Table 2-1. Typical Product Gas Composition[1]

Component	Product Gas Composition (Volume %)
Methane	15.61
Ethylene	5.26
Ethane	0.68
Carbon Monoxide	45.8
Carbon Dioxide	11.03
Hydrogen	20.7
Water Vapor	0.22
Hydrogen Sulfide	0.02
Nitrogen	0.68
Heating Value (Btu/scf) LHV	435.4

[1] Analysis provided by SilvaGas

Table 2-2. Startup and Shutdown Emissions Summary

Emission Component	Source	Turnaround Shutdowns, TPY	Emergency Shutdowns, TPY	Start-up, TPY	Controlled Emissions, TPY	**Total Annual Emissions (TPY)**
NOx	Combustion Duct Burner			0.06		
	Gasifier Duct Burner			0.09		
	Char			0.36		
	Wood Combustion			3.56		
	Gasifier Island	0.025	0.05	0.82		
Total NOx		0.025	0.05	4.89		**4.965**
PM_{10}		0.0025	0.0005	0.51	0.01	**0.523**
PM		0.0025	0.0005	0.51	0.01	**0.523**

Based upon information from SilvaGas

TABLE 3-1
BG&E PROJECT SUMMARY OF POTENTIAL AIR EMISSIONS

Pollutant (TPY)	CTs/DBs (1A & 1B)	Gasifier Combustor	Cooling Tower	Material Handling	Auxiliary Boiler	Flare	Dryer	Total Emissions
SO_2	71.8	10.7			0.09	0.80		83
PM	63.0	26.7	0.04	24.0	0.03	neg	0.10	114
PM_{10}	63.0	26.7	0.04	24.0	0.03	neg	0.01	114
NO_x	167.4	27.2			1.47	0.70		197
CO	187.6	11.2			1.24	3.80		204
VOC (as methane)	10.9	5.6			0.08	1.50		18
Fluoride	neg	neg						0
Lead	neg	neg						0
Total HAPs	4.0	0.9						5

* Based on emissions at 59F.

Table 3-2. Combustion Turbine and Duct Burner Emissions

SOLAR TURBINES

BGE POWER PLANT STANDARD EMISSIONS

Annual Hour Basis: 8760

Emissions at Full Load Operations

	GTU Fuel (MMBtu/hr LHV)		
Temp F	25	59	95
Each	157.4	146.9	132.4
Total	314.9	293.7	264.8

HRSG Duct Burner Emission Rate (lb/MMBtu HHV)	
Nox	0.15
CO	0.08
UHC	0.03
Pm	0.01

GTU Pm Emissions
0.0413 lb/MMBtu HHV

Rev B: No change in emissions - changes in Silva Steam to reflect reduced fuel production
Rev C: Revised Fired Case capacity, added stack dia of 78 inches

Unfired Duct Duct Burner Case

Fuel Available 378 MMBtu/hr LHV

Reduction: 90%

EMISSIONS ARE FOR ONE UNIT - TWO REQUIRED

		Gas Turbine Outlet (80-100%)						Duct Burner Contribution					After Duct Burner / Before SCR					After SCR (Stack Outlet) Nox Reduction of 90%				
	Ambient Temp F	GTU Exh Flow pph	Exh Temp F	Nox ppm	CO ppm	UHC ppm	NH3 ppm	Duct Burner Mass Flow	Nox ppm	CO ppm	UHC ppm	NH3 ppm	Mass Flow pph	Nox ppm	CO ppm	UHC ppm	NH3 ppm	Stack Exh Flow pph	Exh Temp F	Nox ppm	CO ppm	UHC ppm	NH3 ppm
	25	425,658	916	325.0	50.0	25.0		0.0	0.0	0.0	0.0	0.0	425,658	325.0	50.0	25.0	0.0			32.5	50.0	25.0	9.6
	59	403,569	932	325.0	50.0	25.0		0.0	0.0	0.0	0.0	0.0	403,569	325.0	50.0	25.0	0.0			32.5	50.0	25.0	9.6
	95	368,786	972	325.0	50.0	25.0		0.0	0.0	0.0	0.0	0.0	368,786	325.0	50.0	25.0	0.0			32.5	50.0	25.0	9.6
Temp F	25		pph	197.9	18.5	5.3			0	0	0	0		197.9	18.5	5.3	0.0			19.8	18.5	5.3	2.2
Temp F	59		pph	184.0	17.2	4.9			0	0	0	0		184.0	17.2	4.9	0.0			18.4	17.2	4.9	2.0
Temp F	95		pph	163.4	15.3	4.4			0	0	0	0		163.4	15.3	4.4	0.0			16.3	15.3	4.4	1.8
Temp F	25		TPY	867.0	81.2	23.2			0	0	0	0		867.0	81.2	23.2	0.0			86.7	81.2	23.2	9.5
Temp F	59		TPY	806.1	75.5	21.5			0	0	0	0		806.1	75.5	21.5	0.0			80.6	75.5	21.5	8.6
Temp F	95		TPY	715.9	67.1	19.1			0	0	0	0		715.9	67.1	19.1	0.0			71.6	67.1	19.1	7.8

Fired Duct Duct Burner Maximum 56.5 MMBtu/hr LHV Fuel/Duct Burner

Stack Diameter 78 inches

Silva fuel Usage				
Temp F	25	59	95	
Total Fuel Available	378.0	378.0	378.0	MMBtu/hr LHV
Fuel/Train	189.0	189.0	189.0	MMBtu/hr LHV
GTU Fuel/ Train	157.4	146.9	132.4	MMBtu/hr LHV
HRSG Fuel/Train	31.50	42.0	56.5	MMBtu/hr LHV

HRSG Performance per Train (Typ 2)			
Ambient Temp F	Fuel MMBtu/hr LHV	Steam Flow pph	Stack Temp F
25	31.5	75,463	373
59	42.0	83,750	364
95	56.5	96,064	352

Total Available Steam @ Full Load				
Ambient Temp F	HRSG 1	HRSG 2	Silva Gas	Total Seam Production
25	75,463	75,463	47,000	197,926
59	83,750	83,750	47,000	214,500
95	96,064	96,064	47,000	239,128

Total Unfired Steam Full Load				
Ambient Temp F	HRSG 1	HRSG 2	Silva Gas	Total Seam Production
25	48,549	48,549	47,000	144,098
59	48,033	48,549	47,000	143,582
95	48,547	48,547	47,000	144,094

