter bag when they are pulsed. The filter bag should have a definite flexing action when the solenoids are fired.

4. Check for air leakage at all flange or panel connections.

EQUIPMENT START-UP SEQUENCE

1. The compressed air supply must be started first.

2. When the pressure gauge on the compressed air header indicates that the system is at full pressure (90-100 psig), the sequential timer can be energized. The timer "off time" should initially be set at 6 to 10 seconds.

3. Dust take away equipment such as rotary airlocks, screw conveyors, horizontal unloading valves, live bottom bin activators, and pneumatic conveying systems can now be started in their correct sequence.

4. Check that all access doors, hatches, ports and other openings are closed and latched or bolted.

5. If a temperature control interlocking system is used, check that it is correctly adjusted and fully operational.

Start-Up Checklist: Equipment Start-Up Sequence (cont'd)

6. The main exhaust fan can now be started and brought up to speed.

NOTE: There will be very little pressure drop across clean filter bag , and some systems may require throttling the fan discharge to prevent the fan motor from overloading during the first few hours of operation.

7. Dangerous or explosive gasses may accumulate in gas fired burner systems during shutdown. Allow the main fan to purge gasses from these systems before igniting the burner. It may be advisable to bring the system up to temperature so that interior surfaces are free from condensation before introducing the dust load.

NOTE: At shutdown, allow the main fan to run with the burner off and no dust load. This will purge the above system of warm, moist air that would otherwise condense and cause further problems. (rusting and/or dust caking).

8. Start the dust-laden air through the Dust Collector. The collector should be started under partial load to allow the filter bag to become slowly and evenly coated with dust particles and prevent fine materials from passing through the pores of new filter bags. Throttling the fan discharge is an effective means of regulating the dusty air load.

9. Observe the manometer or magnehelic differential pressure gauge reading. As the new filter bag becomes coated with dust, efficiency of the filtering action increases, and the differential pressure across the filter bag will also increase. Slowly bring the collector to full load and note the final pressure drop across the filter bag. The gauge or manometer reading should stabilize between 3" and 4" w.g.

Never allow the pressure drop across the filter bag to exceed 17" w.g. maximum, or filter bag may collapse.

NOTE: If the pressure drop continues to increase over 4" w.g. and does not stabilize, decrease the timer "off time" to 3 seconds. Should adjustment of the timer "off time" fail to cause the pressure drop to stabilize below 4" w.g., shut down the system and refer to "Troubleshooting the Collector", or call your local Cyclonaire sales representative.

10. When the collector has stabilized, the timer "off time" interval may be slowly increased for the most economical use of compressed air. As the "off time" is increased, the differential pressure will also increase. Reading up to 6" w.g. are acceptable; however, we recommend operating at 4" w.g. for maximum filter life. The timer "off time" may decrease when lower differential pressure readings are desired. When adjusting the "off time" intervals, proceed in small steps, allowing the differential pressure to stabilize for several hours between increments.

11. Check the main airflow with a pilot tube or equivalent measuring device, to establish initial conditions. If the main airflow must be adjusted up or down to suit the process, repeat step 6-J above.

SECTION 4: TROUBLESHOOTING

TROUBLESHOOTING THE DUST COLLECTOR

1. Excessive Pressure Drop Across Filter Bag:

The differential pressure gauge or manometer on your Dust Collector should read 4" w.g. or less. Higher readings and/ or steadily increasing readings are an indications that the main airflow through the Dust Collector may be restricted, and a potential process problem such as poor suction at duct pick up points may exist. In extreme cases (over 17" w.g.), filter bag assemblies will be damaged.
Check the following:

A. Is Pressure Gauge Working?:

Check the differential pressure gauge or manometer and the tubing leading to the Dust Collector. Disconnect the lines at the gauge or manometer and clear the compressed air. Look for loose fittings, cracked, broken, or pinched tubing. Make sure the gauge is zeroed or that the manometer is level, zeroed, and contains the correct fluid. See Differential Pressure Gauge installation section for detailed information.

B. Pulsing System:

Inspect the pulsing air system as follows, to make sure that all of the filter bags are being cleaned:

1. If none of the solenoid valves are operating, check the timer using the troubleshooting guide on page 19.

2. Check the air pressure at the header; it should recover to 90 –100 psig before each pulse. If not, check to make sure that the compressed air supply system is in good operating condition, correctly sized and supply lines are not too small or restricted. Listen for the sound of compressed air flowing continuously through one or more rows of filter bags, an indication of valve or valves "stuck" in the pulsing position. The usual causes for this condition is: leak in tubing to solenoid pilot valve, and dirt in the solenoid or diaphragm valve.

3. Check that all solenoid pilot valves are firing in sequence by holding a finger over each solenoid exhaust port.

NOTE: Solenoid valves or diaphragm valves that do not operate properly may be serviced according to instructions in " Troubleshooting the Pulsing Air System", on page 16.

C. Water or Oil in Compressed Air:

Inspect upper portions of the filter bag for dust caking, dampness, or oil. Any or all of these symptoms are indications of moisture or oil in the compressed air supply. Install equipment that will insure a continuous supply of clean, dry, oil-free compressed air. See you compressor supplier for recommendations.

Troubleshooting the Dust Collector (cont'd):

D. Filter Bag Loaded With Dust:

This is a condition known as **blinding. If the dust is dry:**

1. **Dust is discharged from the hopper**. Check the hopper for overloading or bridging across the dust discharge. Correct by repairing dust discharge equipment, replacing with higher capacity equipment, or installing hopper vibrators, etc. as required to keep hopper clear.

2. **Airflow too high.** If the main airflow is too high to allow dust to drop off the filter bags, an excessive pressure drop across the Dust Collector will result and dust will build up in the system. In many cases, this high pressure drop in turn leads to a reduction in the main air flow, so that it is necessary to remove the dust accumulation from the pleated filters (and the rest of the system) before measuring the main airflow volume.

   Visually inspect the pleated filter for heavy caking; if caking is evident, see the note below and take the necessary action to clean the pleated filter. Next, measure the main airflow with a pilot tube or equivalent device and compare with original volume for which the unit was designed. If the flow is too high, cut back the main fan to prevent a recurrence of the problem.

3. **Particle size and dust load.** If possible, compare the dust particle size and loading with the original design specifications. Finer dust may cause a higher pressure drop.
   If you have questions: Please call the factory, a service representative will be glad to assist you.

If The Dust Is Wet:

4. **Water Leaks.** Inspect the Dust Collector housing and ductwork for holes, cracks, or loose gasketing where water could enter the Dust Collector.

5. **Condensation:** If moisture has been condensing inside the collector, check the dew point temperature of the incoming air system. It may be necessary to insulate the collector and/or the ductwork leading to the collector to keep surface temperatures above the dew point and prevent condensation of the pleated filter.

NOTE: Collectors that have had blinded or caked bags can possibly be put into service by running the pulsing air system for 15 to 30 minutes with a 3 second timer "off time" and without the main fan or blower. If the pressure drop is not lower when the main fan is started again, take the pleated filters out of the collector and remove the caked dust.

WARNING: Some Dust Collectors are supplied with a bar grid beneath the filter to catch a filter or cage if it is dropped. ***250 lb. CAPACITY ON THE GRID!**

Troubleshooting the Dust Collector (cont'd)

2. **EXTREMELY LOW PRESSURE DROP:**

A. **Is Pressure Gauge Working?**

Check the differential pressure gauge or manometer and the tubing leading to the Dust Collector as in Section 1A On Page 4-1.

B. **Holes in Pleated Filter or Pleated Filter Incorrectly Installed:**

Inspect the filter bag assemblies for holes, rips, tears, or excessive wear. Make sure that the filter bags were installed correctly according to the " Filter Bag Installation Instructions Top Removal or Bottom" section and that no filter bag assemblies have dropped off.

C. **Ductwork, Dampers:**

Inspect the ductwork to and from the Dust Collector for air leaks or blockage. Make sure that any dampers in the system are correctly positioned to allow air to flow through the Dust Collector.

D. **Leaks in the Housing:**

Check the tube sheets (flat steel sheets from which the pleated filters are suspended) and the Dust Collector housing for holes, cracks, or loose gasketing that would permit air to bypass the Dust Collector or pleated filters.

3. **CONTINUOUS FLOW OF DUST IN THE CLEAN AIR EXHAUST (PRIMARY DUSTING):**

A. **Holes in the Filter Bag or Incorrectly Installed:**

1. Inspect the pleated filters as in section 2A on this page.

2. Check the tube sheets for holes, cracks, loose bolts, or loose filter assemblies (Bottom Removal Only) that would permit dusty air to bypass the filter bag.

4. **PUFF OF DUST IN THE CLEAN AIR EXHAUST AFTER EACH PULSE (SECONDARY DUSTING):**

NOTE: This condition is normal with new filters, and should stop after the first several hours of operation.

A. **Air Header Pressure Too High:**

Check the header air pressure gauge. If the pulsing air pressure is over 100psig, filter bag may flex excessively and allow fine dust to pass through the filter material.

B. **Worn Filter Bag:**

Inspect the filter bag for wear. Thin filters may not stop fine dust when flexed by a compressed air pulse.

C. **Residual Dust:**

If dust has gotten into the clean air plenum because of a dropped or torn filter, hole in tube sheet, etc., the pulsing air may stir up the dust and allow it to escape into the clean air exhaust after each pulse. Residual dust may also be driven down inside filter bags by pulsing air; if the filters are filled with several inches of dust, clean both the clean air plenum and the filter bag assemblies to avoid further problems.

5. **SHORT FILTER BAG LIFE:**

This is often a complicated problem to diagnose, and we recommend calling the Cyclonaire main office for advice. The following list may be helpful in performing some preliminary checks:

A. **Chemical Attack:**

Filter bag material degrades due to attack from certain chemicals in the dust or gasses in the air stream.

B. **High Moisture:**

High moisture content in the collector may cause certain filter bag materials to shrink or degrade (more rapidly at elevated temperatures).

C. **Localized Abrasion:**

1. Abrasion of the top cuff due to incorrect installation.

2. Abrasion of the filter bag at dirty air inlet: A dust impingement baffle may be required.

TROUBLESHOOTING THE TIMER

1. Check for mechanical damage.

2. If "Power On" indicator is not on, check for 120 VAC power input. The "hot" line connection must be connected to terminal "L1", as this is the fused terminal.

3. Check for blown fuse; if replacement is necessary, use only 3 AMP standard 3AG fuse (1 ¼" long). Do not use slow-blow type fuse.

4. Check wiring from timer to solenoid for open or short circuits.

5. After performing steps 1-4, if timer is still not functioning properly (no output voltage, sequencing problems, etc.), please contact the factory.

TROUBLESHOOTING THE PULSING AIR SYSTEM

1. Pulsing Failure of All Valves or the Same Numbered Valves on Each Header:

A. Timer Inoperative:

Check timer per maintenance instructions in the timer section. Check for 120 VAC pule between each numbered terminal on the timer board and solenoid common terminal. Repair or replace timer if necessary.

B. Open or Short Circuit in Wiring Between:

Check continuity with ohmmeter or suitable tester and repair as required.

2. Pulsing Failure of Valves at Any Location:

A. Red Plastic Plug in Solenoid Exhaust Port (ASCO Valve Only) :

Remove and discard plug.

B. Ruptured Diaphragm:

Disassemble valve in question and inspect diaphragm(s). Replace if necessary.

C. Pinched or Plugged Tubing Between Solenoid and Diaphragm Valve:

Inspect tubing and replace if necessary.

Troubleshooting the Pulsing Air System (cont'd):

D. Open Solenoid Coil:

Check continuity of solenoid coil with ohmmeter (200-300 OHMS). Replace if necessary.

3. Continuous Passage of Compressed Air Through One or More Blowpipes:

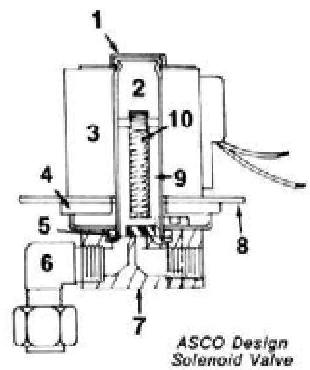
A. ¼" O.D. Tubing of Fittings Leaking or Broken:

Inspect and repair as required. Always use new Ferrules in fittings when replacing tubing

B. ¼" O.D. Tubing Connected Into Solenoid Exhaust Port (ASCO Valve Only):

NOTE: When correctly connected, the letters "IN" Will be visible on the valve body next to The 1/8" NPT fitting.

Open solenoid box and remove the core tube retainer from the solenoid in question. Remove valve core assembly, being careful not to loosen the gasket. Remove tubing from compressed fitting; change Fitting to inlet port on valve body and reassemble.



1. Spring Clip Retainer	6. Compression Fitting
2. Core Tube	7. Valve Body
3. Coil (400 OHMS)	8. Solenoid Box
4. Flat Gasket	9. Armature
5. Core Tube "O" Ring	10. Armature Spring

C. Solenoid Armature not Seated Properly (A Steady Flow of Air From the Solenoid Exhaust Port is felt by Placing a Finger Over the Port):

Remove the valve core from solenoid in question. Disassemble the valve core, using the appropriate illustration above the guide. Remove particles of dirt, scale, or rust from the valve body and from around the armature. Check for smooth action and reassemble.

D. Diaphragm Valve Air Bleed Hole or Passage Restriction:

Disassemble and inspect the diaphragm valve in question as follows:

¾" valve – check for plugged air bleed hole in diaphragm.

1" valve – check for plugged air bleed hole in valve body and cover.

1 ½" valve – check for plugged or restricted air bleed passages. See the illustration in "Pulsing Air System". Clean valve, as required, and reassemble.

Appendix E
SMAQMD Application to Modify the SMAQMD PTOs for the CPP Gas Turbines and Cooling Tower

SFA
SACRAMENTO MUNICIPAL UTILITY DISTRICT FINANCING AUTHORITY
P.O. Box 15830, Sacramento, CA 95852-1830

August 24, 2010
SFA 10-007

Larry F. Greene
Air Pollution Control Officer
Sacramento Metropolitan Air Quality Management District
777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Re: Cosumnes Power Plant
Applications to Modify the Permits to Operate for the Gas Turbines and Cooling Tower

Dear Mr. Greene:

The Sacramento Municipal Utility District Financing Authority (SFA) submits the enclosed applications with filing fee in the amount of $7,611 to modify the Permits to Operate for two gas turbines and the cooling tower at Cosumnes Power Plant (CPP). SFA also requests review of this application under Enhanced New Source Review for concurrent processing of modifications to CPP's Permits to Operate and Title V Federal Operating Permit.

The permit modifications are needed to accommodate the addition of digester gas to CPP's gas turbine fuel supply of pipeline natural gas. Combustion of digester gas in CPP's gas turbines will generate renewable electrical power in greater quantities than currently generated from combusting the digester gas at the Carson Cogeneration Project. As such, the permit modifications will allow SFA to make more efficient use of a renewable fuel source.

For the cooling tower, the permit modifications are needed to accommodate changes to the quality of CPP's cooling water supply from the Folsom South Canal (FSC). Historically, the FSC conveyed water from the American River. Recently, the Freeport Regional Water Authority (FRWA) has commenced operation of an outtake structure and piping system that conveys Sacramento River water to the FSC. Introduction of Sacramento River water into the FSC significantly alters the quality of CPP's water supply including increased conductivity and total dissolved solids (TDS). These cooling water quality characteristics impact particulate emissions from the cooling tower.

If there are any questions on these application materials, please contact Stu Husband, Regulatory Compliance Coordinator, at (916) 732-6246.

Sincerely,

Ross Gould, Superintendent
Thermal Generation & Gas Pipeline
Power Generation Department

Enclosure

bcc: Tom Andrews, Sierra Research
Kurt Hook, WGPO
Stu Husband, SMUD
Brad Jones, SMUD
Andrea McGagin, SMUD
Keith McGregor, CH2MHILL
Corporate Files
CPP File 1200.14

UNION BANK OF CALIFORNIA, N.A.
SACRAMENTO, CA 95814
11-49/1210

21256

SIERRA RESEARCH
916-444-6666
1801 J Street
Sacramento, CA 95811

8/17/2010

PAY TO THE ORDER OF Sacramento Metropolitan AQMD

$ **7,611.00

Seven Thousand Six Hundred Eleven and 00/100** DOLLARS

Sacramento Metropolitan AQMD
777 12th St, 3rd Floor
Sacramento CA 95814-1908

MEMO

MP

⑈021256⑈ ⑆121000497⑆ 21911290⑈

SIERRA RESEARCH

21256

Sacramento Metropolitan AQMD 8/17/2010

Date	Type	Reference	Original Amt.	Balance Due	Discount	Payment
8/17/2010	Bill		7,611.00	7,611.00		7,611.00
					Check Amount	7,611.00

Union Bank of Californ 7,611.00

Application to the Sacramento Metropolitan Air Quality Management District to Modify the Permits to Operate for the Gas Turbines and Cooling Tower at the Cosumnes Power Plant

prepared for:

Sacramento Municipal Utility District Financing Authority

August 2010

prepared by:

Sierra Research, Inc.
1801 J Street
Sacramento, California 95811
(916) 444-6666

APPLICATION TO THE
SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

for a

MODIFICATION TO THE PERMITS TO OPERATE

for the

EXISTING GAS TURBINES AND COOLING TOWER AT THE COSUMNES POWER PLANT

Submitted by:

Sacramento Municipal Utility District Financing Authority
6201 S Street
Sacramento, CA 95817

August 2010

Prepared by:

Sierra Research, Inc.
1801 J Street
Sacramento, California 95811
(916) 444-6666

SUMMARY

Sacramento Municipal Utility District Financing Authority (SFA) proposes to generate renewable electric power at the Cosumnes Power Plant (CPP) by combusting digester gas from the Sacramento Regional Wastewater Treatment Plant (SRWTP). To accomplish this, SFA is applying for a modification to the Permits to Operate (PTO) in order to increase the potential to emit SOx emissions from the CPP gas turbines. To address changes to the quality of CPP's water supply from the Folsom South Canal, SFA is also applying for PTO modifications in order to increase cooling water total dissolved solids (TDS) levels, and increase the potential to emit particulate emissions for the cooling tower

The proposed PTO modifications will trigger Best Available Control Technology (BACT) requirements for SOx emissions, which will be met by the continued use of low-sulfur content fuel by the CPP gas turbines. Offset requirements are not triggered for the proposed gas turbine SOx emission increases. The proposed PTO modifications did not trigger BACT requirements for the cooling tower particulate matter emissions increase. However, the proposed PTO modifications will trigger emission offset requirements for the increase in particulate emissions for the cooling tower, which will be met through the surrender of emission reduction credit (ERC) certificates.