Reduction: 90%

EMISSIONS ARE FOR ONE UNIT - TWO REQUIRED

		Gas Turbine Outlet						Duct Burner Contribution					After Duct Burner / Before SCR					After SCR (Stack Outlet) Nox Reduction of 90%							
	Ambient Temp F	GTU Exh Flow pph	Exh Temp F	Nox ppm	CO ppm	UHC ppm	NH3 ppm	Duct Burner Mass Flow	Nox ppm	CO ppm	UHC ppm	NH3 ppm	Mass Flow pph	Nox ppm	CO ppm	UHC ppm	NH3 ppm	Stack Exh Flow pph	Exh Temp F	Nox ppm	CO ppm	UHC ppm	NH3 ppm	Pm GTU	PM HRSG Only	PM TOTAL
	25	425,658	916	325	50	25	0	4,981	Duct Burner Emissions Included Within "After Duct Burner / Before SCR"			0	430,639	276.9	48.7	25.5	0.0	430,639	373	27.9	48.7	25.5	9.7			
	59	403,569	932	325	50	25	0	6,641				0	410,210	263.5	48.3	25.6	0.0	410,210	364	26.3	48.3	25.6	9.7			
	95	368,786	972	325	50	25	0	8,934				0	377,720	241.5	47.4	25.8	0.0	377,720	352	24.2	47.4	25.8	9.7			
Temp F	25		pph	197.9	18.5	5.3	0		5.24	3.1	1.18	0		203.8	21.7	6.5	0.0			20.4	21.7	6.5	2.6	7.2	0.3	7.6
Temp F	59		pph	184.0	17.2	4.9	0		6.98	4.2	1.57	0		191.9	21.4	6.5	0.0			19.2	21.4	6.5	2.6	6.7	0.5	7.2
Temp F	95		pph	163.4	15.3	4.4	0		9.39	5.6	2.11	0		174.2	20.9	6.5	0.0			17.4	20.9	6.5	2.6	6.1	0.6	6.7
Temp F	25		TPY	867.0	81.2	23.2	0	0.0	22.9	13.8	5.2	0.0		889.9	95.0	28.4	0.0			89.0	95.0	28.4	11.4	31.6	1.5	33.1
Temp F	59		TPY	806.1	75.5	21.5	0	0.0	30.6	18.3	6.9	0.0		836.7	93.8	28.4	0.0			83.7	93.8	28.4	11.4	29.4	2.0	31.5
Temp F	95		TPY	715.9	67.1	19.1	0	0.0	41.1	24.7	9.2	0.0		757.0	91.7	28.4	0.0			75.7	91.7	28.4	11.4	26.5	2.7	29.3

Table 3-3. Hazardous Air Pollutant Emission Factors and Emissions for the BG&E Project
Natural Gas and Product Gas-Firing

Parameter		Emission Rate (lb/hr) firing Gas for Operating Conditions of Base Load (1)			Natural Gas Maximum Annual Emissions (TPY) (2)	
Ambient Temperature (°F):		25 F	59 °F	95 F	59 °F	59 °F
					1	2
HIR (MMBtu/hr):		157	147	132	CT/HRSG	CTs/HRSGs
HAPs (Section 112(b) of Clean Air Act)						
1,3-Butadiene		0.000068	0.000063	0.000057	0.0003	0.0006
Acetaldehyde		0.0063	0.0059	0.0053	0.0257	0.0515
Acrolein		0.0010	0.0009	0.0008	0.0041	0.0082
Benzene		0.0019	0.0018	0.0016	0.0077	0.0154
Ethylbenzene		0.0050	0.0047	0.0042	0.0206	0.0412
Formadehyde		0.403	0.427	0.403	1.8712	3.7423
Naphthalene		0.00020	0.00019	0.00017	0.0008	0.0017
Polycyclic Aromatic Hydrocarbons (PAH)	(3)	0.00035	0.00032	0.00029	0.0014	0.0028
Propylene Oxide		0.0046	0.0043	0.0038	0.0187	0.0373
Toluene		0.0052	0.0048	0.0044	0.0212	0.0425
Xylene		0.010	0.009	0.008	0.0412	0.0824
Antimony		0.0	0.0	0.0	0.00	0.0000
Arsenic		0.0	0.0	0.0	0.00	0.0000
Beryllium		0.0	0.0	0.0	0.00	0.0000
Cadmium		0.0	0.0	0.0	0.00	0.0000
Chromium		0.0	0.0	0.0	0.00	0.0000
Lead		0.0	0.0	0.0	0.00	0.0000
Manganese		0.0	0.0	0.0	0.00	0.0000
Mercury		0.0	0.0	0.0	0.00	0.0000
Nickel		0.0	0.0	0.0	0.00	0.0000
Selenium		0.0	0.0	0.0	0.00	0.0000
HAPs (Total)		0.438	0.460	0.432	2.01	4.0

(1) Emissions based on the following emission factors and conversion factors for firing natural gas:

Emission Factors		Value	Reference
Sulfuric acid mist		5	%; Conversion of SO_2 to SO_3 in gas turbine
1,3-Butadiene	(a)	0.43	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000
Acetaldehyde		40	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000
Acrolein		6.4	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000
Benzene		12	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000
Ethylbenzene		32	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000
Formadehyde		0.091	ppmvd @15% O_2 (see Table 15a)
Naphthalene		1.3	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000
Polycyclic Aromatic Hydrocarbons (PAH)		2.2	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000
Propylene Oxide	(a)	29	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000. Database
Toluene		33	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000
Xylene		64	lb/10^{12} Btu; AP-42,Table 3.1-3. EPA 2000
Antimony		0.00E+00	
Arsenic		0.00E+00	
Beryllium		0.00E+00	
Cadmium		0.00E+00	
Chromium		0.00E+00	
Lead		0.00E+00	
Manganese		0.00E+00	
Mercury		0.00E+00	
Nickel		0.00E+00	
Selenium		0.00E+00	

(a) Based on 1/2 the detection limit; expected emissions are lower.

(2) Annual emissions based on ambient temperature of 59 °F firing gas for following hours: 8,760

(3) Assumed to be representative of Polycyclic Organic Matter (POM) emissions, a regulated HAP.

Table 3-3. (continued) Estimated HAP Emissions from Gasification Process

HAP	Feed (ug/g)	Feed (lb/hr)	Emission (lb/hr)	Emissions, (TPY)
Mercury	6.7×10^{-6} lb/ton wood	60,800	0.0002	0.0009
Arsenic	90	5.4	0.00081	0.003443
Cobalt	4	0.24	0.000036	0.000153
Molybdenum	16	0.96	0.000144	0.000612
Silver	5	0.3	0.000045	0.000191
Thallium	26	1.56	0.000234	0.000995
Zirconium	3.4	0.204	3.06E-05	0.00013
Sodium	4726	283.56	0.042534	0.18077
Potassium	4299	257.94	0.038691	0.164437
Cerium	2	0.12	0.000018	7.65E-05
Lithium	<1	0	0	0
Calcium	8721	523.26	0.078489	0.333578
Magnesium	4790	287.4	0.04311	0.183218
Barium	173	10.38	0.001557	0.006617
Strontium	152	9.12	0.001368	0.005814
Phosphorus	365	21.9	0.003285	0.013961
Antimony	4	0.24	0.000036	0.000153
Chromium	492	29.52	0.004428	0.018819
Copper	1239	74.34	0.011151	0.047392
Lead	66	3.96	0.000594	0.002525
Nickel	26	1.56	0.000234	0.000995
Tungsten	< 0.5	0	0	0
			Total	0.965

Table 3-4. Gasifier Combustor Emissions

Performance	
Product Gas Produced (MMBtu/hr)	376
Quantity of Residual Char (%)	33.0
Heat Input from Residual Char (MMBtu/hr)	124
Char Heating Value (Btu/lb)	14,500
Hours of Operation	8,760
Stack Parameters	
Diameter (ft)	TBD
Height (ft)	TBD
Temperature (^{o}F)	TBD
Velocity (ft/sec)	TBD
Flow (acfm)	TBD
Emissions	
SO_2 -Basis is feedstock organic sulfur content (%)	0.004
Feedstock Rate (dry TPD)	730
(lb/hr)	2.4
(tpy)	10.7
NO_x - (lb/MMBtu) Battelle Report, 1989	0.05
(lb/hr)	6.2
(tpy)	27.2
CO - (lb/ton) AP-42, Table 1.2-2	0.6
Char produced (ton/hr)	4.3
(lb/hr)	2.6
(tpy)	11.2
VOC - (lb/ton) AP-42, Table 1.2-6	0.3
Char produced (ton/hr)	4.3
(lb/hr)	1.3
(tpy)	5.6
PM/PM10-(lb/ton) AP-42, Table 1.2-3	71.2
Char produced (ton/hr)	4.3
(lb/hr)	304.6
Cyclone/Baghouse Efficiency (%)	98.0
(tpy)	26.7

Table 3-5. Material Handling Emissions

Vibrating Grate Baghouse (FS001) Parameters		Value	Units	Source
Flow Rating of Baghouse (V)		2,500	scfm	ASSUMED
Emission Factor (EF)		0.03	gr/dscf	Default EF from 62-296.711 FAC
Emission Rate (ER)		2.82	tpy	ER = EF * V *60 * 8760 / 2000 / 7000

Front End Loader Fugitive PM_{10} Emissions (FS002) Parameters		Value	Units	Source
Vehicle Data				
Vehicle weight:(W_L)	Loaded	30.00	ton	ASSUMED
(W_U)	Unloaded	27.25	ton	ASSUMED
(W_{AVG})	Average	28.625	ton	$W_{AVG} = (W_L + W_U) / 2$
Material throughput (M)	Annual	365,000	tons/yr	ASSUMED
Vehicle capacity (C)		2.8	ton	$C = W_L - W_U$
Number of vehicles (V)	Annual	132,727	vehicles	V = M / C
Distance traveled/ vehicle/ route (D_I)	Per trip	0.076	miles	Assume 400 feet (width of building across and back)
VMT (D_{VMT})	Annual	10,055.1	VMT/yr	$D_{VMT} = D_I * V$
General/ Site Characteristics				
Days of precipitation greater than or equal to 0.254 mm (P)	Annual	0	days	Located under covered area
Silt content (s)		8.4	%	AP-42 13.2.2 Unpaved Roads
Particle size multiplier, PM_{10} (k)		1.5	lb/VMT	AP-42 13.2.2 Unpaved Roads
Emission Factor Equation				
$EF_{UNC}(lb/VMT) = k(s/12)^{0.9}(W_{AVG}/3)^{0.45}[(365-P)/365]$				AP-42 13.2.2 eq. 1a
Calculated PM_{10} Emission Factor				
Uncontrolled EF (ER_{UNC})	Annual	3.003	lb/VMT	AP-42 13.2.2 eq. 1a
Calculated PM_{10} Emission Rates				
Uncontrolled Emissions (E_{UNC})	Annual	15.1	tpy	$E_{UNC} = EF_{UNC} * D_{VMT} / 2000$

Stacker Transfer Point Baghouse (FS003) Parameters		Value	Units	Source
Flow Rating of Baghouse (V)		1,000	scfm	ASSUMED
Emission Factor (EF)		0.03	gr/dscf	Default EF from 62-296.711 FAC
Emission Rate (ER)		1.13	tpy	ER = EF * V *60 * 8760 / 2000 / 7000

Stacker Conveyor Dropping Material onto Pile (FS004) Parameters		Value	Units	Source
Material throughput (M)	Annual	365,000	tons/yr	ASSUMED
Mean Wind Speed		6.3	mph	AP 42 Table 7.1.9 Tallahassee, FL
Material Moisture Content (U)		4.8	%	(A)
K		0.35		AP 42 Table 13.2.4
EF		0.00044	lb/ton	EF = k * 0.0032 * ((U/5)^1.3) / ((M/2)^1.4)
E	Annual	0.08	tpy	E = M * EF

Front End Loader Dropping Biomass onto Reclaimer Elevator (FS005) Parameters		Value	Units	Source
Material throughput (M)	Annual	365,000	tons/yr	ASSUMED
Mean Wind Speed		6.3	mph	AP 42 Table 7.1.9 Tallahassee, FL
Material Moisture Content (U)		4.8	%	(A)
K		0.35		AP 42 Table 13.2.4
EF		0.00044	lb/ton	EF = k * 0.0032 * ((U/5)^1.3) / ((M/2)^1.4)
E	Annual	0.08	tpy	E = M * EF

Drier/Fuel Silo Baghouse (FS006) Parameters		Value	Units	Source
Flow Rating of Baghouse (V)		1,000	scfm	ASSUMED - Probably will be higher for a drier
Emission Factor (EF)		0.03	gr/dscf	Default EF from 62-296.711 FAC
Emission Rate (ER)		1.13	tpy	ER = EF * V *60 * 8760 / 2000 / 7000

Fuel Silo Screw Auger Baghouse (FS007) Parameters		Value	Units	Source
Flow Rating of Baghouse (V)		1,000	scfm	ASSUMED
Emission Factor (EF)		0.03	gr/dscf	Default EF from 62-296.711 FAC
Emission Rate (ER)		1.13	tpy	ER = EF * V *60 * 8760 / 2000 / 7000

Gassifier Fuel Bin Vent Filter (FS008) Parameters		Value	Units	Source
Material throughput (M)	Annual	365,000	tons/yr	ASSUMED
Emission Factor (EF)		0.0063	lb/ton	AP-42 9.9.1-1 Storage Bin
Control (C)		99.9%		ASSUMED
Emission Rate (ER)	Annual	0.00	tpy	E = M * EF * (1-C)/1

Sand (Olivine) System Baghouse (FS009) Parameters		Value	Units	Source
Material throughput (M)	Annual	37	lb/hr	MATERIAL BALANCE
Emission Factor (EF)		162.1	tpy	8,760 hr/yr
Control (C)		99.9%		ASSUMED
Emission Rate (ER)	Annual	0.16	tpy	E = M * (8,760/2000) * (1-C)/1