Because air dispersion modeling analyses were previously performed for the gas turbines and cooling tower during the original permitting of the CPP in 2001, these SO_2 and PM_{10} modeling results were revised to account for the proposed higher SOx and particulate emission levels. Also, due to an increase in toxic air contaminant emissions associated with the combustion of digester gas by the gas turbines, a revised screening level risk analysis was performed for the proposed PTO modifications. The revised modeling and risk assessment do not show any new significant air quality impacts.

APPLICATION TO THE
SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT
for
MODIFIED PERMITS TO OPERATE
for the
EXISTING GAS TURBINES AND COOLING TOWER AT THE
COSUMNES POWER PLANT

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MODIFIED PERMITS TO OPERATE
for the
EXISTING GAS TURBINES AND COOLING TOWER AT THE COSUMNES POWER PLANT

I. PROJECT DESCRIPTION

A. Applicant's Name and Business Description

Name of Applicant:	Sacramento Municipal Utility District Financing Authority (SFA)
Mailing Address:	P.O. Box 15830 Sacramento, CA 95852
Facility Address:	14295 Clay East Road Herald, CA 95638
SIC Code:	4911
General Business:	Power Plant
Submitting Officer:	James Shetler SFA Representative, and Assistant General Manager, SMUD Energy Supply (916) 732-6757
Project Contact:	Stu Husband Regulatory Compliance Coordinator (916) 732-6246
Consultant:	Sierra Research, Inc. 1801 J Street Sacramento, California 95811 Contact: Tom Andrews (916) 444-6666
Type of Use Entitlement:	SFA owns the equipment described in this application.
Estimated Construction Date:	Existing equipment

B. Type of Application

SFA is applying for modifications to the Permits to Operate for the existing gas turbines (PTO Numbers 16006.rev1 and 16007.rev1) and cooling tower (PTO Number 20185) at the Cosumnes Power Plant (CPP). The modification to the Permits to Operate (PTOs) for the gas turbines is necessary due to the proposed combustion of digester gas by these units, and the modification to the PTO for the cooling tower is necessary due to a proposed increase in the expected maximum cooling water total dissolved solids (TDS) level.

The appropriate Sacramento Metropolitan Air Quality Management District (SMAQMD) application forms are included in Attachments 1A and1B (gas turbines) and 1C (cooling tower).

C. Facility Description

The CPP is comprised of two natural gas fired GE 7FA combined cycle gas turbine-generators and a single steam turbine- generator. The facility also includes a counter-flow mechanical draft cooling tower, single-pass filtration system for incoming water, and zero liquid discharge (ZLD) system for plant effluent.

D. Equipment and Process Description

Gas Turbines

To increase the quantity of renewable electrical energy provided to SMUD, SFA proposes to combust digester gas at the CPP. The digester gas produced by the Sacramento Regional Wastewater Treatment Plant (SRWTP) is currently either combusted at the Carson Cogeneration facility or combusted at the SRWTP (by a combination of boilers and/or flares). The electrical generation equipment at CPP is more efficient than the Carson Cogeneration facility. In 2009, CPP’s average net heat rate was 7,130 Btu/kWh compared to the average heat rate of the Carson’s combined cycle unit of 10,413 Btu/kWh. Using these values as representative, every MMBtu of digester gas would generate 140 kWh of renewable power from CPP and 96 kWh at Carson Cogeneration facility, a 46 percent difference.

For this proposed change, the digester gas would be injected into SMUD’s 26-mile gas transmission pipeline that connects the Carson Cogeneration facility to the CPP. Prior to injection into the pipeline, the digester gas would be dried and the total sulfur content of the gas reduced to a maximum of 1 gr/100 scf (17 ppmv). This will be accomplished by installing and operating sulfur removal and gas dehydration process equipment at the Carson Cogeneration facility to treat the digester gas. The primary purpose for the additional digester gas treatment is to meet gas pipeline design and safety criteria. Sulfur compounds and moisture are corrosion agents and must be reduced to specified levels before the digester gas is injected into SMUD’s gas pipeline. For times when CPP cannot take the digester gas, the Carson Cogeneration facility and/or SRWTP will retain the capability and permit authority to combust the digester gas.

For CPP permitting purposes, the amount of digester gas produced at SRWTP reaches a maximum level of 2,500 scfm. Because the heating value of digester gas (approximately 618 Btu/scf, HHV) is lower than natural gas (approximately 1019 Btu/scf, HHV), the use of this fuel at CPP will not result in an increase in the maximum heat input rating of the gas turbines (i.e., 1,865 MMBtu/hr). Due to the higher sulfur content of the treated digester gas compared to natural gas, it will be necessary to account for the SOx emission increase associated with the use of digester gas at CPP.

In addition, including digester gas with the natural gas currently burned at the CPP will change the composition and physical properties of the gas currently being burned by the gas turbines. However, this change to the gas composition is expected to result in only a very minimal increase in the exhaust flow rate associated with each Btu of gas burned by this equipment. Both of these effects are discussed in more detail in the following emissions assessment section.

Cooling Tower

The Freeport Regional Water Authority (FRWA) has commenced operation of an outtake structure and piping system that conveys Sacramento River water to the Folsom South Canal (FSC). Historically, the FSC conveyed American River water to the now-decommissioned Rancho Seco Nuclear power station and Rancho Seco Lake. FSC also is the source of raw cooling and service water to CPP. Introduction of Sacramento River water into FSC significantly alters the quality of CPP's raw water including increased conductivity, total dissolved solids (TDS), and total suspended solids (TSS).

The proposed change in the source of water for CPP will result in an increase in the TDS level of the water used by the cooling tower as well as the particulate emissions in the cooling tower drift. The following table summarizes the CPP cooling tower specifications that affect particulate emissions. This table compares the cooling tower specifications in the current PTO to the proposed change. As shown in Table 1, there is a proposed increase in the cooling water maximum TDS level from 800 to 1,500 ppmw.

Table 1
CPP Cooling Tower Specifications

Parameter	Existing PTO	Proposed Change
Maximum water circulation rate (gpm)	155,000	155,000
Maximum water TDS level (ppmw)	800 (3-hr avg)	1,500 (3-hr avg)
Drift rate (%)	0.0005	0.0005

E. Facility Operations

While actual operation will vary, the CPP has the potential to operate on a full time basis (24-hours/day, 365 days/year). Consequently, in the following sections regarding emissions and regulatory applicability, full time facility operation is assumed.

II. EMISSION ASSESSMENT

A. Gas Turbines

SOx Emission Change

As discussed above, the proposed project includes the combustion of up to a maximum of 2,500 scfm of digester gas in the CPP gas turbines. The digester gas will have a maximum total sulfur content of 1 gr/100 scf (17 ppmv). The digester gas will displace an equal amount of natural gas on a heat input basis. Therefore, the use of digester gas by the CPP gas turbines will not result in an increase in the heat input rate. For these emission calculations, we examined the CPP gas turbine full load operating case and calculated the net SOx emission change associated with the combustion of 2,500 scfm of digester gas compared to an equal amount of natural gas on a heat input basis. The SOx emissions for the combustion of natural gas were based on natural gas total sulfur content of 0.25 gr/100 scf which is the basis for the existing emission limits in the SMAQMD permit for CPP. The following calculations show the net increase in hourly SOx emissions associated with the combustion of the digester gas:

Digester Gas:

Heat Input (MMBtu/hr) = (2,500 scf/min) x (60 min/hour) x (617.55 Btu/scf[1]) x (MMBtu/10^6Btu)

Heat Input (MMBtu/hr) = 92.63 MMBtu/hr

SOx (lbs/hr) = (2,500 scf/min) x (60 min/hour) x (1 gr/100 scf) x (lb/7000 gr) x (64 lbs_{SOx}/32 lbs_s)

SOx (lbs/hr) = 0.43 lbs/hr

Natural Gas:

Natural gas fuel use (scf/hr) = (92.63 MMBtu/hr) x (10^6 Btu/MMBtu) x (scf/1019.0 Btu[1])

Natural gas fuel use (scf/hr) = 90,902.85 scf/hr

SOx (lbs/hr) = (90,902.85 scf/hr) x (0.25 gr/100 scf) x (lb/7000 gr) x (64 lbs_{SOx}/32 lbs_s)

SOx (lbs/hr) = 0.065 lbs/hr

[1] See Attachment 2 for digester gas and natural gas characteristics.

Net SOx Emission Change:

Net SOx Emissions Change = (0.43 lbs/hr) – (0.065 lbs/hr) = 0.37 lbs/hr

Table 2 shows the change to the hourly, daily, quarterly, and annual SOx emissions associated with the combustion of digester gas by the CPP gas turbines. These proposed new SOx emission levels are based on full load/full time operation of the CPP gas turbines. As shown by this table, there is an expected SOx net emission increase for all averaging times. Please note that on Table 2 the existing PTO SOx emission limit for the CPP gas turbines has been changed from 1.31 to 1.32 lbs/hr. This change was made to correct an apparent rounding error in the existing SMAQMD CPP permit. Using the maximum allowable heat input rate in the SCAQMD permit (1,865 MMBtu/hr) and the SOx emission factor (0.00071 lbs/MMBtu) results in a SOx emission limit of 1.32 lbs/hr rather than 1.31 lbs/hr.

Table 2
CPP Gas Turbines
SOx Emission Summary

	Existing PTO	Proposed Levels	Net Emission Increase
Gas Turbine hourly SOx emission limit (lbs/hr)	1.32	1.69	0.37
Gas Turbine daily SOx emission limit (lbs/day)	31.4	40.56	9.16
Facility-wide daily SOx emission limit (lbs/day)	62.9	72.06	9.16
Facility-wide quarterly SOx emission limit (lbs/quarter)	5,405 (1st qt) 5,465 (2nd qt) 5,525 (3rd qt) 5,525 (4th qt)	6,229 (1st qt) 6,299 (2nd qt) 6,368 (3rd qt) 6,368 (4th qt)	824 (1st qt) 834(2nd qt) 843 (3rd qt) 843 (4th qt)
Facility-wide annual SOx emission limit (lbs/year)	21,922	25,264	3,344

Impacts on NOx, CO, ROC, and PM_{10} Emissions

Including digester gas with the natural gas currently burned at the CPP will change the composition and physical properties of the gas currently being burned by the gas turbines. This change to the gas composition is expected to increase the exhaust flow rate associated with each Btu of gas burned by this equipment. This increase is associated with the relatively high concentrations of CO_2 in the digester gas. The factor that accounts for the exhaust flow per unit of heat input to a combustion device is known as the "F-Factor."[2] Increasing the exhaust flow rate for each Btu of heat input may result in a corresponding increase in the maximum hourly mass emission rates for this equipment for nitrogen oxides (NOx), carbon monoxide (CO), and reactive organic compounds (ROC).

With regards to PM_{10} emissions, due to uncertainties regarding the actual level of PM_{10} emissions from natural gas fired turbine units associated with the inherent limitations of existing EPA-approved test methods, and because there is no change in maximum turbine firing rate as a result of the use of digester gas, SFA has concluded that there will be no significant measurable increase in PM_{10} emissions associated with the proposed combustion of digester gas in the CPP gas turbines.

The CPP has the flexibility of operating with either one or two gas turbines and the operating load of each CPP gas turbine can range from 50% to 100% depending on power grid requirements. The natural gas/digester gas mixture will change depending on the number of gas turbines operating and the gas turbine operating load. Gas mixture changes affect the exhaust flow characteristics and heating value of the gas. Table 3 summarizes the resulting blended gas factors for several CPP operating cases and shows the percent change in the gas factors compared to 100% natural gas. The detailed gas mixture analyses are included as Attachment 2.

Table 3
Change in Blended Gas Parameters Compared to 100% Natural Gas[1]

Fuel/Operating Case	F-Factor[2] (dscf/MMBtu)	Heat Content (HHV) (Btu/scf)	Percent Change in F-Factor (%)	Percent Change in Heat Content (HHV) (%)
100% Natural Gas/All Operating Cases	8,650	1019	0%	0%
Blended Gas/Single GT only, 50% load	8,693	963	0.50%	-5.52%
Blended Gas/Single GT only, 100% load	8,671	987	0.25%	-3.08%
Blended Gas/Two GTs, 50% load	8,669	990	0.22%	-2.84%
Blended Gas/Two GTs, one at 50% load and one at 100%	8,662	998	0.14%	-2.02%
Blended Gas/Two GTs, 100% load	8,659	1,002	0.10%	-1.63%

1) See Attachment 2 for detailed calculations.
2) F-Factor calculated from actual site natural gas composition data; see Attachment 2.

[2] See 40 CFR Part 60, Appendix A, Method 19.

In addition to comparing the blended gas parameters to actual site natural gas characteristics, we compared the blended gas F-Factors to the default EPA 40 CFR Part 60, Appendix A, Method 19 F-Factor used by the CPP CEMS/DAS system and used by the firms that have performed compliance tests on the CPP gas turbines over the past five years (2006 to 2010). This comparison is shown in Table 4 and, unlike the comparison with actual site natural gas which shows an increase in the F-Factor, the CEMS/Compliance Test comparison shows a decrease in the F-Factor when blended gas is used.

Table 4
Comparison between Blended Gas F-Factors and CEM/DAS and Compliance Test F-Factors

CPP Operating Case	Blended Gas F-Factor (dscf/MMBtu)	CEMS/DAS EPA Default F-Factor (dscf/MMBtu)	Compliance Test Default F-Factor (dscf/MMBtu)	Percent Change (%)
Single GT, 50% load	8,693	8710	8710	-0.19%
Single GT, 100% load	8,671	8710	8710	-0.44%
Two GTs, 50% load	8,669	8710	8710	-0.47%
Two GTs, one at 50% load and one at 100%	8,662	8710	8710	-0.55%
Two GTs, 100% load	8,659	8710	8710	-0.59%

As shown in Tables 3 and 4, the percent change in the F-Factor of the blended gases for the various CPP operating cases are relatively minor, with either a small increase (when compared to actual site natural gas) or a small decrease (when compared to CEMS/Compliance Testing default factors) that is less than 1 percent. The expected effect on CPP emissions associated with the change to the F-Factor is discussed in the following paragraphs.

To determine whether it is necessary to increase the existing PTO NOx, CO, or ROC emission limits for the CPP gas turbine due to the combustion of digester gas, it is necessary to compare the relatively small increase in the blended gas F-Factor to the current emission compliance margins at CPP. Enclosed as Attachment 3 are a number of tables showing the current compliance margins for CPP. These compliance margins were calculated by comparing the current CPP permit limits with actual emissions data. Compliance margin is calculated as (Permit Limit – Actual Emissions) / (Permit Limit), so a large percentage value for compliance margin indicates a large (safer) difference between actual and permitted emissions. The actual emissions data were determined based on a review of CEMS/DAS hourly emissions data for the past five quarters (1^{st} quarter 2009 to 1^{st} quarter 2010), emissions data for compliance tests performed over the past 5 years (2006 to 2010), and daily/quarterly/annual emission reports for the past two years (2008 and 2009).

As shown in Attachment 3, for the three pollutants that may be affected by the change in the F-Factor (i.e., NOx, CO, and ROC), the current compliance margins for CPP range from approximately 20% to 90%. Therefore, in general, the small change in the F-Factor (approximately 0.5%) due to the combustion of blended gas at CPP is expected to have a negligible effect on the compliance margins for NOx, CO, and ROC. In addition, since the CEM/DAS system and source tests have used an EPA default natural gas F-Factor of 8710 dscf/MMBtu, which is higher than the calculated blended gas factor, the use of blended gas at CPP will not result in an increase in the fuel F-Factor used by these compliance methods. As a result, SFA has concluded that there will be no increase in NOx, CO, and ROC emissions associated with the combustion of blended gas at CPP and there is no need to change the existing gas turbine PTO emission limits for these pollutants. Therefore, there is no net emission increase for NOx, CO, or ROC associated with the proposed combustion of digester gas in the CPP gas turbines.