Ash System Baghouse (FS010) Parameters		Value	Units	Source
Material throughput (M)	Annual	550	lb/hr	MATERIAL BALANCE
Emission Factor (EF)		2409	tpy	8,760 hr/yr
Control (C)		99.9%		ASSUMED
Emission Rate (ER)	Annual	2.41	tpy	E = M * (8,760/2000) * (1-C)/1

Total PM_{10} Emissions				
Total PM10 Emissions from fugitive sources	Annual	24.0	tpy	Sum of Fugitive Sources

(A) Wet wood is 30% moisture; however, this emission factor is only valid for material up to a moisture content of 4.8%. This value has been used which is conservative

Table 3-6. Feedstock Dryer Emissions

Performance				
Dry wood produced		266,450	dry tpy	Dry wood from dryer
Emissions				
PM -	Emission Factor	0.72	lb/ton dry wood	AP42 Table 10.6-1
	Control	99.9%	Baghouse Efficiency	
	Emission Rate	**0.10**	tpy	Emission Rate = Emission Factor * Dry Wood Produced
PM_{10} -	Emission Factor	0.062	lb/ton dry wood	AP42 Table 10.6-1
	Control	99.9%	Baghouse Efficiency	
	Emission Rate	**0.01**	tpy	Emission Rate = Emission Factor * Dry Wood Produced

AP-42, Table 10.6-1 also provides factors for SO2, NOx, CO, and CO2 emissions for indirect dryers; however, drying is by heat exchange, there is no combustion proposed.

Table 3-7. Performance, Stack Parameters and Emissions for Auxiliary Boiler

Performance	
Fuel Usage (scf/hr-gas)	60,713
Heat Input (mmBtu/hr-HHV)	62.00
Hours per Year	500
Maximum Fuel Usage (mmscf/yr)	30.36
Stack Parameters	
Diameter (ft)	2.75
Height (ft)	50
Temperature (^{o}F)	296
Velocity (ft/sec)	81
Flow (acfm)	29,000
Emissions	
SO_2 -Basis (grains S/100 scf-gas; %S diesel)	2.00
(lb/hr)	0.35
(tpy)	0.09
NO_x - (lb/mmBtu)	0.095
(lb/hr)	5.89
(tpy)	1.47
CO - (lb/mmBtu)	0.08
(lb/hr)	4.96
(tpy)	1.24
VOC - (lb/mmBtu)	0.005
(lb/hr)	0.31
(tpy)	0.08
PM/PM10 - (lb/10^6 ft^3)	1.90
(lb/hr)	0.12
(tpy)	0.03

Table 3-8. Flare System Emissions

Parameter		Value	Units	Source/Description
Fuel Flow		19,627	lbm/hr	Gas Analysis 18-Oct -07, Solar
Energy Density		7,337	Btu/lbm	Gas Analysis 18-Oct -07, Solar, Low Heating Value of fuel
Energy Input to Flare		144	MMBtu/hr	Energy Input = Fuel Flow * Energy Density / 1,000,000
Emissions				
TOC -	Emission Factor	0.14	lb/MMBtu	AP-42 Table 13.5-1
	Emission Rate	**20.2**	lb/hr	Emission Rate = Emission Factor * Energy Input
	Emission Rate	**1.5**	tpy	Emission Rate (tpy) = Emission Rate (lb/hr) * 8760 /2000
CO -	Emission Factor	0.37	lb/MMBtu	AP-42 Table 13.5-1
	Emission Rate	**53.3**	lb/hr	Emission Rate = Emission Factor * Energy Input
	Emission Rate	**3.8**	tpy	Emission Rate (tpy) = Emission Rate (lb/hr) * 8760 /2000
NO_x -	Emission Factor	0.068	lb/MMBtu	AP-42 Table 13.5-1
	Emission Rate	**9.8**	lb/hr	Emission Rate = Emission Factor * Energy Input
	Emission Rate	**0.7**	tpy	Emission Rate (tpy) = Emission Rate (lb/hr) * 8760 /2000
SO_2 (Based on Mass	Heating Value	435.0	Btu/scf	Heating Value of Syngas @ 14.7 psia & 60°F
Balance) -	Syngas Flow	331,042.1	scf/hr	144 MMBtu * 1,000,000 / 435 btu/scf
	H2S in syngas	0.02	% by vol	Gas Analysis 18-Oct -07, Solar
	H2S Flow	66.2	scf/hr	86687 scfm * 0.0002 vol %
	gas constant	0.0029	cf-atm/mol-K	Constant
	H2S Molar Flow	79.1	g-mol/hr	n= (1 atm) * (17.34 scfm) / (0.0029 cf-atm/mol-K) / (288.7K)
	MW SO2	64.1	g/g-mol	1 mol of H2S forms 1 mol of SO2
	SO2 Mass Flow	5,072.8	g/hr	20.7 gmol/hr * 64.1 g/gmol
	SO2 Mass Flow	**11.2**	lb/hr	5072 g/hr / 453.59 g/lb
	SO2 Mass Flow	**0.8**	tpy	11.2 lb/hr * 8760 / 2000
Soot (PM) -	AP-42, Table 13.5-1--- fuels with a C:H ratio of less than 0.33 tend not to soot. The average C:H ratio in the syngas is less than 0.33.			

Table 3-9. Physical, Performance, and Emissions Data for the Mechanical Draft Cooling Towers

Parameter	Steam Turbine Cooling	Compressor Gas Cooling
Physical Data		
Number of Cells	2	3
Deck Dimensions, ft		
Length	96.5	16.4
Width	33.5	12.2
Height(Tower Height)	32.3	17.5
Stack Dimensions		
Height, ft	10.0	5.2
Stack Top Effective Inner Diameter, per cell, ft	21.5	9.0
Effective Diameter, all cells, ft	TBD	TBD
Performance Data (per cell)		
Discharge Velocity, ft/min	1,690	1,799
Circulating Water Flow Rate (CWFR), gal/min	7,050	3,800
Design hot water temperature, °F	113.7	95
Design Air Flow Rate per cell, acfm, (estimated)	1,061,664	114,386
Hours of operation	8,760	8,760
Emission Data		
Drift Rate [a] (DR), percent	0.0020	0.0050
Total Dissolved Solids (TDS) Concentration [b], average ppm	2,000	1,000
Solution Drift [c] (SD), lb/hr	70.2	94.6
PM Drift [d], lb/hr	0.14	0.09
tons/year	0.6	0.4
PM_{10} Drift[e]		
PM_{10} Emissions, lb/hr	0.09	0.08
tons/year	0.4	0.3

[a] Drift rate is the percent of circulating water.

[b] The TDS values assumed are conservative and include cycling.

[c] Includes water and based on circulating water flow rate and drift rate (CWFR x DR x 8.3 lb/gal x 60 min/hr).

[d] PM calculated based on total dissolved solids and solution drift (TDS x SD).