B. Cooling Tower

As discussed above, the proposed change for the cooling tower is comprised of an increase in the maximum expected cooling water TDS level. Normally, an increase in the maximum TDS level would result in a corresponding proportional increase in the maximum allowable PM_{10} emission rate for a cooling tower. However, due to a relatively new approach for calculating PM_{10} emissions from wet cooling towers, such a proportional increase in the allowable PM_{10} emission rate for the CPP cooling tower will not be necessary.

The new approach for calculating PM_{10} emissions from cooling towers accounts for the fact that the size distribution of particulate emissions from cooling towers is directly related to the size distribution of the water droplets in the drift from cooling towers. Relatively large water droplets entrained in the drift from a cooling tower form relatively large particulates and small water droplets form small particulates. Accurate water droplet size distribution data are available from the cooling tower manufacturers. A detailed discussion of the approach used to calculate the PM_{10} emissions for the CPP water tower is enclosed as Attachment 4.

The detailed cooling tower PM_{10} emission rates shown in Attachment 4 are based on the manufacturer's droplet size distribution data, maximum CPP cooling water recirculation rate, maximum TDS level in the cooling water, and drift rate. While this is a relatively new method for calculating PM_{10} emissions for cooling towers, it has been recently reviewed and approved by the San Joaquin Valley Air Pollution Control District and the California Energy Commission (CEC) Staff for the Elk Hills Power Plant. Table 5 shows estimated PM_{10} emissions from the cooling tower at the CPP. As shown in this table, there will be an hourly, a daily, and a quarterly net emission increase for PM_{10} for the CPP cooling tower associated with this proposed change.

Table 5 CPP Cooling Tower PM_{10} Emission Summary			
	Existing PTO	Proposed Levels Based on Droplet Size	Net Emission Increase
Cooling tower hourly PM_{10} emission limit (lbs/hr)	0.31	0.39	0.08
Cooling tower daily PM_{10} emission limit (lbs/day)	7.43	9.36	1.93
Facility-wide quarterly PM_{10} emission limit (lbs/quarter)	39,550 (1st qt) 39,989 (2nd qt) 40,428 (3rd qt) 40,428 (4th qt)	39,724 (1st qt) 40,165 (2nd qt) 40,606 (3rd qt) 40,606 (4th qt)	174 176 178 178
Facility-wide annual PM_{10} emission limit (lbs/year)	160,395	161,101	706

III. COMPLIANCE WITH APPLICABLE RULES AND REGULATIONS

Rule 201, Section 303 requires that an applicant demonstrate compliance with applicable SMAQMD, state, and federal requirements before a Permit to Operate can be granted. The rules and regulations applicable to the affected equipment are listed below and discussed thereafter.

- Rule 201: General Permit Requirements
- Rule 202: New Source Review
- Rule 203: Prevention of Significant Deterioration
- Rule 207: Title V Federal Operating Permit Program
- Rule 208: Acid Rain
- Rule 301: Stationary Source Permit Fees
- Rule 401: Ringelmann Chart/Opacity
- Rule 402: Nuisance
- Rule 404: Particulate Matter
- Rule 420: Sulfur Content of Fuels
- Rule 801: New Source Performance Standards
- CEQA

A. Rule 201: General Permit Requirements

Rule 201 requires that a PTO be obtained for any new or modified equipment that has the potential to emit air contaminants. As discussed above, the existing gas turbines and cooling tower at the CPP are currently operating under PTOs. The purpose of this application is to modify these PTOs due to the proposed combustion of digester gas in the gas turbines and a proposed increase in the cooling water TDS level. These proposed changes will result in an increase in the potential to emit SOx emissions for the gas turbines and an increase in potential to emit PM_{10} emission levels for the cooling tower.

B. Rule 202: New Source Review

The SMAQMD adopted Rule 202 to provide for preconstruction review of new or modified facilities, to ensure that affected sources do not interfere with the attainment of ambient air quality standards. In general, Rule 202 contains four separate elements, as listed and discussed below.

- Best Available Control Technology (BACT)
- Emission Offsets
- Air Quality Impact Analysis
- Public Notification and Publication Requirements

1. Best Available Control Technology

Rule 202, Section 301 requires that an applicant apply BACT on a pollutant-by-pollutant basis to new or modified emissions units resulting in a quarterly emissions increase provided that the daily potential to emit for the unit is equal to or greater than 10 lb/day (550 lb/day for CO).

Gas Turbines

As shown above in Table 2, the proposed new daily SOx emission limit for each gas turbine continues to be above 10 lbs/day. Consequently, BACT is triggered by the requested PTO modification for SOx emissions. Based on previous SMAQMD BACT determinations, BACT for SOx emissions associated with the use of blended gas (i.e., natural gas and digester gas) at a facility is determined by the allowable sulfur content of the digester gas. For the Carson Cogeneration facility, the SMAQMD determined that BACT was met for SOx emissions by limiting the sulfur content of digester gas to 50 ppmv H_2S. The proposed project will have maximum total sulfur content of 1 gr/100 scf (17 ppmv) in the digester gas at the point of pipeline injection, which is equivalent to pipeline-quality natural gas. Therefore, the proposed CPP facility fuel change will comply with BACT for SOx emissions.

Cooling Tower

As shown in Table 6, the proposed new PM_{10} emission limit for the cooling tower remains below 10 lbs/day. Consequently, BACT is not triggered by the requested PTO modification. While BACT is not triggered, the cooling tower will continue to use a high efficiency drift eliminator meeting a drift rate of 0.0005%. This constitutes BACT for cooling towers in most air districts in California.

Table 6
BACT Applicability

Pollutant	SMAQMD BACT Trigger Level (lb/day)	Potential to Emit (lb/day)	Is BACT Triggered?	Proposed BACT
Gas Turbines				
SOx	≥10	40.56	Yes	Total sulfur content of digester gas limited to 1 gr/100 scf (17 ppmv) to meet gas pipeline safety criteria
Cooling Tower				
PM_{10}	≥10	9.36	No	N/A

2. Emission Offsets

Rule 201, Section 302 requires that emission offsets be provided on a per-pollutant basis for increases in quarterly emissions from a new or modified emissions unit if the stationary source's post-project potential to emit exceeds the levels specified in Table 7.

Gas Turbines

As shown in Table 7, the facility-wide quarterly potential to emit following the net emission increase associated with the combustion of digester gas by the CPP gas turbines does not exceed the emission offset threshold for SOx. Consequently, this proposed PTO modification does not trigger emission offset requirements.

Cooling Tower

As shown in Table 7, the facility-wide quarterly potential to emit exceeds the emission offset threshold for PM_{10}. Consequently, the next step is to determine the amount of

PM_{10} emission offsets required for the proposed modification of the PTO for the cooling tower. Under Rule 201, Section 418, the amount of PM_{10} emission offsets is calculated on a lbs/quarter basis for each emissions unit. For modifications, this calculation is done by subtracting the historic potential emissions (for fully offset units like the CPP cooling tower this is equal to the current PTO limits) from the proposed potential emissions for a modified emissions unit. As shown previously in Table 5, using the above calculation approach the proposed change to the cooling tower results in a PM_{10} quarterly net emission increase ranging from 174 to 178 lbs/quarter. Therefore, SFA must obtain PM_{10} offsets in order to cover this net emission increase. SFA has access to sufficient emission offsets for this application. Tentatively, SMAQMD ERC Certificate 07-01030 will be used to comply with the emission offset requirements.

Table 7
Facility-Wide Emission Offset Trigger Level

Pollutant	Offset Threshold (lbs/quarter)	CPP Facility-Wide Quarterly Potential to Emit (lbs/quarter)	Facility-Wide Trigger Level Exceeded?
Gas Turbines			
SOx	13,650	6,229 to 6,368	No
Cooling Tower			
PM_{10}	7,500	39,724 to 40,606	Yes

3. Ambient Air Quality Impact Analysis

Rule 202, Section 305 prohibits a new or modified stationary source from interfering with the attainment or maintenance of an applicable ambient air quality standard. Normally this type of ambient air quality impact analysis is required only for a new major source or major modification, and the proposed gas turbine and cooling tower PTO modifications are neither a new major source nor a major modification. However, since SO_2 and PM_{10} modeling was performed for the CPP gas turbines and cooling tower during previous permitting efforts, SFA used these previous modeling results to estimate the revised ambient impacts associated with the proposed higher emissions levels for the gas turbines and cooling tower. Table 8 shows the maximum ambient SO_2 impacts for the CPP gas turbines shown in a 2001 permit application and estimates the corresponding impacts associated with the proposed higher SOx emission levels using a simple emissions ratio method.

A similar approach was used for the PM_{10} impacts for the cooling tower, and Table 8 shows the PM_{10} ambient impacts shown in a 2007 permit application for the CPP cooling tower. This emissions ratio method is appropriate to estimate ambient impacts for the CPP gas turbines and cooling tower because the exhaust characteristics of this equipment are unchanged from the previous modeling analyses.

As shown in Table 8, while the proposed potential to emit SOx emissions for the gas turbines has increased, the maximum ambient SO_2 impacts remain below ambient air quality standards. Consequently, there are no new significant SO_2 ambient impacts associated with the proposed modification of the PTO for the gas turbines. For the cooling tower, the maximum ambient 24-hour and annual average impacts are well below the ambient air quality standards. When cooling tower impacts are combined with the ambient background levels, the total PM_{10} impacts are above the 24-hour and annual ambient air quality standards due to high background levels. However, because these impacts are well below the PSD significance levels for PM_{10} of 5.0 $\mu g/m^3$ (24-hr average) and 1.0 $\mu g/m^3$ (annual average), these small net increases are considered negligible. Consequently, there are no new significant PM_{10} ambient impacts associated with the proposed modification of the PTO for the cooling tower.

A similar conclusion is reached with regards to cooling tower $PM_{2.5}$ ambient impacts, with the cooling tower impacts alone being well below ambient air quality standards while background levels exceed the standards. In addition, the cooling tower $PM_{2.5}$ impacts are well below the PSD significant levels for PM_{10} (5.0 $\mu g/m^3$ and 1.0 $\mu g/m^3$), which is also an indication of negligible impacts (no significant impact levels have been adopted for $PM_{2.5}$). Consequently, there are no new significant $PM_{2.5}$ ambient impacts associated with the proposed modification of the PTO for the cooling tower.

Table 8 Ambient Impacts for Gas Turbines and Cooling Tower					
	Previous Modeling Analysis	Revised Impacts	Background Levels[f]	Total Impact	Ambient Air Quality Standard
Gas Turbines (SO_2 Impacts)					
1-hour Impact (µg/m^3)	0.58[a]	0.74[c]	78.6	79.3	655
24-hour Impact (µg/m^3)	0.22[a]	0.28[c]	10.5	10.8	105
Annual Impact (µg/m^3)	0.02[b]	0.03[c]	2.6	2.6	80
Cooling Tower (PM_{10} Impacts)					
24-hour Impact (µg/m^3)	0.177[d]	0.223[e]	89	89	50
Annual Impact (µg/m^3)	0.020[d]	0.025[e]	32	32	20
Cooling Tower ($PM_{2.5}$ Impacts)					
24-hour Impact (µg/m^3)	N/A	0.086[g]	54.9	55.0	35
Annual Impact (µg/m^3)	N/A	0.0096[g]	18.9	18.9	12

Notes:
[a] CEC Final Staff Assessment, CPP (01-AFC-19), February 2003, Table 5 (Phase 1 ambient impacts).
[b] Supplement A to AFC for CPP (01-AFC-19), March 15, 2002, Table 8.1-28R (calculated based on one-half of combined impacts for four gas turbines to account for impacts for only two gas turbines).
[c] Based on ratio between proposed gas turbine SOx emissions of 1.32 lbs/hr and proposed level of 1.69 lbs/hr.
[d] Permit application package for modification to PTO for CPP cooling tower, March 22, 2007, Table 5 and Petition to Amend CEC Approval of CPP, November 2007, Table 2.
[e] Based on ratio between proposed cooling tower daily PM_{10} emissions of 9.36 lbs/day and the permitted level of 7.43 lbs/day.
[f] Based on maximum background levels recorded by Sacramento County monitoring stations during the period from 2007 to 2009. Based on data from http://www.arb.ca.gov/adam/topfour/topfour1.php and http://www.epa.gov/air/data/repsco.html?co~06067~Sacramento%20Co%2C%20California.
[g] Based on revised PM_{10} ambient impacts for the cooling tower and the ratio between proposed cooling tower daily $PM_{2.5}$ emissions of 3.60 lbs/day (0.15 lbs/hr x 24 hours) and the proposed daily PM_{10} emissions of 9.36 lbs/day.

4. Public Notification and Publication Requirements

Rule 202, Sections 405, 406, 407, and 409 require that the SMAQMD notify certain public agencies and the public, and make available certain documents for public inspection and review. These requirements pertain to new permit applications requiring emission offsets pursuant to Section 302. These notification and publication requirements are listed below:

- Transmittal of Authority to Construct Evaluation to CARB and EPA;
- Publish in one newspaper of general circulation a notice of the preliminary determination contained in the Authority to Construct Evaluation, including how pertinent information may be obtained;
- Allow a 30-day period following each of the above actions;
- Submit any new BACT determination to CARB;
- After considering any and all comments that are received, notify CARB and EPA of the final determination; and
- Publish notice of final determination in one newspaper of general circulation and make all related documents available for inspection at the SMAQMD office.

In addition to the notification requirements of Rule 202, California Health and Safety Code Section 42301.6 requires that an additional public notice be distributed whenever an Authority to Construct is issued that would allow increased toxic air contaminant emissions within 1,000 feet of the outer boundary of a school site.

Since the requested modification to the PTO for the cooling tower triggers PM_{10} offset requirements, the requested permit action will trigger the public notification requirements.

The above SMAQMD NSR regulatory section discusses SOx and PM_{10} emissions. Because $PM_{2.5}$ has not yet been incorporated into the SMAQMD NSR regulations, this pollutant is covered by the Federal NSR regulations. In a May 16, 2008 Federal Register notice, the EPA clarified that while local agencies are amending their permit programs to incorporate $PM_{2.5}$, beginning on July 15, 2008 EPA requires new major sources or major modifications of $PM_{2.5}$ located in $PM_{2.5}$ nonattainment areas to undergo NSR permitting via 40 CFR 51, Appendix S. While the CPP is located in a Federal $PM_{2.5}$ nonattainment area, as shown above on Table 5 the facility-wide $PM_{2.5}$ potential to emit for CPP (limited by the PM_{10} annual emission limit), both before and after the proposed increase in the cooling water TDS level, is well below the Federal NSR major source threshold for $PM_{2.5}$ of 100 tons/year. Therefore, the Federal NSR regulations for PM2.5 do not apply to the proposed change to the CPP permit.

C. Rule 203: Prevention of Significant Deterioration

Rule 203 incorporates the Federal Prevention of Significant Deterioration (PSD) Program by reference and incorporation of the Federal PSD regulations (40 CFR 52.21). The PSD program requires pre-construction review and permitting of new or modified major stationary sources of air pollution to prevent significant deterioration of ambient air quality. PSD applies to pollutants for which ambient concentrations do not exceed the corresponding National Ambient Air Quality Standards (i.e., attainment pollutants). For the proposed modifications to the PTOs for the CPP gas turbines and cooling tower, the pollutants in question are SOx and $PM_{10}/PM_{2.5}$, respectively. While the SMAQMD is classified as an attainment area for SO_2, the SMAQMD is a nonattainment area with respect to the PM_{10} and $PM_{2.5}$ National Ambient Air Quality Standard. Consequently, the PSD regulations do not apply to the proposed modification to the PTO for the CPP cooling tower.

The federal PSD requirements apply on a pollutant-specific basis to any project that is a new major stationary source or a major modification to an existing major stationary source. (These terms are defined in federal regulations at 40 CFR 52.21). Since CPP is an existing major source, PSD applicability for the proposed modification to the PTOs for the gas turbines is based on whether the SOx net emission increase associated with these PTO modifications is above the PSD significance level of 40 tons/year. As shown in Table 2, the net emission increase is well below this level because the modified facility total SOx emissions are below 40 tons/year. Thus with respect to SOx emissions, the proposed modification to the PTOs for the gas turbines is not subject to PSD review.

On June 3, 2010 the EPA finalized the PSD greenhouse gas (GHG) tailoring regulation. The purpose of this regulation is to establish criteria to determine which new stationary sources and/or project modifications trigger PSD and Title V review due to increases in GHG emissions. Under the GHG tailoring regulation and subsequent EPA guidance documents, beginning on July 1, 2011, existing major sources of GHG emissions such as the CPP that undergo a modification that increases GHG emissions by 75,000 tons/year CO_{2e} are subject to PSD review. It is expected that the proposed project will receive final permit approval before July 1, 2011 and therefore will not be subject to this new GHG PSD trigger level. Nonetheless, with respect to the proposed modifications of the PTOs for the CPP gas turbines, the combustion of digester gas by the CPP gas turbines will increase the CO_2 emissions for these units solely due to the pass-through of the CO_2 in the digester gas, and this increase will not exceed 75,000 tons/year. The following calculation of this increase in GHG emissions is based on a digester gas CO_2 content of approximately 40% by volume.

(2500 scfm) x 0.4 x (lb-mol/385 scf) x (44 lb CO_2/lb-mol) x (60 min/hr) x (8760 hr/yr) x (ton/2000 lb) = <u>30,034 tons/yr of CO_2</u>

As shown by this calculation, the GHG emission increase associated with the combustion of digester gas by the CPP gas turbines is below the PSD trigger level of 75,000 tons/year. We note that the project will not otherwise affect the operating characteristics of the plant such that future actual GHG emissions would change as a result of the project. Therefore, with respect to GHG emissions, the proposed modification to the PTOs for the gas turbines is not subject to PSD review.

Furthermore, the digester gas is already combusted at the Carson Cogeneration facility and SRWTP. As such, there is no cumulative increase in GHG emissions from combusting the digester gas at CPP.

D. Rule 207: Title V Federal Operating Permit Program

The CPP is an existing Title V facility, with Permit No. TV2006-19-01B. The requested modifications to the gas turbines and cooling tower PTOs will require a significant modification to CPP's Title V permit. In order to expedite the Title V permit modification process, SFA requests that the SMAQMD process this application and Title V permit modification under the Enhanced New Source Review process allowed under Rule 202 (Sections 101 and 404). This permit application package includes the SMAQMD application forms necessary for this modification to the CPP Title V permit (see Attachment 1).

E. Rule 208: Acid Rain

Rule 208 incorporates the Federal Acid Rain Program by reference and incorporation of the Federal Acid Rain regulations (40 CFR 72, 75, and 76). Rule 208 applies to the existing CPP; it requires the facility to hold emissions allowances for SOx and to monitor and report SOx, NOx, and CO_2 emissions. Since the CPP facility burns pipeline quality natural gas, under the Acid Rain program the facility is allowed to use a default SOx emission factor to monitor/report SOx emissions. Since neither "pipeline natural gas" nor "natural gas" fuels can include digester gas under the Acid Rain program, when digester gas is added to the fuel mix used at the CPP, the facility will no longer qualify as either a pipeline natural gas fired facility or a natural gas fired facility (see 40 CFR 72.2 for definitions of natural gas and pipeline natural gas). Thus, with digester gas added to the fuel, the CPP facility would be classified as a gaseous fuel fired facility under the Acid Rain program and could no longer use the default SOx emission factor to monitor/report SOx emissions. The combustion of digester gas by the CPP gas turbines may also have some impact on the F-factors used by the CPP CEM/DAS system to monitor/report NOx and CO_2 emissions for Acid Rain purposes. Under the Acid Rain regulations, there are several options available to monitor/report SOx, NOx, and CO_2 emissions for the CPP gas turbines (combusting a blend of natural gas and digester gas). SFA is currently in the process of selecting these options which will be incorporated in a petition to the EPA Acid Rain group to amend the CPP Acid Rain Monitoring Plan. A copy of this petition will also be submitted to the SMAQMD.

F. Rule 301: Stationary Source Permit Fees

This permit application is subject to the permit fees established by this rule. For the proposed modification to the PTOs for the gas turbines and cooling tower, the initial filing fee was determined in accordance with SMAQMD Rule 301 based on one half of the estimated initial permit fee for the two CPP gas turbines ($5,074 per section 308.3) and the CPP cooling tower ($2,537 per section 308.2). Therefore, a check in the amount of $7,611 payable to the SMAQMD is included as part of this permit application package. The applicant understands that the SMAQMD may charge additional fees based on actual review hours spent by District staff.

G. Rule 401: Ringelmann Chart/Opacity

This rule prohibits the emission of air contaminants that are darker than Ringelmann No. 1 or 20% opacity for more than three minutes in a one-hour period. Water vapor is not included in an opacity determination. The cooling tower will not create visible emissions in excess of the limits of this rule, nor will combustion of a blend of natural gas and digester gas in CPP's gas turbines.

H. Rule 402: Nuisance

This rule prohibits the discharge of air contaminants in quantities that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public. The SMAQMD regulates new and modified sources of toxic air contaminants (TACs) under this rule by implementing its "Risk Assessment Guidelines for New and Modified Stationary Sources," dated December 2000. These guidelines implement what is commonly known as "Toxics New Source Review."

For the CPP cooling tower, while the proposed PTO modification requests an increase in the cooling water TDS level, there is no expected increase in TAC emissions associated with this change. Consequently, there is no need to analyze the TAC impacts for the CPP cooling tower.

For the proposed combustion of digester gas in the CPP gas turbines, there may be TAC emissions associated with the combustion of this gas. AP-42 TAC emission factors for the combustion of digester gas by gas turbines were used to calculate the net TAC emission increase associated with the combustion of digester gas at CPP. In addition to the TAC emissions associated with digester gas combustion, as discussed in the above sections there may be a small increase (approximately 0.5% increase) in the exhaust flow rate associated with the combustion of digester gas by the CPP gas turbines. Therefore, the corresponding increase in gas turbine ammonia emissions at the maximum permitted ammonia slip rate due to this small increase in the exhaust flow rate was also examined. The detailed TAC emission calculations for the CPP gas turbines associated with the combustion of digester gas are included in Attachment 5. Some of these compounds have both carcinogenic and non-cancer health effects.

Under the SMAQMD's toxics policy, modified projects with TAC emissions are required to perform a screening level risk assessment. To determine whether the proposed combustion of digester gas in the CPP gas turbine will result in a significant change in the either the carcinogenic or non-cancer health impacts for the CPP, a screening level health risk assessment prioritization analysis was performed for the net increase in TAC emissions discussed above for the CPP gas turbines. This analysis was prepared using the risk prioritization module of the CARB's Hotspots Analysis and Reporting Program (HARP) computer model. The HARP model was used to assess prioritization scores for the cancer risk as well as chronic and acute risk impacts. A prioritization score of less than 1 for cancer risk, chronic risk, or acute risk is considered to be insignificant. The results of the screening level health risk prioritization assessment are summarized in Table 9, and the detailed HARP modeling results are enclosed as Attachment 6.

Table 9 Risk Prioritization Results CPP Gas Turbines	
Risk Methodology	Risk Prioritization Score
Cancer	0.142
Acute	0.006
Chronic	0.017

Table 9 shows that the risk prioritization scores for the CPP gas turbines are well below the significance threshold of one for cancer, acute, and chronic impacts. Therefore, the TAC emission impacts for the proposed PTO modification for the CPP gas turbines are not expected to be significant, and the project is not expected to create a nuisance due to health risk.

I. Rule 404: Particulate Matter

This rule limits the emission concentration of dust, fumes, or total suspended particulate matter to 0.1 grain per cubic foot of dry exhaust gas at standard conditions (gr/dscf). With a PM_{10} potential to emit for the cooling tower of 0.39 lbs/hr and a per cell exhaust flow rate of 1,613,000 acfm, the resulting grain loading is approximately 3.5×10^{-6} gr/acf. Therefore, the cooling tower will continue to comply with this regulation.

J. Rule 420: Sulfur Content of Fuels

Rule 420 limits the sulfur content of any gaseous fuel to 50 grains per 100 cubic foot, calculated as H_2S. The sulfur content of the natural gas used by CPP will be well below the limit of this rule, and the total sulfur content of the treated digester gas proposed for this project will be limited to 1.0 grain per 100 cubic foot (17 ppmv). Therefore, the sulfur content of the blended gas used by the CPP gas turbines is expected to be well below the Rule 420 limit of 50 grains per 100 cubic foot.

K. Rule 801: New Source Performance Standards

Rule 801 incorporates the Federal New Source Performance Standards (NSPS) by reference and incorporation of the Federal NSPS regulations (40 CFR 60). The Federal NSPS for gas turbines (40 CFR 60, Subpart GG) currently applies to the gas turbines at the CPP. A new gas turbine NSPS was adopted by EPA that applies to gas turbines installed or modified after February 18, 2005 (40 CFR 60, Subpart KKKK). This new regulation has lower NOx and SOx emission limits than the older gas turbine NSPS. For NOx, the new NSPS emission limit is approximately 42 ppmvc as compared to the previous 75 ppmvc limit for the size of gas turbines at the CPP. For SOx, the new NSPS emission limit is approximately 41 ppmvc vs. 150 ppmvc for the old Subpart GG. In addition, the new NSPS has different calculation procedures for determining excess emissions.

Under the NSPS regulations, a modification to a subject piece of equipment occurs if there is a physical or operational change that results in an increase in the hourly potential to emit for either NOx or SOx. As shown previously in Table 2, there is an expected increase in the hourly SOx potential to emit. However, there is an exemption from the new NSPS requirements if the equipment modification consists solely of the use of an alternative fuel (see 40 CFR 60.14.e.4). Because there are no physical changes necessary at the CPP to use blended gas (natural gas/digester gas), the proposed modification to the PTOs for the CPP gas turbines appears to qualify for this exemption. As such, the proposed use of digester gas at CPP would not trigger the new gas turbine Subpart KKKK NSPS requirements.

L. California Environmental Quality Act (CEQA)

Under Rule 202 (Section 307), the Air Pollution Control Officer shall deny an Authority to Construct or Permit to Operate if the Air Pollution Control Officer finds that the project which is the subject of an application would not comply with CEQA. Because the CPP underwent review/approval by the CEC, the CEC was responsible for the CEQA review of the CPP. As a CEC-approved project, all subsequent CPP modifications go through the CEC amendment process. This CEC amendment process includes a review to confirm that a proposed project modification complies with applicable CEQA requirements. The applicant is in the process of preparing the petition to the CEC to amend the approval of the CPP to allow the proposed changes discussed in this permit application package. Therefore, the CEQA review of these proposed CPP modifications will be covered by the CEC amendment process. Normally under this process, the SMAQMD issues a preliminary and final determination of compliance (PDOC/FDOC) for a requested permit change. Once the FDOC is issued, the CEC Staff will finish their analysis and bring the amendment to the Commission for approval. Once the CEC approves the amendment the CEQA process is complete, and the FDOC acts like an authority to construct.

Attachment 1

SMAQMD Application Forms

Attachment 1A: Gas Turbine Unit 2

777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Sacramento Metropolitan
Air Quality Management District

(916) 874-4800
Fax (916)874-4899

FORM G100
APPLICATION FOR AUTHORITY TO CONSTRUCT AND/OR PERMIT TO OPERATE

A SEPARATE APPLICATION AND FORM(S) SPECIFIC TO THE PROCESS OR EQUIPMENT MUST BE COMPLETED FOR **EACH** PROCESS OR PIECE OF EQUIPMENT

A. Both pages of this application must be completed; an original signature (not a facsimile or copy) is required.
B. The appropriate permit fee must be submitted with the application (refer to the SMAQMD Rules or fee schedule).

1. Name of business or organization that is to receive the permit: Sacramento Municipal Utility District Financing Authority

Business type: ☐ Sole Proprietorship ☐ Limited Liability Company ☐ Partnership ☐ Corporation ☐ Wholly-owned Subsidiary ☐ Government X Other Joint Powers Authority

2. Employer Identification Number (E.I.N.): 68-0329429

3. Mailing address:

NUMBER	STREET	CITY	STATE	ZIP CODE	PHONE NO.
P.O. Box 15830		Sacramento	CA	95852	(916) 452-3211

4. Location Address (where the equipment will be operated, if different than above)

NUMBER	STREET	CITY	STATE	ZIP CODE	PHONE NO.
14295 Clay East Road		Herald	CA	95638	(209) 748-5177

5. Name of Facility that will Operate the Equipment (if different than above):

DBA: Wood Group

6. Description of equipment/process to be permitted: Existing Gas Turbine - PTO Modification

☐ Constructing/installing new equipment
Estimated startup date for new equipment: ____________________

☐ Initial permit for existing equipment
Date Operation First Commenced: ____________________

X Modification of existing permitted equipment or permit conditions
Estimated completion date for modification: Existing Unit Previous Permit No.: 16006 (Rev1)

☐ Change of Ownership
Change of ownership date: ____________________ Previous Permit No.: ____________________

7. Is this permit application being submitted in response to a Notice of Violation (NOV) or Notice to Correct (NTC) issued by the SMAQMD? ☐ Yes X No If Yes, NOV or NTC #: ____________________

DO NOT WRITE BELOW (SMAQMD USE ONLY)

DATE STAMP	PERMIT NUMBER	A/C FEE	A/C RECEIPT
	PREVIOUS P/O	P/O FEE	P/O RECEIPT

777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Sacramento Metropolitan
Air Quality Management District

(916) 874-4800
Fax (916) 874-4899

APPLICATION FOR AUTHORITY TO CONSTRUCT AND/OR PERMIT TO OPERATE

A SEPARATE APPLICATION AND FORM(S) SPECIFIC TO THE PROCESS
OR EQUIPMENT MUST BE COMPLETED FOR **EACH** PROCESS OR PIECE OF EQUIPMENT

A. Both pages of this application must be completed; an original signature (not a facsimile or copy) is required.
B. The appropriate permit fee must be submitted with the application (refer to the SMAQMD Rules or fee schedule).

8. All information submitted to obtain an Authority to Construct/Permit to Operate is considered public information as defined by section 6254.7 of the California Government Code unless specifically marked as trade secret by the applicant. Each document containing trade secrets must be separated from all non-privileged documents. Each document which is claimed to contain trade secrets must indicate each section or paragraph that contains trade secret information and must have attached a declaration stating with specificity the reason this document contains trade secret information. All emission data is subject to disclosure regardless of any claim of trade secret.

Acknowledgement [JRS] (Please initial) Trade secret documents are included with this application: ☐ Yes ☒ No

9. Pursuant to Section 42301.6(f) of the Health and Safety Code, I hereby certify that emission sources in this permit application:

(*Initial appropriate box*) [ ] **ARE** OR [JRS] **ARE NOT** within 1,000 feet of the outer boundary of a school

Pursuant to section 42301.9(a) of the Health and Safety Code, "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

10. Required information, analyses, plans and/or specifications needed to complete this application are being collected under authority granted by California Health & Safety Code (CH&SC) section 42303. In addition, CH&SC section 42303.5 states that *No person shall knowingly make any false statements in any application for a permit, or in any information, plans, or specifications submitted in conjunction with the application or at the request of the Air Pollution Control Officer.* Violations of the CH&SC may result in criminal or civil penalties, as specified in CH&SC sections 42400 through 42402.3. By signing below, I certify that all information is true and accurate and complete, to the best of my knowledge and ability.

Please be advised that constructing, installing, or operating air pollutant emitting equipment prior to receiving an Authority to Construct from the Air District is a violation of air pollution regulations and is subject to civil or criminal penalties prescribed in the California Health and Safety Code.

Signature of responsible officer, partner or proprietor of firm James R. Shetler

Printed Name: James Shetler Title: SFA Representative Date: 8/20/10

Phone number: (916) 732-6757 Fax number: (916) 732-6562 E-mail address: JSHETLE@SMUD.ORG

11. Contact person for information submitted with this application (if different from above):

Name: Stu Husband Title: Environmental Specialist

Phone number: (916) 732-6246 Fax number: (916) 732-6563 E-mail address: SHUSBAN@SMUD.ORG

12. Receipt of future rules and planning notices affecting your permit and facility; check one box:

☐ Please send e-mail notices to ______
X I will sign up myself at www.airquality.org/listserve/ to receive e-mailed notices.
☐ I want the District to mail notices to the address on this application.
☐ I am already subscribed.

FORM HRA100
HEALTH RISK ASSESSMENT INFORMATION

PURPOSE: The purpose of this form is to gather the basic information needed to run an air dispersion model and perform a health risk assessment for a simple emissions unit. Additional information may b e needed depending on type of process and potential risk to the public.

STACK/VENT EMISSIONS: Complete this section if pollutants are being released to the atmosphere via a stack or vent (e.g. roof vent).

Stack Height: 160 ft. above ground

Stack Inner Diameter: 222 in.

Exhaust Gas Flow Rate: 640,284 acfm

Exhaust Gas Temperature : 156 degrees F.

FUGITIVE EMISSIONS: Complete this section if pollutants are being released to the atmosphere without the benefit of a stack or vent (e.g. emissions from windows, eaves and doors, ponds, open tanks, and wind blown emissions from piles and fields).

Source Base Elevation: ______ ft. above groun d

Source Height:_______ ft. above ground

Source Width (East/West Dimension): _______ feet

Source Length (North/South Dimension): _______ feet

DRAWINGS REQUIRED: Drawings should be submitted on 8-1/2" X 11" sheets or larger. Drawings must clearly show the required information but do not need to be professionally drawn. All drawings should be drawn with north facing up and to scale.

Nearby Buildings:
Submit a drawing showing all buildings affecting the exhaust stack or point of release. The area of influence for a building is defined as the area within 5 times the lesser of the height or width of a building. For each building, the drawing must show length, width, and height of the building, and distance to exhaust stack or point of release.

Property Line:
Submit a drawing showing the exhaust stack in relation to the property line. The drawing must be drawn to scale, with north facing up, and must show the e ntire property.

Receptors:
Submit a drawing showing residential and commercial buildings surrounding the property. Indicate the distance from the stack/point of release to the residential/commercial buildings. 1,554 ft. to nearest residence and worker.

Attachment 1B: Gas Turbine Unit 3

777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Sacramento Metropolitan
Air Quality Management District

(916) 874-4800
Fax (916)874-4899

FORM G100
APPLICATION FOR AUTHORITY TO CONSTRUCT AND/OR PERMIT TO OPERATE

A SEPARATE APPLICATION AND FORM(S) SPECIFIC TO THE PROCESS
OR EQUIPMENT MUST BE COMPLETED FOR **EACH** PROCESS OR PIECE OF EQUIPMENT

A. Both pages of this application must be completed; an original signature (not a facsimile or copy) is required.
B. The appropriate permit fee must be submitted with the application (refer to the SMAQMD Rules or fee schedule).