[e] PM_{10} based on Cooling Tower PM_{10} emissions study see Attachment A.

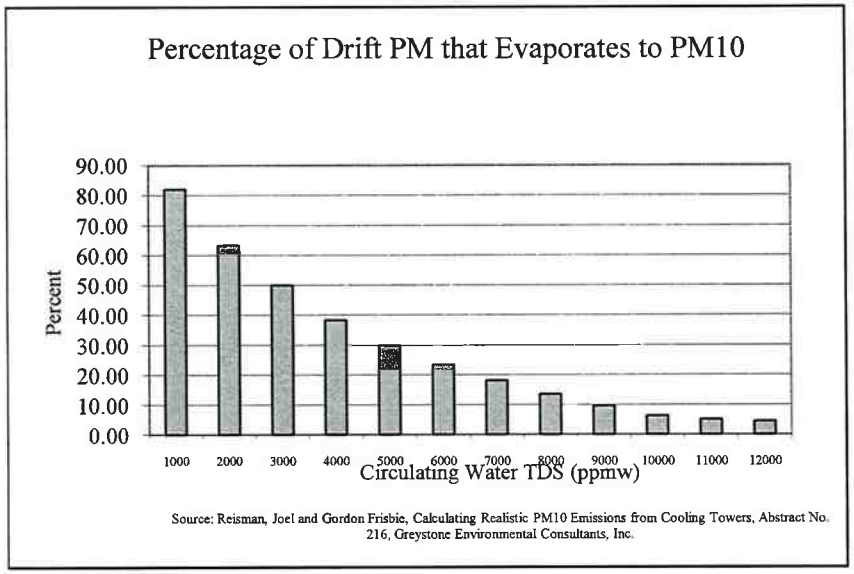
Source: Solar, 2008; Golder, 2008.

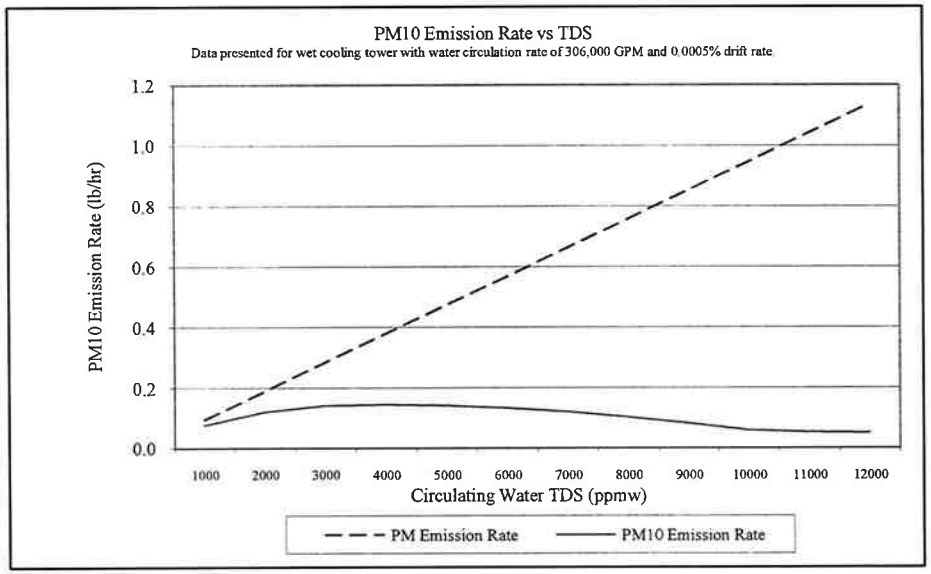
TDS (ppmw)	PM Emission Rate (lb/hr)	Percent of Emissions < or = PM10 %	PM10 Emissions (lb/hr)
1000	0.09	82.04	0.078
2000	0.19	63.50	0.120
3000	0.28	50.00	0.142
4000	0.38	38.33	0.145
5000	0.47	29.97	0.142
6000	0.57	23.59	0.134
7000	0.66	18.20	0.121
8000	0.76	13.57	0.103
9000	0.85	9.65	0.082
10000	0.95	6.28	0.059
11000	1.04	5.11	0.053
12000	1.14	4.46	0.051
25307	2.39	1.07	0.026
29000	2.74	0.82	0.023
89600	8.48	0.22	0.019

Tower Circulation Rate (GPM)	Drift Rate %
3,800	0.005

water density (lb/gal)
8.3

Calculated PM10 % < or = PM10 %
82.04
63.50
50.00
38.33
29.97
23.59
18.20
13.57
9.65
6.28
5.11
4.46
1.07
0.82
0.22





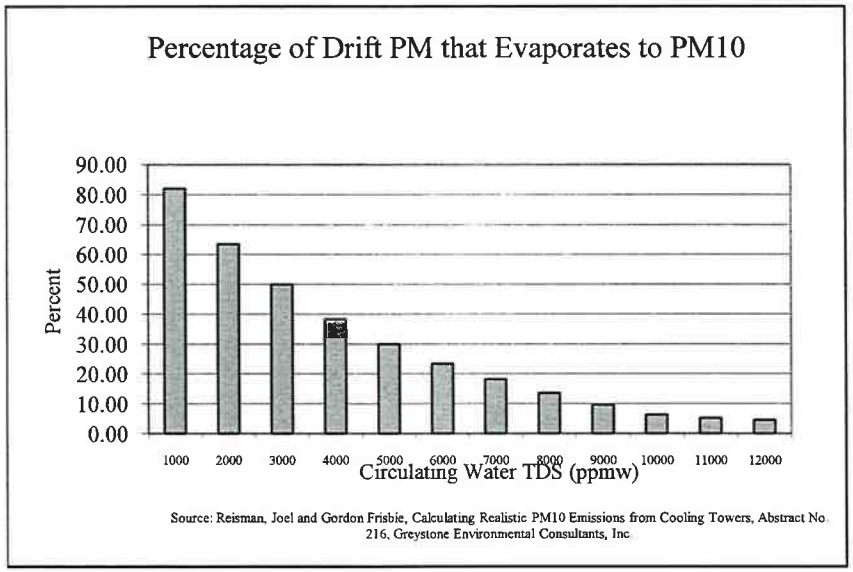
Reisman, Joel and Gordon Frisbie, *Calculating Realistic PM10 Emissions from Cooling Towers,* Abstract No. 216, Greystone Environmental Consultants, Inc.