1. Name of business or organization that is to receive the permit: Sacramento Municipal Utility District Financing Authority

Business type: ☐ Sole Proprietorship ☐ Limited Liability Company ☐ Partnership ☐ Corporation ☐ Wholly-owned Subsidiary ☐ Government X Other Joint Powers Authority

2. Employer Identification Number (E.I.N.): 68-0329429

3. Mailing address:

NUMBER	STREET	CITY	STATE	ZIP CODE	PHONE NO.
P.O. Box 15830		Sacramento	CA	95852	(916) 452-3211

4. Location Address (where the equipment will be operated, if different than above)

NUMBER	STREET	CITY	STATE	ZIP CODE	PHONE NO.
14295 Clay East Road		Herald	CA	95638	(209) 748-5177

5. Name of Facility that will Operate the Equipment (if different than above):

DBA: Wood Group

6. Description of equipment/process to be permitted: Existing Gas Turbine - PTO Modification

☐ Constructing/installing new equipment
Estimated startup date for new equipment: ____________

☐ Initial permit for existing equipment
Date Operation First Commenced: ____________

X Modification of existing permitted equipment or permit conditions
Estimated completion date for modification: Existing Unit Previous Permit No.: 16007 (Rev1)

☐ Change of Ownership
Change of ownership date: ____________ Previous Permit No.: ____________

7. Is this permit application being submitted in response to a Notice of Violation (NOV) or Notice to Correct (NTC) issued by the SMAQMD? ☐ Yes X No If Yes, NOV or NTC #: ____________

DO NOT WRITE BELOW (SMAQMD USE ONLY)

DATE STAMP	PERMIT NUMBER	A/C FEE	A/C RECEIPT
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APPLICATION FOR AUTHORITY TO CONSTRUCT AND/OR PERMIT TO OPERATE

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   Acknowledgement [JRS] (Please initial) Trade secret documents are included with this application: ☐ Yes ☒ No

9. Pursuant to Section 42301.6(f) of the Health and Safety Code, I hereby certify that emission sources in this permit application:

   (*Initial appropriate box*) [ ] **ARE** OR [JRS] **ARE NOT** within 1,000 feet of the outer boundary of a school

   Pursuant to section 42301.9(a) of the Health and Safety Code, "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

10. Required information, analyses, plans and/or specifications needed to complete this application are being collected under authority granted by California Health & Safety Code (CH&SC) section 42303. In addition, CH&SC section 42303.5 states that *No person shall knowingly make any false statements in any application for a permit, or in any information, plans, or specifications submitted in conjunction with the application or at the request of the Air Pollution Control Officer.* Violations of the CH&SC may result in criminal or civil penalties, as specified in CH&SC sections 42400 through 42402.3. By signing below, I certify that all information is true and accurate and complete, to the best of my knowledge and ability.

    Please be advised that constructing, installing, or operating air pollutant emitting equipment prior to receiving an Authority to Construct from the Air District is a violation of air pollution regulations and is subject to civil or criminal penalties prescribed in the California Health and Safety Code.

    Signature of responsible officer, partner or proprietor of firm: James R Shetler

    Printed Name: James Shetler Title: SFA Representative Date: 8/26/10

    Phone number: (916) 732-6757 Fax number: (916) 732-6562 E-mail address: JSHETLE@SMUD.ORG

11. Contact person for information submitted with this application (if different from above):

    Name: Stu Husband Title: Environmental Specialist

    Phone number: (916) 732-6246 Fax number: (916) 732-6563 E-mail address: SHUSBAN@SMUD.ORG

12. Receipt of future rules and planning notices affecting your permit and facility; check one box:

    ☐ Please send e-mail notices to ______
    X I will sign up myself at www.airquality.org/listserve/ to receive e-mailed notices.
    ☐ I want the District to mail notices to the address on this application.
    ☐ I am already subscribed.

FORM HRA100
HEALTH RISK ASSESSMENT INFORMATION

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Stack Height: 160 ft. above ground

Stack Inner Diameter: 222 in.

Exhaust Gas Flow Rate: 640,284 acfm

Exhaust Gas Temperature : 156 degrees F.

FUGITIVE EMISSIONS: Complete this sect ion if pollutants are being released to the atmosphere without the benefit of a stack or vent (e.g. emissions from windows, eaves and doors, ponds, open tanks, and wind blown emissions from piles and fields).

Source Base Elevation: ______ ft. above groun d

Source Height:_______ ft. above ground

Source Width (East/West Dimension): _______ feet

Source Length (North/South Dimension): _______ feet

DRAWINGS REQUIRED: Drawings should be submitted on 8-1/2" X 11" sheets or larger. Drawings must clearly show the required information but do not need to be professionally drawn. All drawings should be drawn with north facing up and to scale.

Nearby Buildings:
Submit a drawing showing all buildings affecting the exhaust stack or point of release. The area of influence for a building is defined as the area within 5 times the lesser of the height or width of a building. For each building, the drawing must show length, width, and height of the building, and distance to exhaust stack or point of release.

Property Line:
Submit a drawing showing the exhaust stack in relation to the property line. The drawing must be drawn to scale, with north facing up, and must show the e ntire property.

Receptors:
Submit a drawing showing residential and commercial buildings surrounding the property. Indicate the distance from the stack/point of release to the residential/commercial buildings. 1,554 ft. to nearest residence and worker.

Attachment 1C: Cooling Tower

777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

**Sacramento Metropolitan
Air Quality Management District**

(916) 874-4800
Fax (916)874-4899

FORM G100
APPLICATION FOR AUTHORITY TO CONSTRUCT AND/OR PERMIT TO OPERATE

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B. The appropriate permit fee must be submitted with the application (refer to the SMAQMD Rules or fee schedule).

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that is to receive the permit: Sacramento Municipal Utility District Financing Authority

Business type: ☐ Sole Proprietorship ☐ Limited Liability Company ☐ Partnership
☐ Corporation ☐ Wholly-owned Subsidiary ☐ Government X Other Joint Powers Authority

2. Employer Identification Number (E.I.N.): 68-0329429

3. Mailing address:

NUMBER	STREET	CITY	STATE	ZIP CODE	PHONE NO.
P.O. Box 15830		Sacramento	CA	95852	(916) 452-3211

4. Location Address (where the equipment will be operated, if different than above)

NUMBER	STREET	CITY	STATE	ZIP CODE	PHONE NO.
14295 Clay East Road		Herald	CA	95638	(209) 748-5177

5. Name of Facility that will Operate the Equipment (if different than above):

DBA: Wood Group

6. Description of equipment/process to be permitted: Existing Cooling Tower - PTO Modification

☐ Constructing/installing new equipment
Estimated startup date for new equipment: ____________

☐ Initial permit for existing equipment
Date Operation First Commenced: ____________

X Modification of existing permitted equipment or permit conditions
Estimated completion date for modification: Existing Unit Previous Permit No.: 20185

☐ Change of Ownership
Change of ownership date: ____________ Previous Permit No.: ____________

7. Is this permit application being submitted in response to a Notice of Violation (NOV) or Notice to Correct (NTC) issued by the SMAQMD? ☐ Yes X No If Yes, NOV or NTC #: ____________

DO NOT WRITE BELOW (SMAQMD USE ONLY)

DATE STAMP	PERMIT NUMBER	A/C FEE	A/C RECEIPT
	PREVIOUS P/O	P/O FEE	P/O RECEIPT

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Sacramento Metropolitan
Air Quality Management District

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APPLICATION FOR AUTHORITY TO CONSTRUCT AND/OR PERMIT TO OPERATE

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Acknowledgement [JA] (Please initial) Trade secret documents are included with this application: ☐ Yes ☒ No

9. Pursuant to Section 42301.6(f) of the Health and Safety Code, I hereby certify that emission sources in this permit application:

(*Initial appropriate box*) [ ] **ARE** OR [JA] **ARE NOT** within 1,000 feet of the outer boundary of a school

Pursuant to section 42301.9(a) of the Health and Safety Code, "School" means any public or private school used for purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in private homes.

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Please be advised that constructing, installing, or operating air pollutant emitting equipment prior to receiving an Authority to Construct from the Air District is a violation of air pollution regulations and is subject to civil or criminal penalties prescribed in the California Health and Safety Code.

Signature of responsible officer, partner or proprietor of firm James R. Shetler

Printed Name: James Shetler Title: SFA Representative Date: 8/30/16

Phone number: (916) 732-6757 Fax number: (916) 732-6562 E-mail address: JSHETLE@SMUD.ORG

11. Contact person for information submitted with this application (if different from above):

Name: Stu Husband Title: Environmental Specialist

Phone number: (916) 732-6246 Fax number: (916) 732-6563 E-mail address: SHUSBAN@SMUD.ORG

12. Receipt of future rules and planning notices affecting your permit and facility; check one box:

☐ Please send e-mail notices to ______

X I will sign up myself at www.airquality.org/listserve/ to receive e-mailed notices.

☐ I want the District to mail notices to the address on this application.

☐ I am already subscribed.

Attachment 1D: Title V Application Forms

777 12th Street 3rd Floor
Sacramento, CA 95814-1908

Sacramento Metropolitan
Air Quality Management District

(916) 874-4800
Fax: (916) 874-4899

TITLE V PERMIT APPLICATION

STATIONARY SOURCE SUMMARY

I. FACILITY IDENTIFICATION

1. Facility Name: Cosumnes Power Plant
2. Four digit SIC Code: 4911 EPA Plant ID: ORIS Code 55970
3. Parent Company: Sacramento Municipal Utility District Financing Authority
(if different from Facility name)
4. Mailing Address: P.O. Box 15830, Sacramento, CA 95852
5. Street Address or Source Location: 14295 Clay East Road, Herald, CA 95638
6. Is source located within 50 miles of the state line?: [ ] Yes [X] No
7. Is source located within 1000 feet of a school?: [ ] Yes [X] No
8. Type of Organization: [ ] Corporation [ ] Sole Ownership [ ] Government
[ ] Partnership [ ] Utility Company [X] Other - Joint Power Authority
9. Legal Owner's Name: Sacramento Municipal Utility District Financing Authority
10. Owner's Agent Name (if any): N/A
11. Responsible Official: James Shetler Telephone No.: (916) 732-6757
Title: SFA Representative
12. Plant Site Manager/Contact: Kurt Hook Telephone No.: (209) 748-5179
Title: Facility Manager
13. Type of facility: Power Plant
14. General description of processes/products: Gas turbine combined cycle power plant.
15. Is a Federal Risk Management Plan required [pursuant to Section 112(r)]? [X] Yes [ ] No
(If yes, attach verification that the Risk Management Plan is registered with appropriate agency.)

Sacramento Metropolitan Air Quality Management District

STATIONARY SOURCE SUMMARY

II. TYPE OF PERMIT ACTION

16. Indicate type of permit action being requested.

	CURRENT PERMIT (permit number)	EXPIRATION (date)
☐ Initial Title V Application		
☐ Permit Renewal		
X Significant Permit Modification	TV2006-19-01B	March 10, 2013
☐ Minor Permit Modification		
☐ Administrative Amendment		

III. DESCRIPTION OF PERMIT ACTION

17. Does the permit action requested involve: [ ] Temporary Source [ ] Voluntary Emissions Caps [X] Acid Rain Source [ ] Alternative Operating Scenarios [ ] Source Subject to MACT Requirements [Section 112]

18. Is source operating under Compliance Schedule? [ ] Yes [X] No

18. For permit modifications, provide a general description of the proposed permit modification:

PTO modifications for existing equipment. See attached permit application report.

➢ SMAQMD USE ONLY ≺

APPLICATION AND PERMIT NUMBER	DATE SENT TO EPA FOR REVIEW	DATE EPA COMMENTS RECEIVED
DATE APPLICATION DEEMED COMPLETE	EVALUATION FEE	RECEIPT NUMBER
DATE PERMIT ISSUED	MAP PAGE	ZONE

Sacramento Metropolitan Air Quality Management District

CERTIFICATION REPORT

I. FACILITY INFORMATION

1. Company Name: Sacramento Municipal Utility District Financing Authority
2. Facility Name (if different than Company Name): Cosumnes Power Plant
3. Mailing Address: P.O. Box 15830, Sacramento, CA 95852
4. Street Address or Source Location: 14295 Clay East Road, Herald, CA 95638
5. Type of Organization: [ ] Corporation [ ] Sole Ownership [ ] Utility Company [ ] Government [ ] Partnership [X] Other - Joint Powers Authority
6. Facility Permit Number: Title V Permit TV2006-19-01B

II. GENERAL INFORMATION

7. Reporting period (specify dates): Compliance status at time of filing, Title V Permit Modification.
8. Due date for submittal of report: Reports are filed annually.
9. Type of submittal: [ ] **Monitoring Report** (complete Section III)
   [X] **Compliance Certification** (complete Section IV)

III. MONITORING REPORT INFORMATION

10. Were deviations from monitoring requirements encountered during the reporting period?
    [ ] No [ ] Yes (If Yes, complete the **Title V DEVIATION REPORT** form)

IV. COMPLIANCE CERTIFICATION

11. Was source in compliance during the reporting period specified in Section II of this Form and is source currently in compliance with all applicable federal requirements and permit conditions.
    [ ] No [X] Yes (If No, see requirements in SMAQMD Rule 207 Section 413.2)

V. CERTIFICATION

I certify based on information and belief formed after reasonable inquiry that the statements and information in this document and supplements are true, accurate and complete.

James R. Shetler (signature) 8/20/10

Signature of Responsible Official Date

James Shetler

Print Name of Responsible Official

SFA Representative

Title of Responsible Official and Company Name

Telephone Number of Responsible Official: (916) 732 - 6757

777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Sacramento Metropolitan
Air Quality Management District

(916) 874-4800
Fax: (916) 874-4899

APPLICATION TO MODIFY TITLE V PERMIT

I. FACILITY IDENTIFICATION

1. Facility Name: Cosumnes Power Plant

2. Parent Company: Sacramento Municipal Utility District Financing Authority
(if different from Facility name)

3. Mailing Address: P.O. Box 15830, Sacramento, CA 95852

4. Facility Location: 14295 Clay East Road, Herald, CA 95638

5. Type of Organization:

[ ] Corporation [ ] Sole Ownership [ ] Government [ ] Partnership [ ] Utility Company [X] Other-Joint Powers Authority

6. Responsible Official: James Shetler Phone No.: (916) 732-6757

Title: SFA Representative

7. Plant Site Contact: Kurt Hook Phone No.: (209) 748-5179

Title: Facility Manager

II. TYPE OF PERMIT ACTION

	Current Permit Number	Permit Expiration Date
X Significant Permit Modification	TV2006-19-01B	March 10, 2013
☐ Minor Permit Modification		
☐ Administrative Amendment		

777 12th Street, 3rd Floor
Sacramento, CA 95814-1908

Sacramento Metropolitan
Air Quality Management District

(916) 874-4800
Fax: (916) 874-4899

APPLICATION TO MODIFY TITLE V PERMIT

III. DESCRIPTION OF PERMIT ACTION

1. Does the permit action involve?: [ ] Temporary Source [ ] Voluntary Emissions Caps
   [X] Acid Rain Source [ ] Alternative Operating Scenarios
   [ ] MACT Requirements

2. Provide a general description of the proposed permit modification. Reference any Authority to Construct that is requested to be incorporated. Attach any additional information that is relevant to the request.

   PTO Modifications for existing equipment. See attached permit application report.

Under penalty of perjury, I certify that based on information and belief formed after reasonable inquiry, the answers, statements and information contained in this application (and supplemental attachments thereto) are true, accurate and complete. This application consists of the application forms provided by the SMAQMD, information required pursuant to the List and Criteria and any supplemental information and/or attachments submitted with the application. I also certify that I am the responsible official as defined in SMAQMD Rule 207.

James R Shetler
Signature of Responsible Official

8/20/10
Date

James Shetler
Print Name of Responsible Official

Attachment 2

Blended Gas Mixture Analyses

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
Natural Gas and Digester Gas Properties (Natural gas)

Natural gas HHV (Btu/scf) =	1019
Digester gas HHV (Btu/scf) [1] =	617.55

Natural Gas

Component	Component	Volume Percent [4]	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	95.9114%	16.043	95.91	383.65	0.00	0.00	0.00	0.918	1013	912.93	23,879	21,520	15.39	1.1096
C2H6	**Ethane**	2.3068%	30.070	4.61	13.84	0.00	0.00	0.00	0.041	1792	1640.42	22,320	20,432	0.69	1.0924
C3H8	**Propane**	0.1556%	44.097	0.47	1.24	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.07	1.0861
N-C4H10	**N-Butane**	0.0222%	58.125	0.09	0.22	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0171%	58.125	0.07	0.17	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0020%	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0031%	72.152	0.02	0.04	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0074%	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0000%	31.998	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
N2		0.7434%	28.014	0.00	0.00	1.49	0.00	0.00	0.012					0.21	
CO2		0.8307%	44.009	0.83	0.00	0.00	1.66	0.00	0.022					0.37	
H2		0.0000%	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0000%	18.015	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
Dry Basis															
Total		100.0%		102.05	399.29	1.49	1.66	0.00	504.49	1018.83	918.88	22,982	20,728	16.76	1.1088
		Mol Wt		12.011	1.008	14.007	15.999	32.064							
gms/100 moles				1225.73	402.48	20.83	26.58	0.01	1675.64						
		Wt %		73.15%	24.02%	1.24%	1.59%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = <u>**8649.981**</u>

1. Black & Veatch Corporation, Digester Gas Use for the Cosumnes Power Plant, January 2009, Appendix A, Gas Sampling Test Reports

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
Case 1: One GT 50% Load

Gas turbine 50% load heat input per unit HHV (MMBtu/hr) [1] =	1015.7
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	15100
Total blended gas flow rate (scfm) =	17600

Component	Component	Volume Percent	Natural Gas Flow rate (scfm)	Digester Gas Flow Rate (scfm)	Blended Gas Flow Rate (scfm)	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	90.9641%	14482.75	1526.95	16009.70	16.043	90.96	363.86	0.00	0.00	0.00	0.804	1013	912.93	23,879	21,520	14.59	1.1096
C2H6	**Ethane**	1.9793%	348.33	0.02	348.35	30.070	3.96	11.88	0.00	0.00	0.00	0.033	1792	1640.42	22,320	20,432	0.60	1.0924
C3H8	**Propane**	0.1338%	23.50	0.05	23.54	44.097	0.40	1.07	0.00	0.00	0.00	0.003	2590	2384.70	21,661	19,944	0.06	1.0861
N-C4H10	**N-Butane**	0.0193%	3.35	0.04	3.39	58.125	0.08	0.19	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0150%	2.58	0.05	2.63	58.125	0.06	0.15	0.00	0.00	0.00	0.000	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0018%	0.30	0.01	0.32	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0027%	0.47	0.01	0.48	72.152	0.01	0.03	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0069%	1.12	0.10	1.22	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0180%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.04	0.00	0.000					0.01	
N2		0.7241%	112.25	15.19	127.44	28.014	0.00	0.00	1.45	0.00	0.00	0.011					0.20	
CO2		6.0816%	125.44	944.93	1070.37	44.009	6.08	0.00	0.00	12.16	0.00	0.147					2.68	
H2		0.0014%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0514%	0.00	9.05	9.05	18.015	0.00	0.10	0.00	0.05	0.00	0.001					0.01	
Dry Basis																		
Total		99.9%	15100	2500	17600		101.61	377.40	1.45	12.25	0.00	492.71	962.56	868.07	20,033	18,067	18.16	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1220.41	380.42	20.29	196.00	0.02	1817.14						
					Wt %		67.16%	20.94%	1.12%	10.79%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = <u>**8693.381**</u>

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
Case 2: One Gas Turbine at Max Load

Gas turbine maximum heat input per unit HHV (MMBtu/hr) [1] =	1866
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	29010
Total blended gas flow rate (scfm) =	31510

Component	Component	Volume Percent	Natural Gas Flow rate (scfm)	Digester Gas Flow Rate (scfm)	Blended Gas Flow Rate (scfm)	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	93.1480%	27823.79	1526.95	29350.74	16.043	93.15	372.59	0.00	0.00	0.00	0.852	1013	912.93	23,879	21,520	14.94	1.1096
C2H6	**Ethane**	2.1239%	669.20	0.02	669.22	30.070	4.25	12.74	0.00	0.00	0.00	0.036	1792	1640.42	22,320	20,432	0.64	1.0924
C3H8	**Propane**	0.1434%	45.14	0.05	45.19	44.097	0.43	1.15	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.06	1.0861
N-C4H10	**N-Butane**	0.0206%	6.44	0.04	6.48	58.125	0.08	0.21	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0159%	4.96	0.05	5.01	58.125	0.06	0.16	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0019%	0.58	0.01	0.59	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0029%	0.90	0.01	0.91	72.152	0.01	0.03	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0071%	2.15	0.10	2.25	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0101%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.02	0.00	0.000					0.00	
N2		0.7326%	215.66	15.19	230.85	28.014	0.00	0.00	1.47	0.00	0.00	0.012					0.21	
CO2		3.7636%	240.99	944.93	1185.92	44.009	3.76	0.00	0.00	7.53	0.00	0.094					1.66	
H2		0.0008%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0287%	0.00	9.05	9.05	18.015	0.00	0.06	0.00	0.03	0.00	0.000					0.01	
Dry Basis																		
Total		100.0%	29010	2500	31510		101.80	387.06	1.47	7.58	0.00	497.91	987.41	890.51	21,282	19,193	17.54	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1222.76	390.16	20.52	121.21	0.02	1754.67						
					Wt %		69.69%	22.24%	1.17%	6.91%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = 8671.464

Case 3: Both Gas Turbine at 50% load

Gas turbine 50% load heat input per unit HHV (MMBtu/hr) [1] =	1015.7
Total heat input HHV (MMBtu/hr) =	2031
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	31716
Total blended gas flow rate (scfm) =	34216

Component	**Component**	**Volume Percent**	**Natural Gas Flow rate (scfm)**	**Digester Gas Flow Rate (scfm)**	**Blended Gas Flow Rate (scfm)**	**MW**	**Moles C**	**Moles H**	**Moles N**	**Moles O**	**Moles S**	**Weight Percent**	**Btu/ft3 (HHV)**	**Btu/ft3 (LHV)**	**Btu/lb (HHV)**	**Btu/lb (LHV)**	**Average MW**	**HHV/LHV**
CH4	**Methane**	93.3665%	30418.88	1526.95	31945.83	16.043	93.37	373.47	0.00	0.00	0.00	0.857	1013	912.93	23,879	21,520	14.98	1.1096
C2H6	**Ethane**	2.1383%	731.62	0.02	731.64	30.070	4.28	12.83	0.00	0.00	0.00	0.037	1792	1640.42	22,320	20,432	0.64	1.0924
C3H8	**Propane**	0.1444%	49.35	0.05	49.40	44.097	0.43	1.15	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.06	1.0861
N-C4H10	**N-Butane**	0.0207%	7.04	0.04	7.08	58.125	0.08	0.21	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0160%	5.42	0.05	5.47	58.125	0.06	0.16	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0019%	0.63	0.01	0.65	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0029%	0.98	0.01	1.00	72.152	0.01	0.03	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0072%	2.35	0.10	2.45	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0093%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.02	0.00	0.000					0.00	
N2		0.7335%	235.77	15.19	250.96	28.014	0.00	0.00	1.47	0.00	0.00	0.012					0.21	
CO2		3.5317%	263.46	944.93	1208.39	44.009	3.53	0.00	0.00	7.06	0.00	0.089					1.55	
H2		0.0007%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0264%	0.00	9.05	9.05	18.015	0.00	0.05	0.00	0.03	0.00	0.000					0.00	
Dry Basis																		
Total		100.0%	31716	2500	34216		101.82	388.03	1.47	7.11	0.00	498.43	989.89	892.75	21,412	19,310	17.48	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1223.00	391.13	20.55	113.73	0.02	1748.42						
					Wt %		69.95%	22.37%	1.18%	6.50%	0.00%							

Molecular Weights	
C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = 8669.344

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
Case 4: One Gas Turbine at 50% load and One Gas Turbine at Max Load

Gas turbine 50% load heat input per unit HHV (MMBtu/hr) [1] =	1015.7
Gas turbine maximum heat input per unit HHV (MMBtu/hr) [2] =	1866
Total heat input HHV (MMBtu/hr) =	2882
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	45625
Total blended gas flow rate (scfm) =	48125

Component	Component	Volume Percent	Natural Gas Flow rate (scfm)	Digester Gas Flow Rate (scfm)	Blended Gas Flow Rate (scfm)	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	94.1021%	43759.93	1526.95	45286.88	16.043	94.10	376.41	0.00	0.00	0.00	0.874	1013	912.93	23,879	21,520	15.10	1.1096
C2H6	**Ethane**	2.1870%	1052.49	0.02	1052.51	30.070	4.37	13.12	0.00	0.00	0.00	0.038	1792	1640.42	22,320	20,432	0.66	1.0924
C3H8	**Propane**	0.1476%	70.99	0.05	71.04	44.097	0.44	1.18	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.07	1.0861
N-C4H10	**N-Butane**	0.0211%	10.13	0.04	10.17	58.125	0.08	0.21	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0163%	7.80	0.05	7.85	58.125	0.07	0.16	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0019%	0.91	0.01	0.93	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0030%	1.41	0.01	1.43	72.152	0.01	0.04	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0072%	3.38	0.10	3.48	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0066%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.01	0.00	0.000					0.00	
N2		0.7363%	339.18	15.19	354.37	28.014	0.00	0.00	1.47	0.00	0.00	0.012					0.21	
CO2		2.7510%	379.01	944.93	1323.94	44.009	2.75	0.00	0.00	5.50	0.00	0.070					1.21	
H2		0.0005%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0188%	0.00	9.05	9.05	18.015	0.00	0.04	0.00	0.02	0.00	0.000					0.00	
Dry Basis																		
Total		100.0%	45625	2500	48125		101.89	391.28	1.47	5.53	0.00	500.18	998.26	900.30	21,855	19,711	17.27	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1223.79	394.41	20.63	88.54	0.02	1727.38						
					Wt %		70.85%	22.83%	1.19%	5.13%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = <u>**8662.303**</u>

Blended Fuel Gas Component Fuel Analysis Worksheet - CPP
Case 5: Both Gas Turbine at Baseload

Gas turbine annual average heat input for two units HHV (MMBtu/hr) [1] =	3577
Digester gas flow rate (scfm) =	2500
Natural gas flow rate (scfm) =	56993
Total blended gas flow rate (scfm) =	59493

Component	Component	Volume Percent	Natural Gas Flow rate (scfm)	Digester Gas Flow Rate (scfm)	Blended Gas Flow Rate (scfm)	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/ft3 (HHV)	Btu/ft3 (LHV)	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	**Methane**	94.4478%	54662.77	1526.95	56189.72	16.043	94.45	377.79	0.00	0.00	0.00	0.882	1013	912.93	23,879	21,520	15.15	1.1096
C2H6	**Ethane**	2.2099%	1314.71	0.02	1314.74	30.070	4.42	13.26	0.00	0.00	0.00	0.039	1792	1640.42	22,320	20,432	0.66	1.0924
C3H8	**Propane**	0.1491%	88.68	0.05	88.73	44.097	0.45	1.19	0.00	0.00	0.00	0.004	2590	2384.70	21,661	19,944	0.07	1.0861
N-C4H10	**N-Butane**	0.0213%	12.65	0.04	12.69	58.125	0.09	0.21	0.00	0.00	0.00	0.001	3370	3112.52	21,308	19,680	0.01	1.0827
iso-C4H10	**Iso-Butane**	0.0165%	9.75	0.05	9.79	58.125	0.07	0.16	0.00	0.00	0.00	0.001	3363	3105.44	21,257	19,629	0.01	1.0829
N-C5H12	**N-Pentane**	0.0019%	1.14	0.01	1.15	72.152	0.01	0.02	0.00	0.00	0.00	0.000	4016	3716.29	21,091	19,517	0.00	1.0806
iso-C5H12	**Iso-Pentane**	0.0030%	1.77	0.01	1.78	72.152	0.01	0.04	0.00	0.00	0.00	0.000	4008	3708.33	21,052	19,478	0.00	1.0808
C6H14	**Hexane**	0.0073%	4.22	0.10	4.32	86.179	0.04	0.10	0.00	0.00	0.00	0.000	4762	4412.47	20,940	19,403	0.01	1.0792
O2		0.0053%	0.00	3.17	3.17	31.998	0.00	0.00	0.00	0.01	0.00	0.000					0.00	
N2		0.7377%	423.69	15.19	438.88	28.014	0.00	0.00	1.48	0.00	0.00	0.012					0.21	
CO2		2.3841%	473.44	944.93	1418.37	44.009	2.38	0.00	0.00	4.77	0.00	0.061					1.05	
H2		0.0004%	0.00	0.24	0.24	2.016	0.00	0.00	0.00	0.00	0.00	0.000					0.00	
H2O		0.0152%	0.00	9.05	9.05	18.015	0.00	0.03	0.00	0.02	0.00	0.000					0.00	
Dry Basis																		
Total		100.0%	56993	2500	59493		101.92	392.81	1.48	4.79	0.00	501.00	1002.19	903.85	22,068	19,902	17.17	1.1088
					Mol Wt		12.011	1.008	14.007	15.999	32.064							
					gms/100 moles		1224.16	395.96	20.67	76.70	0.02	1717.50						
					Wt %		71.28%	23.05%	1.20%	4.47%	0.00%							

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) = **8659.044**

Attachment 3

NOx, CO, and ROC Compliance Margins
CPP Gas Turbines

Table 3-1 Hourly Emissions Compliance Margins CPP Gas Turbines						
	Permit limit [1] (lb/hr)	2010 [2]	2009 [3]	2008 [4]	2007 [4]	2006 [4]
	UNIT 2					
CO	16.46	77%	81%	80%	87%	77%
NOx	13.51	37%	40%	32%	21%	16%
ROC	3.30	87%	82%	83%	90%	74%
ROC	0.0018 lbs/MMBtu	86%	81%	81%	88%	72%
	UNIT 3					
CO	16.46	78%	83%	81%	89%	83%
NOx	13.51	35%	41%	39%	23%	30%
ROC	3.30	87%	72%	92%	94%	75%
ROC	0.0018 lbs/MMBtu	86%	70%	91%	94%	73%

Notes:

1. Hourly emission limits based on SMAQMD Permit to Operate (PTO), re-issued 5/6/2010, Condition 9.
2. Hourly compliance margins for CO and NOx are calculated based on hourly CEMS data. Hourly compliance margins for ROC are calculated based on 2010 source test results.
3. Hourly compliance margins for CO and NOx are calculated based on hourly CEMS data. Hourly compliance margins for ROC are calculated based on 2009 source test results.
4. Hourly compliance margins for all pollutants are calculated based on source test results.

Table 3-2 Daily Emissions Compliance Margins											
	Permit limit [1] (lbs/day)	2010 [2]	2009 [3]	2008 [3]	Permit limit [1] (lbs/day)	2010 [2]	2009 [3]	2008 [3]	Permit limit [1] (lbs/day)	2009 [3]	2008 [3]
	UNIT 2				UNIT 3				Facility		
CO	3,051.7	97%	97%	96%	3,051.7	97%	97%	97%	6,103.3	97%	97%
NOx	523.7	61%	62%	61%	523.7	61%	62%	65%	1,047.4	67%	65%
ROC	117.3	--	43%	41%	117.3	--	43%	47%	234.6	51%	48%

Notes:

1. Daily emission limits based on SMAQMD Permit to Operate (PTO) for Cosumnes Power Plant, re-issued 5/6/2010, Condition 10.
2. Daily compliance margins for CO and NOx are calculated based on hourly CEMS emissions data from 1/1/2010 to 3/31/2010.
3. Daily compliance margins are calculated based on daily emission report data.

Table 3-3
Facility-Wide Quarterly Emissions Compliance Margins

	2009 [2]				2008 [3]			
	1st QT	2nd QT	3rd QT	4th QT	1st QT	2nd QT	3rd QT	4th QT
CO	89%	90%	91%	89%	88%	90%	91%	88%
NOx	48%	60%	43%	50%	43%	48%	47%	49%
ROC	27%	44%	18%	29%	24%	27%	23%	29%

Notes:

1. Facility quarterly emissions include Units 2 & 3 and cooling tower.
2. Compliance margin calculations based on quarterly emission limits in SMAQMD Permit to Operate (PTO) for Cosumnes Power Plant, re-issued 5/6/2010, and quarterly facility emissions reported in 2009 4th Quarter Compliance Report for CPP.
3. Compliance margin calculations based on quarterly emission limits in SMAQMD Permit to Operate (PTO) for Cosumnes Power Plant, re-issued 5/6/2010, and quarterly facility emissions reported in 2008 4th Quarter Compliance Report for CPP.

Table 3-4
Facility-Wide Annual Facility Emissions Compliance Margins

	Permit limit [1,2] (lbs/year)	2009 [3]	2008 [4]
CO	595,505	90%	89%
NOx	251,194	50%	47%
ROC	59,986	30%	26%

Notes:

1. Facility annual emissions include Units 2 & 3.
2. Annual emission limits based on SMAQMD Permit to Operate (PTO) for Cosumnes Power Plant, re-issued 5/6/2010, Condition 11.
3. Compliance margin calculations based on annual facility emissions reported in 2009 4th Quarter Compliance Report for CPP.
4. Compliance margin calculations based on annual facility emissions reported in 2008 4th Quarter Compliance Report for CPP.

Attachment 4

Cooling Tower PM_{10} Emission Calculations

Calculation of PM, PM_{10}, and $PM_{2.5}$ Emissions for the CPP Cooling Tower[1]

Wet cooling towers like the CPP cooling tower cool water by evaporating a portion of the water through contact with the air. The nature of the contact is such that water droplets are entrained in the air and are carried out of the cooling tower. The entrained droplets are called "drift." Modern cooling towers have high efficiency drift eliminators which recover much of the entrained water. The high-efficiency drift eliminator installed on the CPP cooling tower is a Marley Model TU12 which reduces drift to less than 0.0005% of circulated cooling tower water.