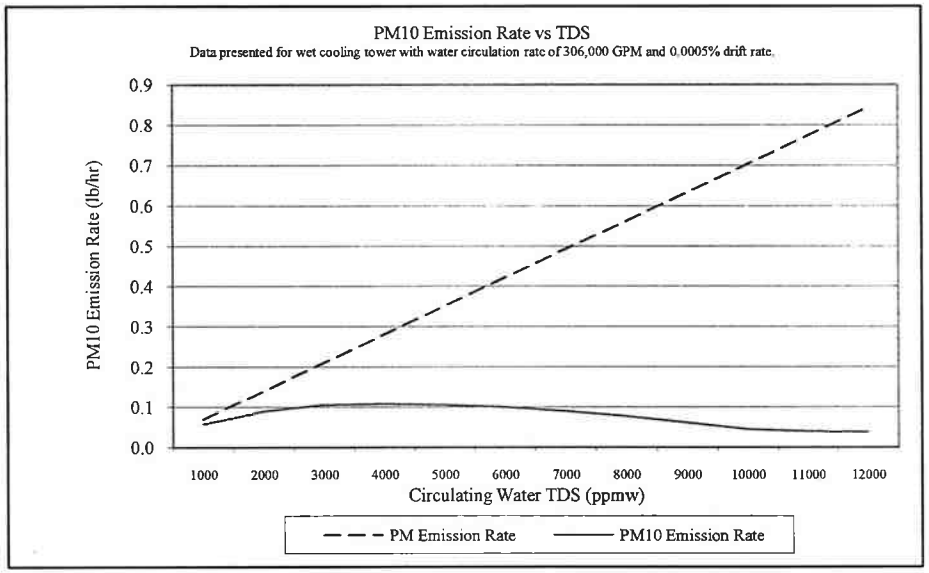
TDS (ppmw)	PM Emission Rate (lb/hr)	Percent of Emissions < or = PM10 %	PM10 Emissions (lb/hr)
1000	0.07	82.04	0.058
2000	0.14	63.50	0.089
3000	0.21	50.00	0.105
4000	0.28	38.33	0.108
5000	0.35	29.97	0.105
6000	0.42	23.59	0.099
7000	0.49	18.20	0.090
8000	0.56	13.57	0.076
9000	0.63	9.65	0.061
10000	0.70	6.28	0.044
11000	0.77	5.11	0.040
12000	0.84	4.46	0.038
25307	1.78	1.07	0.019
29000	2.04	0.82	0.017
89600	6.30	0.22	0.014

Tower Circulation Rate (GPM)	Drift Rate %
7,056	0.002

water density (lb/gal)
8.3

Calculated PM10 % < or = PM10 %
82.04
63.50
50.00
38.33
29.97
23.59
18.20
13.57
9.65
6.28
5.11
4.46
1.07
0.82
0.22





Reisman, Joel and Gordon Frisbie, *Calculating Realistic PM10 Emissions from Cooling Towers,* Abstract No. 216, Greystone Environmental Consultants, Inc.

Table ST Cooling. Resultant Solid Particulate Size Destribution (TDS = 2000 ppmw)

EPRI Droplet Diameter (um)	Droplet Volume (um3)	Droplet Mass (ug)	Particulate Mass (Solids) (ug)	Solid Particulate Volume (um3)	Solid Particulate Diameter (um)	EPRI % Mass Smaller
10	523.6	5.24E-04	1.05E-06	0.48	0.969	0.000
20	4188.8	4.19E-03	8.38E-06	3.81	1.937	0.196
30	14137.2	1.41E-02	2.83E-05	12.85	2.906	0.226
40	33510.3	3.35E-02	6.70E-05	30.46	3.875	0.514
50	65449.8	6.54E-02	1.31E-04	59.50	4.844	1.816
60	113097.3	1.13E-01	2.26E-04	102.82	5.812	5.702
70	179594.4	1.80E-01	3.59E-04	163.27	6.781	21.348
90	381703.5	3.82E-01	7.63E-04	347.00	8.719	49.812
110	696910.0	6.97E-01	1.39E-03	633.55	10.656	70.509
130	1150346.5	1.15E+00	2.30E-03	1045.77	12.593	82.023
150	1767145.9	1.77E+00	3.53E-03	1606.50	14.531	88.012
180	3053628.1	3.05E+00	6.11E-03	2776.03	17.437	91.032
210	4849048.3	4.85E+00	9.70E-03	4408.23	20.343	92.468
240	7238229.5	7.24E+00	1.45E-02	6580.21	23.250	94.091
270	10305994.7	1.03E+01	2.06E-02	9369.09	26.156	94.689
300	14137166.9	1.41E+01	2.83E-02	12851.97	29.062	96.288
350	22449297.5	2.24E+01	4.49E-02	20408.45	33.906	97.011
400	33510321.6	3.35E+01	6.70E-02	30463.93	38.749	98.340
450	47712938.4	4.77E+01	9.54E-02	43375.40	43.593	99.071
500	65449846.9	6.54E+01	1.31E-01	59499.86	48.436	99.071
600	113097335.5	1.13E+02	2.26E-01	102815.76	58.124	100.000