The water that is entrained contains dissolved solids. When a water droplet that contains solids evaporates, the dissolved solids form a single particle, which remains suspended in the air. The volume of a droplet can be calculated if its diameter is known. The mass of water in the droplet can be calculated from the volume. The mass of solids in the droplet (and the resulting particle) can be calculated from the mass of the water droplet and the concentration of solids in the water. The volume of the particle can be calculated if the density of the solid is known. The diameter of a spherical particle can be calculated from the particle volume. The size of the final aerosol particle depends on the volume fraction of solid material and the droplet diameter as follows:

$$D_s = D_d \times (F_v)^{1/3}$$

Where:

D_s = diameter of solid particle
D_d = diameter of liquid droplet
F_v = volume fraction of solid material

This equation can be converted to calculate the resulting particle diameter for a cooling tower by accounting for the density of the particle:

$$D_s = D_d \times (\rho_d/\rho_s \times TDS/1{,}000{,}000)^{1/3}$$

Where:

D_s = diameter of solid particle, microns
D_d = diameter of liquid droplet, microns
ρ_d = density of droplet = 1 g/cm^3
ρ_s = density of solid particle = 2.2 g/cm^3 for sodium chloride
TDS = total dissolved solids, ppmw

---

1 *This approach for calculating particulate emissions from wet cooling towers is based an identical calculation approach discussed in the following reference documents:*

- *Calculating Realistic PM_{10} Emissions from Cooling Towers, Joel Reisman/Gordon Frisbie, Graystone Environmental, Abstract No. 216, Session No. AM-1b.*
- *Atmospheric Emissions From Evaporative Cooling Towers, Cooling Technology Institute, Wayne Micheletti, Paper Number TP05-05, February 28, 2005.*
- *Victorville 2 Hybrid Power Project (07-AFC-01), CEC Staff Data Request Numbers 1-9, July 23, 2007.*

The above equation predicts the physical diameter of a particle formed from a cooling tower droplet. This equation assumes that a single particle will be formed when a droplet evaporates, because there is no evidence that multiple particles will be formed.

The term "aerodynamic diameter" has been developed by aerosol physicists in order to provide a simple means of categorizing the sizes of particles having different shapes and densities with a single dimension. The aerodynamic diameter is the diameter of a spherical particle having a density of 1 gm/cm^3 that has the same inertial properties
(i.e., terminal settling velocity in the gas as the particle of interest). The PM_{10} and $PM_{2.5}$ standards refer to aerodynamic diameter.

Therefore, in order to calculate PM_{10} and $PM_{2.5}$ emissions, the aerodynamic diameter of the cooling tower particles must be calculated as follows:[2]

$$D_a = D_s \times (\rho_s)^{0.5}$$

Where:
D_a = aerodynamic diameter, microns
D_s = diameter of solid particle, microns
ρ_s = density of solid particle = 2.2 g/cm^3 for sodium chloride

The following table represents the predicted mass distribution of drift droplet size for cooling tower drift dispersed from a Marley Model TU12 drift eliminator such as the one installed on the CPP cooling tower. This table was provided by the cooling tower vendor (see copy of vendor information provided with this attachment).

Table 4-1
Predicted Drift Droplet Size Distribution

Mass in Droplets (%)		Droplet Size (Microns)
0.2	Larger Than	525
1.0	Larger Than	375
5.0	Larger Than	230
10.0	Larger Than	170
20.0	Larger Than	115
40.0	Larger Than	65
60.0	Larger Than	35
80.0	Larger Than	15
88.0	Larger Than	10

[2] *http://www.epa.gov/air/oaqps/eog/bces/module3/diameter/diameter.htm.*

Using the equations described above, a solids density of 2.2 gm/cm^3 (based on the density of sodium chloride), and the droplet size distribution in the previous table, the following particle diameter distribution can be derived:

Table 4-2
Predicted Particle Aerodynamic Size Distribution

Mass in Droplets (%)		Aerodynamic Particle Size (Microns)
0.2	Larger Than	68.5
1.0	Larger Than	49.0
5.0	Larger Than	30.0
10.0	Larger Than	22.2
20.0	Larger Than	15.0
40.0	Larger Than	8.5
60.0	Larger Than	4.6
80.0	Larger Than	2.0
88.0	Larger Than	1.3

Based upon this particle size distribution, approximately 67.7% of the particles emitted from the CPP cooling tower will be PM_{10} or smaller. Approximately 26.6% of the particles emitted from the CPP cooling tower will be $PM_{2.5}$ or smaller.

Hourly PM emissions from the CPP cooling tower were calculated using the tower design parameters provided in Table 1 of the main document. PM_{10} and $PM_{2.5}$ fractions were calculated using the mass fractions calculated above. PM, PM_{10}, and $PM_{2.5}$ emissions are shown in Table 4-3.

Table 4-3
PM, PM_{10}, and $PM_{2.5}$ Emissions from CPP Cooling Tower[1]

Pollutant, units	Emissions
PM, lbs/hr	0.58
PM_{10}, lbs/hr	0.39
$PM_{2.5}$, lbs/hr	0.15

[1]Based on 155,000 gal/min, Drift = 0.0005%, TDS = 1,500 ppmw.

SPX Cooling Technologies

Balcke | Hamon Dry Cooling | Marley

COOLING TOWER DRIFT MASS DISTRIBUTION
Excel Drift Eliminators

The following table represents the predicted mass distribution of drift particle size for cooling tower drift dispersed from Marley TU10 and TU12 Excel Drift Eliminators properly installed in a cooling tower.

Mass in Particles (%)		Droplet Size (Microns)
0.2	Larger Than	525
1.0	Larger Than	375
5.0	Larger Than	230
10.0	Larger Than	170
20.0	Larger Than	115
40.0	Larger Than	65
60.0	Larger Than	35
80.0	Larger Than	15
88.0	Larger Than	10

How to read table: Example – 0.2% of the drift will have particle sizes larger than 525 microns.

Marley guarantees the data above for properly installed, undamaged drift eliminators in 'like-new' condition.

Attachment 5

CPP Gas Turbine TAC Emission Calculations

Net Increase in Toxic Air Pollutant Emissions
CPP Gas Turbines

Digester Gas Flow Rate (scfm)	Toxic Air Pollutant	Emission Factor(1) (lbs/MMBtu)	Emission Factor(2) (lbs/MMscf)	Toxic Air Emissions (lbs/hr)	Toxic Air Emissions (lbs/year)	Toxic Air Emissions (tons/year)
n/a	Ammonia(3)	n/a	n/a	0.25008	2190.70	1.095
2500	1,3-Butadiened	9.80E-06	5.88E-03	8.82E-04	7.73	0.004
2500	1,4-Dichlorobenzened	2.00E-05	1.20E-02	1.80E-03	15.77	0.008
2500	Acetaldehyde	5.30E-05	3.18E-02	4.77E-03	41.79	0.021
2500	Carbon Tetrachlorided	2.00E-05	1.20E-02	1.80E-03	15.77	0.008
2500	Chlorobenzened	1.60E-05	9.60E-03	1.44E-03	12.61	0.006
2500	Chloroformd	1.70E-05	1.02E-02	1.53E-03	13.40	0.007
2500	Ethylene Dichlorided	1.50E-05	9.00E-03	1.35E-03	11.83	0.006
2500	Formaldehyde	1.90E-04	1.14E-01	1.71E-02	149.80	0.075
2500	Methylene Chlorided	1.30E-05	7.80E-03	1.17E-03	10.25	0.005
2500	Tetrachloroethylened	2.10E-05	1.26E-02	1.89E-03	16.56	0.008
2500	Trichloroethylened	1.80E-05	1.08E-02	1.62E-03	14.19	0.007
2500	Vinyl Chlorided	3.60E-05	2.16E-02	3.24E-03	28.38	0.014
2500	Vinylidene Chlorided	1.50E-05	9.00E-03	1.35E-03	11.83	0.006

Notes:

(1) From AP42, Section 3.1 - Stationary Gas Turbines, 4/2000, Table 3.1-7 (Digester Gas Fired Gas Turbines).

(2) Converted from lbs/MMBtu to lbs/MMscf based on default digester gas HHV of 600 Btu/scf shown in AP42, Section 3.1, Table 3.1-7.

(3) Calculated based a 0.5% increase in the per gas turbine full load ammonia emission rate of 25.0088 lbs/hr (10 ppmvc NH_3).
See September 2001 AFC for CPP, Volume 1, Appendix 8.1A, Table 8.1B-7.

Attachment 6

HARP Inputs/Outputs

File: U:\SHY\SMUD_CPP\smud_cpp_Prioritization08042010.txt

Facility Prioritization for District

Report date: 8/4/2010

Created by HARP Version 1.4a Build 23.07.00

			Emission and Potency Procedure				Dispersion Adjustment Procedure				Total
Fac ID	Description	Multipler	Cancer	Acute	Chronic	NonCancer	Cancer	Acute	Chronic	NonCancer	Score
Proximity Calc. Method: unknown											
1	device 1	***	0.383	0.016	0.046	0.047	0.142	0.006	0.017	0.017	
1	COSUMNES POWER P	***	0.383	0.016	0.046	0.047	0.142	0.006	0.017	0.017	0.383

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Appendix F
TAC Emissions Calculations

Net Increase in Toxic Air Pollutant Emissions
CPP Gas Turbines
(Revised 11/16/10)

Digester Gas Flow Rate (scfm)	Toxic Air Pollutant	Emission Factor(1) (lbs/MMBtu)	Emission Factor(2) (lbs/MMscf)	Toxic Air Emissions (lbs/hr)	Toxic Air Emissions (lbs/year)	Toxic Air Emissions (tons/year)
n/a	Ammonia(3)	n/a	n/a	0.25008	2190.70	1.095
2500	1,3-Butadiene	9.80E-06	6.05E-03	9.07E-04	7.95	0.004
2500	1,4-Dichlorobenzene	2.00E-05	1.23E-02	1.85E-03	16.21	0.008
2500	Acetaldehyde	5.30E-05	3.27E-02	4.91E-03	42.97	0.021
2500	Carbon Tetrachloride	2.00E-05	1.23E-02	1.85E-03	16.21	0.008
2500	Chlorobenzene	1.60E-05	9.87E-03	1.48E-03	12.97	0.006
2500	Chloroform	1.70E-05	1.05E-02	1.57E-03	13.78	0.007
2500	Ethylene Dichloride	1.50E-05	9.26E-03	1.39E-03	12.16	0.006
2500	Formaldehyde	1.90E-04	1.17E-01	1.76E-02	154.04	0.077
2500	Methylene Chloride	1.30E-05	8.02E-03	1.20E-03	10.54	0.005
2500	Tetrachloroethylene	2.10E-05	1.30E-02	1.94E-03	17.03	0.009
2500	Trichloroethylene	1.80E-05	1.11E-02	1.67E-03	14.59	0.007
2500	Vinyl Chloride	3.60E-05	2.22E-02	3.33E-03	29.19	0.015
2500	Vinylidene Chloride	1.50E-05	9.26E-03	1.39E-03	12.16	0.006

Notes:
(1) From AP42, Section 3.1 - Stationery Gas Turbines, 4/2000, Table 3.1-7 (Digester Gas Fired Gas Turbines).
(2) Converted from lbs/MMBtu to lbs/MMscf based on digester gas HHV for CPP of 617 Btu/scf.
(3) Calculated based a 0.5% increase in the per gas turbine full load ammonia emission rate of 25.0088 lbs/hr (10 ppmvc NH_3).
See September 2001 AFC for CPP, Volume 1, Appendix 8.1A, Table 8.1B-7. This is the total emission increase for two gas turbines.

Appendix G
HARP Modeling Results

November 19, 2010

sierra
research

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Memo to: Stu Husband, SMUD

From: Tom Andrews

Subject: Screening-Level HRA for the Cosumnes Power Plant

As requested by the SMAQMD, a screening-level health risk assessment (HRA) was performed to determine the toxic air contaminant (TAC) impacts associated with the proposed combustion of digester gas at the Cosumnes Power Plant (CPP). The HARP model was used to calculate both the TAC dispersion[1] and resulting TAC health impacts associated with digester gas combustion in the CPP gas turbines. The TAC emissions associated with digester gas combustion were calculated using EPA AP-42 emission factors. The detailed TAC emission calculations are enclosed as Attachment 1. The HARP modeling was performed using two different gas turbine operating scenarios. Under the first, the TAC emissions associated with digester gas combustion were assumed to come from a single gas turbine stack (one-gas-turbine operating case); under the second, the TAC emissions associated with digester gas combustion were equally divided between two gas turbine stacks (two-gas-turbine operating case). As shown in the HARP results summarized in Attachment 2, there are only minor differences between the one- and two-gas-turbine operating scenarios. The HARP input and output files for this screening-level HRA are included on the enclosed compact disc.

Per guidance from the SMAQMD, to determine the revised cumulative TAC health impacts associated with the combustion of digester gas at CPP, the results from the above HARP analysis were added to the results of the previous HRA performed for the CPP. As shown below in Table 1, the revised cumulative HRA results remain below the SMAQMD significance levels of 1×10^{-6} for cancer risk and 1.0 for chronic and acute Health Hazard Indices (HHIs). Therefore, the cumulative health impacts associated with the proposed combustion of digester gas in the gas turbines at CPP are not expected to be significant.

[1] Based on screening-level meteorological data set in the HARP modeling.

Table 1 Revised Cumulative HRA Results CPP			
	Cancer Risk	**Chronic HHI**	**Acute HHI**
Previous HRAs			
CEC Final Staff Assessment[a]	0.67×10^{-6}	0.015	0.10
SMAQMD Final Determination of Compliance[b]	0.67×10^{-6}	0.015	0.10
Impacts for Digester Gas Combustion			
Maximum Impacts from Screening Level HRA	1.29×10^{-8}	0.00005	0.00008
Revised Cumulative Impacts			
Previous Impacts Plus New Impacts	0.67×10^{-6}	0.015	0.10

Notes (Table 1):
[a] CEC Final Staff Assessment for the proposed Cosumnes Power Plant (01-AFC-19), February 11, 2003, Public Health Table 2 and page 4.7-13 (see Attachment 3).
[b] SMAQMD Final Determination of Compliance for the proposed Cosumnes Power Plant, October 9, 2002, page 22 of 24 (see Attachment 4).

If you have any questions or need any additional information regarding this analysis, please do not hesitate to contact us.

Enclosures

ATTACHMENT 1

TAC EMISSION CALCULATIONS

Net Increase in Toxic Air Pollutant Emissions
CPP Gas Turbines
(Revised 11/16/10)

Digester Gas Flow Rate (scfm)	Toxic Air Pollutant	Emission Factor(1) (lbs/MMBtu)	Emission Factor(2) (lbs/MMscf)	Toxic Air Emissions (lbs/hr)	Toxic Air Emissions (lbs/year)	Toxic Air Emissions (tons/year)
n/a	Ammonia(3)	n/a	n/a	0.25008	2190.70	1.095
2500	1,3-Butadiene	9.80E-06	6.05E-03	9.07E-04	7.95	0.004
2500	1,4-Dichlorobenzene	2.00E-05	1.23E-02	1.85E-03	16.21	0.008
2500	Acetaldehyde	5.30E-05	3.27E-02	4.91E-03	42.97	0.021
2500	Carbon Tetrachloride	2.00E-05	1.23E-02	1.85E-03	16.21	0.008
2500	Chlorobenzene	1.60E-05	9.87E-03	1.48E-03	12.97	0.006
2500	Chloroform	1.70E-05	1.05E-02	1.57E-03	13.78	0.007
2500	Ethylene Dichloride	1.50E-05	9.26E-03	1.39E-03	12.16	0.006
2500	Formaldehyde	1.90E-04	1.17E-01	1.76E-02	154.04	0.077
2500	Methylene Chloride	1.30E-05	8.02E-03	1.20E-03	10.54	0.005
2500	Tetrachloroethylene	2.10E-05	1.30E-02	1.94E-03	17.03	0.009
2500	Trichloroethylene	1.80E-05	1.11E-02	1.67E-03	14.59	0.007
2500	Vinyl Chloride	3.60E-05	2.22E-02	3.33E-03	29.19	0.015
2500	Vinylidene Chloride	1.50E-05	9.26E-03	1.39E-03	12.16	0.006

Notes:
(1) From AP42, Section 3.1 - Stationery Gas Turbines, 4/2000, Table 3.1-7 (Digester Gas Fired Gas Turbines).
(2) Converted from lbs/MMBtu to lbs/MMscf based on digester gas HHV for CPP of 617 Btu/scf.
(3) Calculated based a 0.5% increase in the per gas turbine full load ammonia emission rate of 25.0088 lbs/hr (10 ppmvc NH_3).
See September 2001 AFC for CPP, Volume 1, Appendix 8.1A, Table 8.1B-7. This is the total emission increase for two gas turbines.

ATTACHMENT 2

HARP MODELING RESULTS

Table 1-1
HARP Modeling Results
CPP Digester Gas Project

Operating Cases	Derived OEHHA Cancer	Average Point Cancer	Derived Adjusted Cancer	High Point Cancer	Worker Cancer	Chronic HHI	Acute HHI
Single GT	1.29E-08	8.92E-09	9.94E-09	1.29E-08	1.96E-09	4.78E-05	7.53E-05
Two GTs	1.29E-08	8.89E-09	9.90E-09	1.29E-08	1.95E-09	4.76E-05	7.51E-05

ATTACHMENT 3

CEC FINAL STAFF ASSSESSMENT
CPP

Final Staff Assessment

COSUMNES POWER PLANT PROJECT

(Part 1)

Application For Certification (01-AFC-19)
Sacramento County

CALIFORNIA
ENERGY
COMMISSION

STAFF REPORT

FEBRUARY 2003
(01-AFC-19)

Gray Davis, Governor

come into contact with toxic substances, include inhalation, dermal (through the skin) absorption, soil ingestion, consumption of locally grown plant foods, and mother's milk.