Calculated PM10 %	
fraction to PM10	< or = PM10 %
0.66140	63.5

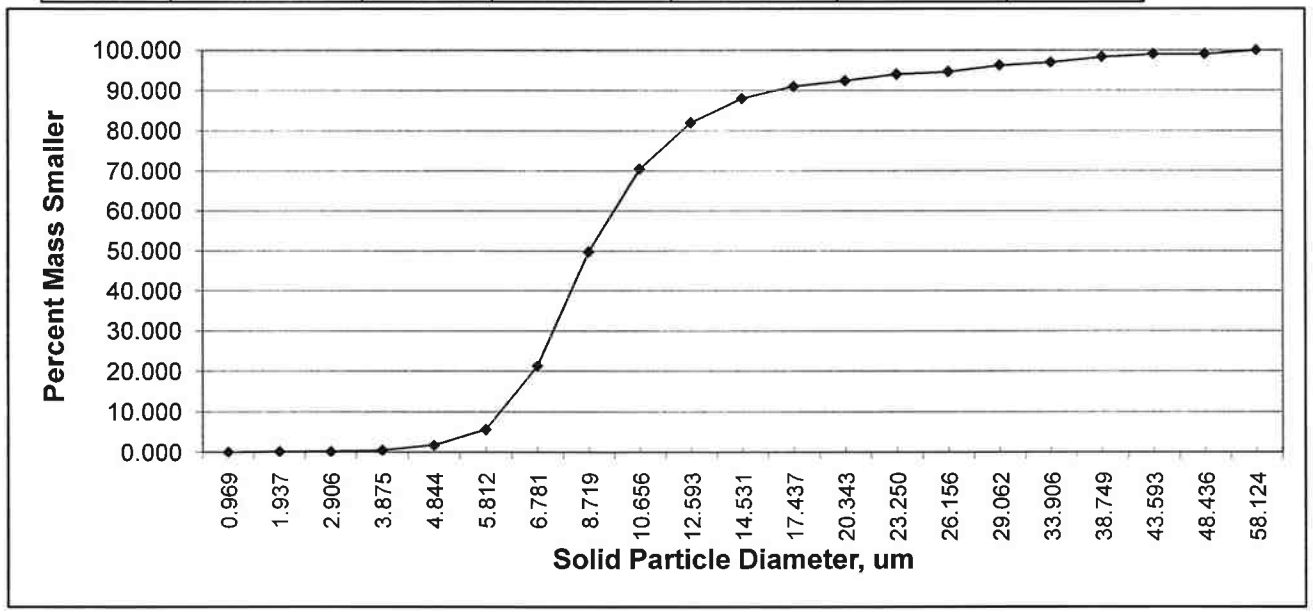
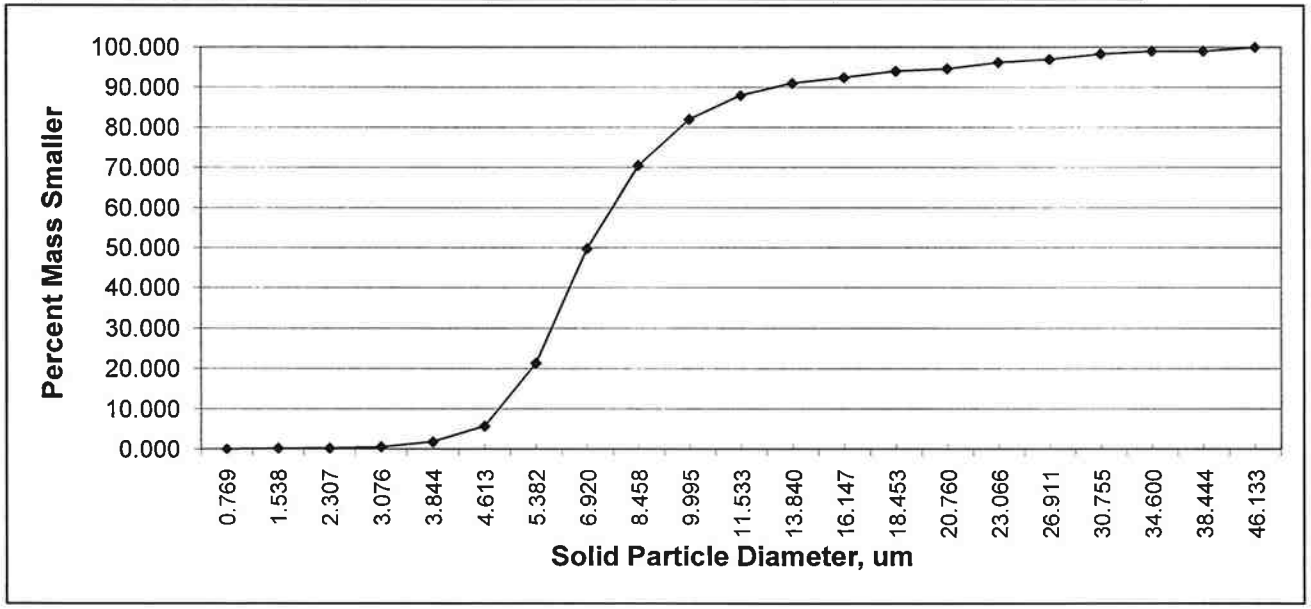
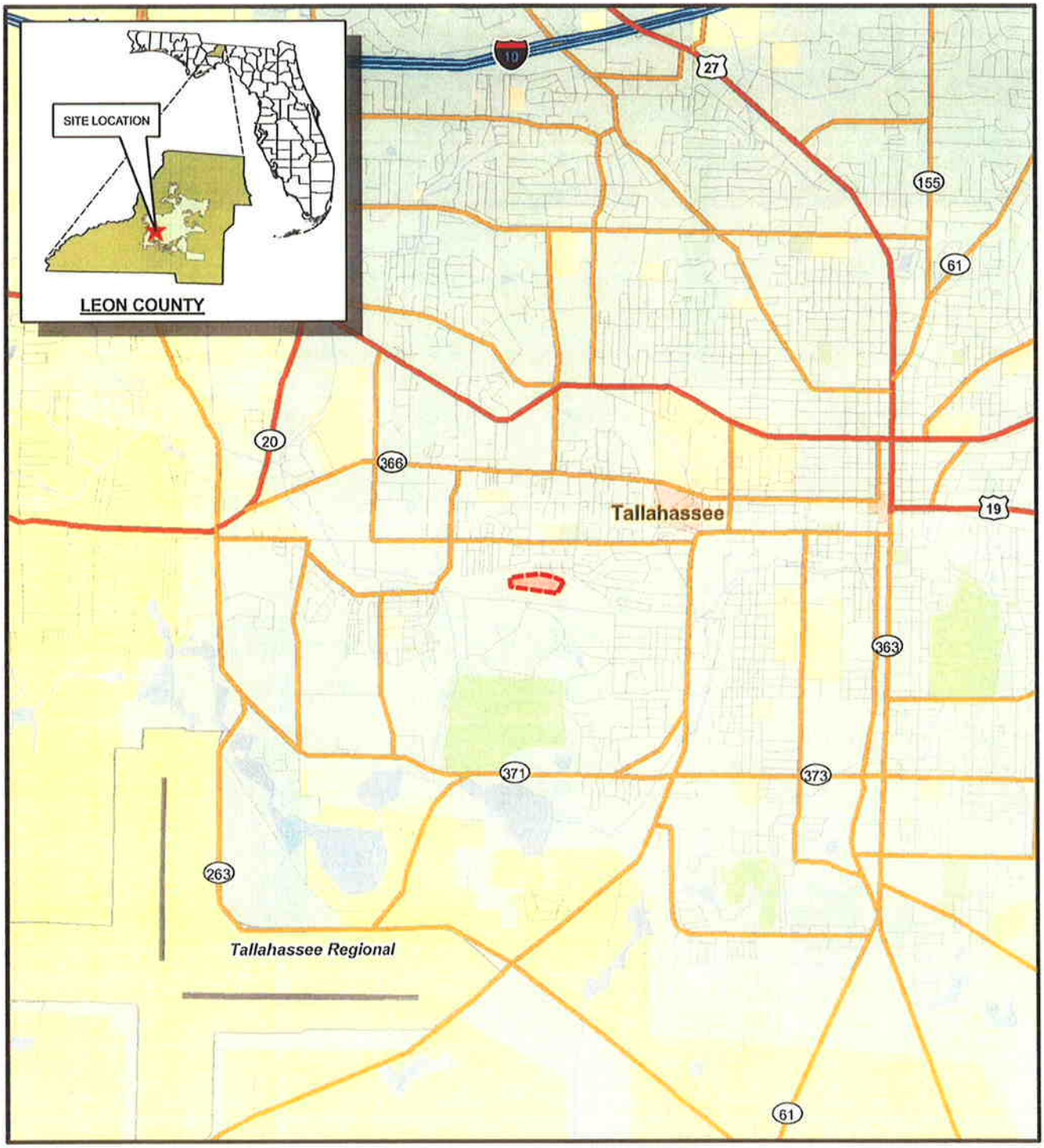