The above method of assessing health effects is consistent with the California Air Pollution Control Officers Association (CAPCOA) Air Toxics "Hot Spot" Program Revised 1992 Risk Assessment Guidelines (October 1993) referred to earlier, and results in the following health risk estimates.

Impacts

The screening health risk assessment prepared by the applicant for the project, including combustion and non-combustion emissions, resulted in a maximum acute hazard index of 0.10 about 0.12 miles south of the project boundary. The chronic hazard index at the point of maximum impact is 0.015. The location of the maximum chronic hazard is about 1.4 miles northeast of the site boundary (SMUD 2001a, Figure 8.1E-1). As **Public Health Table 2** shows, both acute and chronic hazard indices are under the REL of 1.0, indicating that no short- or long-term adverse health effects are expected.

Public Health Table 2
Operation Hazard/Risk

Type of Hazard/Risk	Hazard Index/Risk	Significance Level	Significant?
ACUTE NONCANCER	0.10	1.0	No
CHRONIC NONCANCER	0.015	1.0	No
INDIVIDUAL CANCER	0.26×10^{-6}	10×10^{-6}	No

Source: SMUD 2002j, Tables 8.1E-1 (revised), 8.1E-2 (revised) and 8.1E-3 (revised).

Cancer Risk

As shown in **Public Health Table 2**, total worst-case individual cancer risk is calculated to be 0.26 in one million at a location approximately 0.19 miles northeast of the project boundary. As noted earlier, the existing nearest residence is a mobile home located about 800 feet to the southwest of the project, however SMUD and the property owner have agreed to move the mobile home to about 0.7 mile west of the CPP site (SMUD 2003c). The next closest residences are located about 1 mile to the west and southwest of the project.

The health risk assessment performed by the applicant has been reviewed by Energy Commission staff and was found to be in accordance with guidelines adopted by OEHHA (Office of Environmental Health Hazard Assessment), CARB, and CAPCOA with two exceptions. First, the risk assessment assumes that all chromium emitted is in the form of noncarcinogenic trivalent chromium. Emissions of trivalent and hexavalent chromium from the cooling tower should be included in order to accurately assess the risks from both forms of emitted chromium. Second, crop (fruits and vegetables) ingestion was not included as a potential exposure pathway in the risk assessment. In an agricultural area such as the project site, this exposure pathway should be evaluated. Energy Commission staff performed an independent analysis of risks posed by operations of this proposed facility, conservatively assuming that all chromium emitted is in the hexavalent form and using standard Cal-EPA exposure assumptions for the crop ingestion pathway. The maximum theoretical cancer risk was determined by staff to be 0.67 in a million, a value higher than the 0.26 in one million value obtained by the applicant but still significantly lower than the significance level of 10 in a million. Therefore, staff concludes the maximum theoretical health risks and hazards posed by the toxic air contaminants emitted by the project are not significant.

Cooling Tower

In addition to toxic air contaminants, the possibility (however remote) exists for bacterial growth to occur in the cooling tower, including Legionella. Legionella is a type of bacteria that grows in water (optimal temperature of 37° C) and causes Legionellosis, otherwise known as Legionnaires' Disease. Untreated or inadequately treated cooling systems in the United States have been correlated with an outbreak of Legionellosis. These outbreaks are usually associated with building heating, ventilating, and air conditioning (HVAC) systems but it is possible for growth to occur in an industrial cooling tower. In fact, Legionella bacteria have been found in drift droplets. The U.S. Environmental Protection Agency (U.S. EPA) published an extensive review of Legionella in a human health criteria document (EPA 1999). The U.S. EPA noted that Legionella survival is enhanced by symbiotic relationships with other microorganisms, particularly in biofilms, and that aerosol-generating systems such as cooling towers can aid in the transmission of Legionella from water to air. Numerous outbreaks of Legionellosis have been linked to cooling towers and evaporative condensers in hospitals, hotels, and public buildings, clearly establishing these water sources as habitats for Legionella. Kool et al (2000) found that Legionella was isolated from water systems of 11 of 12 hospitals in San Antonio, TX. Interestingly, the number of legionnaires' disease cases in each hospital correlated better with the proportion of water-system sites that tested positive for Legionella ($p=0.07$) than with the concentration of Legionella bacteria in water systems ($p=0.23$). According to the U.S. EPA, in most cases, disease outbreaks resulting from Legionella aerosolizations have involved indoor exposure or outdoor exposure within 200 meters of the source. The U.S. EPA has inadequate quantitative data on the infectivity of Legionella in humans to prepare a dose-response evaluation. Therefore, sufficient information is not available to support a quantitative characterization of the threshold infective dose of Legionella. Thus, the presence of even small numbers of Legionella bacteria presents a risk – however small – of disease in humans. The victims of Legionella are those who are in some way immuno-compromised (hospital patients, drug users, alcoholics, some of the elderly, etc.). People with normally functioning immune systems would have antibodies to Legionella and would be able to defend against Legionella infection.

The U.S. EPA also published a Legionella Drinking Water Health Advisory (EPA 2001) that noted that there are several control methods for disinfecting water in cooling systems, including thermal (super heat and flush), hyperchlorination, copper-silver ionization, ultraviolet light sterilization, ozonation, and instantaneous steam heating systems.

One technical paper (Addiss, David, et al. 1989) describes cases of Legionnaires' Disease due to cooling tower drift in a town in Wisconsin in the summer of 1986. The

ATTACHMENT 4

SMAQMD FINAL DETERMINATION OF COMPLIANCE
CPP

777 12TH Street, 3rd Floor

SACRAMENTO METROPOLITAN
AIR QUALITY
MANAGEMENT DISTRICT

Sacramento, CA 95814-1908

FINAL DETERMINATION OF COMPLIANCE/PERMIT TO CONSTRUCT EVALUATION

APPLICATION NO.: A/Cs 16006-7, 16010, & 16012-13

DATE: October 9, 2002

ISSUING ENGINEER: Brian Krebs

A. **FACILITY NAME:** Sacramento Municipal Utility District -Cosumnes Power Plant (CPP) project.

B. **LOCATION:** The project is located adjacent to the Rancho Seco Nuclear Power Plant on approximately 30 acre site in Section 29, Township 6N, Range 8E Mount Diablo base and meridian. Clay East Road borders the plant to the south and Twin Cities Road is the closest road to the plant on the north and west.

C. **PROPOSAL:** SMUD is proposing to install up to a 1,060 MW nominal gas fired combined cycle power plant. The entire project is being proposed to be built in two phases.

D. **INTRODUCTION:** The plant at full buildout will consist of four General Electric 7FA gas turbines. They will be equipped with dry, low-NOx combustors, four (not supplementary fired) heat recovery steam generators (HRSG), two condensing steam turbines, and two 9-cell mechanical draft cooling towers. The full project is proposed to be built in two phases. Each phase (nominally 530 megawatts) will consist of two of the turbines, one condensing steam turbine and one 9-cell mechanical draft evaporative cooling tower.

SMUD has only identified and will be providing enough offsets for the first phase of the project. Because of this, this Determination of Compliance will evaluate the environmental impacts of the entire project (both phases), but will only be approving the first phase. The applicant will be required to submit a new application for approval prior to construction of Phase II. In addition, at full buildout (both phases) the source will be classified Major for particulates. Therefore, the major source provisions concerning offsets will be applied to Phase I even though Phase I would not be major by itself.

The fuel for the project will be pipeline quality natural gas. Natural gas will be delivered to the project via an extension of the SMUD-owned high pressure pipeline that currently ends at the Carson Ice-Gen facility approximately 20 miles northwest of the CPP site. The project will have no standby fuel capability.

E. **EQUIPMENT DESCRIPTION:** The CPP project will have the following equipment.

COMBINED CYCLE COMBUSTION TURBINES (4 EACH)
The gas turbines will consist of General Electric model 7FA that will each produce approximately 171.2 MW (baseload rating under average ambient conditions) . These turbines are combined

5. Prohibitory Rule Compliance

Rule 401 - Ringelmann Chart

The combustion turbines will be fired exclusively on natural gas. They are not expected to exceed Ringelmann 1. Therefore, the project should comply with rule.

Rule 402 – Public Nuisance

Air dispersion modeling was performed in conjunction with the Application for Certification to the California Energy Commission. The analysis did not indicate any new violations of the NO_2, PM10, or CO ambient air quality standards. A Screening Health Risk Assessment was performed in accordance with CARB and CAPCOA health risk assessment guidelines. The Excess Cancer Risk was determined to be 0.26 in a million. A further analysis performed by the CEC staff which incorporated crop ingestion and hexavalent chromium emissions raised the cancer risk to 0.67 in a million. The Chronic and Acute Risk had a Hazard Index of 0.015 and 0.1 respectively. Since the significance level for cancer risk and chronic and acute risk is 1 in a million and a hazard index of 1 respectively, the project should comply with this rule.

Rule 403 – Fugitive Dust

During the construction of the facility, the applicant will utilize best available control technology (i.e. water spray) to control fugitive dust. After the construction is completed, the project is not expected to be a source of fugitive dust. Therefore, the project should comply with this rule.

Rule 406 – Specific Contaminants

The sulfur compounds expected to be emitted by the turbines will be less than 1 ppmvd which is 0.0001% by volume. The standard is for the sulfur emissions as SO_2 to not exceed 0.2%. The particulate expected to be emitted by the turbines will be 0.00007 grains/dscf at 12% CO_2. The standard for particulate matter is 0.1 grains/dscf @ 12% CO_2. Therefore, the project should comply with this rule (See Appendix C).

Rule 413 – Stationary Gas Turbines

This rule limits the NOx concentration to 9 ppmdv @ 15% O_2. In addition, the rule requires that turbines greater than 10 MW have a NOx CEMS. These turbines will be required to meet a NOx concentration of 2 ppmdv @ 15% O_2 and a NOx and CO continuous emission monitoring system is proposed. Therefore, the project should comply with this rule.

Rule 420 – Sulfur Content of Fuels

This rule limits the sulfur content of all gaseous fuels to less than 50 grains per 100 cubic foot. The natural gas proposed for the project is estimated to have a maximum sulfur content of 1 grains per 100 cubic foot. Therefore, the project should comply with this rule.

6. NSPS COMPLIANCE

General Requirements

This Regulation has three major provisions.

1. Notification - The applicant must provide written notification to the Air Pollution Control Officer of the following:
   - A. The date of when construction begins.
   - B. The anticipated date of initial start-up
   - C. The actual date of initial start-up.
   - D. Any modifications which may increase an emission rate to which a standard applies.

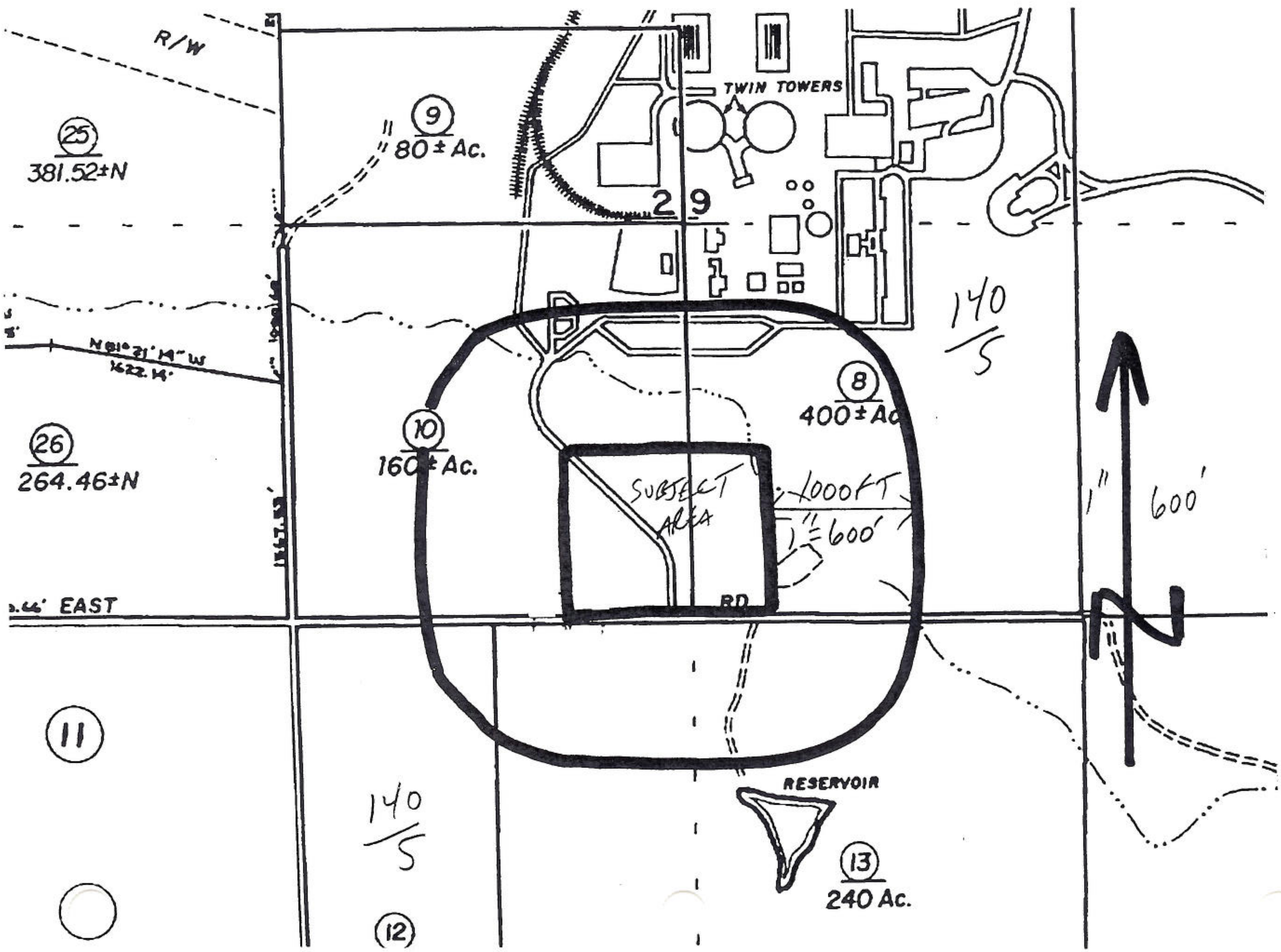
Appendix H
List of Property Owners

1 *----------------------: **MetroScan / Sacramento** :------------------------*
Owner :S M U D Parcel :140 0050 008 0000
Site :14440 Twin Cities Rd Herald 95638 Xfered :04/01/1966
Mail :PO Box 15830 Sacramento Ca 95852 Price :
Use :WDCC0A Pub,City Use,Non-Exempt OwnerPh :
Zoning:Ag80 T County Ag80. Permanent Agric,Extensive MapGrid :
Bedrm : Bth: TotRm: YB: Gar: Pool: Bldg SF: Ac:

2 *----------------------: **MetroScan / Sacramento** :------------------------*
Owner :S M U D Parcel :140 0050 010 0000
Site :14440 Twin Cities Rd Herald 95638 Xfered :04/01/1966
Mail :PO Box 15830 Sacramento Ca 95852 Price :
Use :WDCC0A Pub,City Use,Non-Exempt OwnerPh :
Zoning:Ag80 County Ag80. Permanent Agric,Extensive MapGrid :
Bedrm : Bth: TotRm: YB: Gar: Pool: Bldg SF: Ac:

3 *----------------------: **MetroScan / Sacramento** :------------------------*
Owner :Loretz Frank A Parcel :140 0050 012 0000
Site :14150 Clay East Rd Herald 95638 Xfered :07/09/1991
Mail :10884 Franklin Blvd Elk Grove Ca 95758 Price :$50,000 Full
Use :GCDC0A Ind,Distribution & Warehouses OwnerPh :916-684-2115
Zoning:Ag80 County Ag80. Permanent Agric,Extensive MapGrid :401 E3
Bedrm : Bth: TotRm: YB: Gar: Pool: Bldg SF: Ac:

4 *----------------------: **MetroScan / Sacramento** :------------------------*
Owner :Smud Parcel :140 0050 013 0000
Site :14460 Clay East Rd Herald 95638 Xfered :04/01/1966
Mail :PO Box 15830 Sacramento Ca 95852 Price :
Use :WDCC0A Pub,City Use,Non-Exempt OwnerPh :
Zoning:Ag80 County Ag80. Permanent Agric,Extensive MapGrid :401 F3
Bedrm : Bth: TotRm: YB: Gar: Pool: Bldg SF: Ac:



R/W
25
381.52±N
9
80±Ac.
TWIN TOWERS
29
140
5
N 81° 21' 14" W
1622.14'
8
400±Ac
10
160±Ac.
26
264.46±N
SUBJECT AREA
1000 FT
1" = 600'
1" 600'
N
EAST
RD
11
RESERVOIR
140
5
13
240 Ac.
12