Table #. Resultant Solid Particulate Size Destribution (TDS = 1000 ppmw)

EPRI Droplet Diameter (um)	Droplet Volume (um3)	Droplet Mass (ug)	Particulate Mass (Solids) (ug)	Solid Particulate Volume (um3)	Solid Particulate Diameter (um)	EPRI % Mass Smaller
10	523.6	5.24E-04	5.24E-07	0.24	0.769	0.000
20	4188.8	4.19E-03	4.19E-06	1.90	1.538	0.196
30	14137.2	1.41E-02	1.41E-05	6.43	2.307	0.226
40	33510.3	3.35E-02	3.35E-05	15.23	3.076	0.514
50	65449.8	6.54E-02	6.54E-05	29.75	3.844	1.816
60	113097.3	1.13E-01	1.13E-04	51.41	4.613	5.702
70	179594.4	1.80E-01	1.80E-04	81.63	5.382	21.348
90	381703.5	3.82E-01	3.82E-04	173.50	6.920	49.812
110	696910.0	6.97E-01	6.97E-04	316.78	8.458	70.509
130	1150346.5	1.15E+00	1.15E-03	522.88	9.995	82.023
150	1767145.9	1.77E+00	1.77E-03	803.25	11.533	88.012
180	3053628.1	3.05E+00	3.05E-03	1388.01	13.840	91.032
210	4849048.3	4.85E+00	4.85E-03	2204.11	16.147	92.468
240	7238229.5	7.24E+00	7.24E-03	3290.10	18.453	94.091
270	10305994.7	1.03E+01	1.03E-02	4684.54	20.760	94.689
300	14137166.9	1.41E+01	1.41E-02	6425.98	23.066	96.288
350	22449297.5	2.24E+01	2.24E-02	10204.23	26.911	97.011
400	33510321.6	3.35E+01	3.35E-02	15231.96	30.755	98.340
450	47712938.4	4.77E+01	4.77E-02	21687.70	34.600	99.071
500	65449846.9	6.54E+01	6.54E-02	29749.93	38.444	99.071
600	113097335.5	1.13E+02	1.13E-01	51407.88	46.133	100.000

Calculated PM10 %	
fraction to PM10	< or = PM10 %
0.00296	82.0





LEGEND

Project Location

0 5,000 10,000 Feet

1 Inch equals 5,000 feet

N

PROJECT
BG&E
LEON COUNTY, FLORIDA

TITLE
PROJECT SITE LOCATION

DRAFT

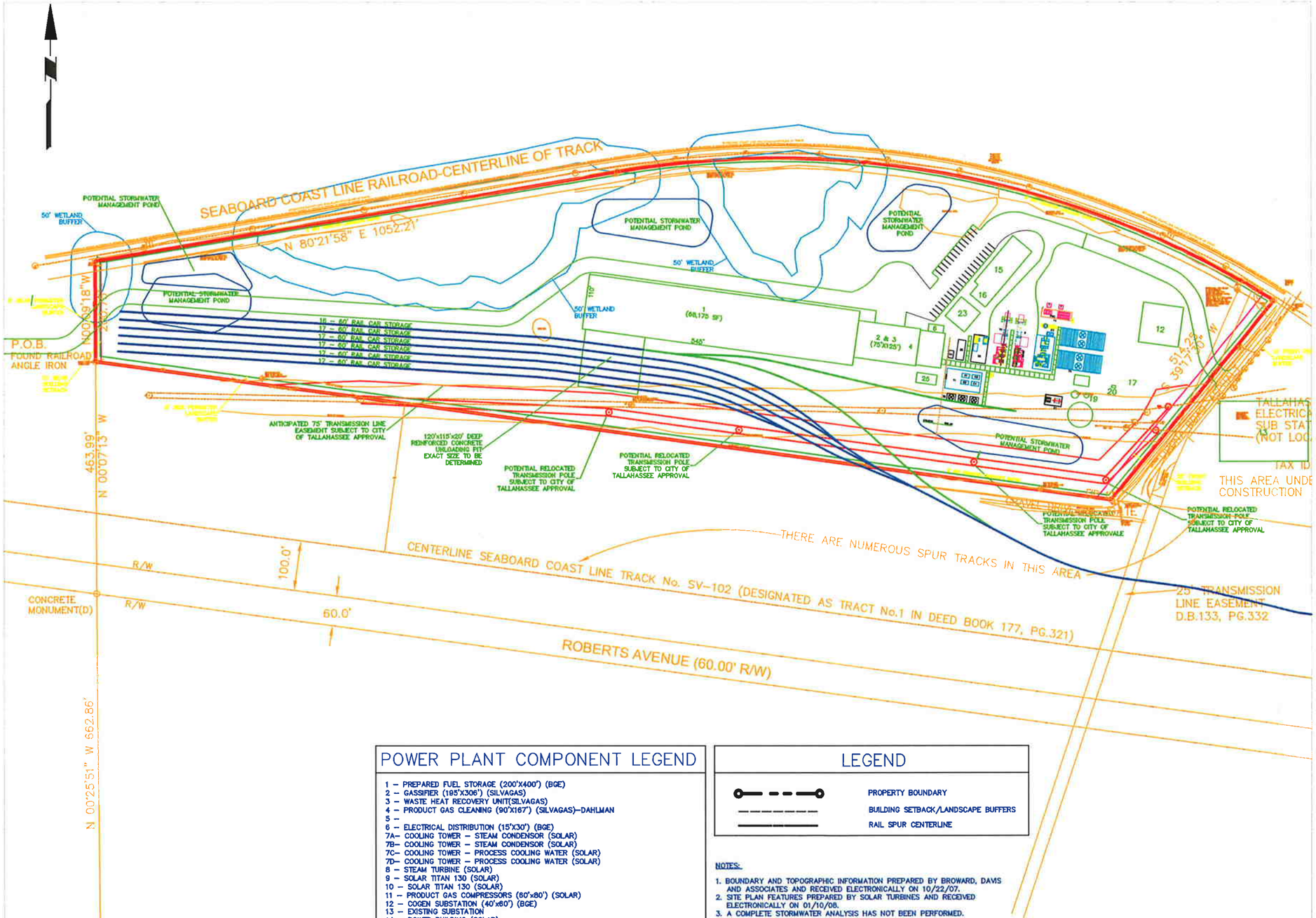
REFERENCES

1. County boundaries - Florida Department of Environmental Protection
2. Roads & Railroads - ESRI StreetMap

Golder Associates
Tampa, Florida

PROJECT No 073-89524			SCALE AS SHOWN	REV 0
DESIGN	PB	01/30/08		
GIS	PB	01/30/08		
CHECK	RZ	01/30/08		
REVIEW	RZ	01/30/08		

FIGURE 2-1



POWER PLANT COMPONENT LEGEND

1 – PREPARED FUEL STORAGE (200'X400') (BGE)
2 – GASSIFIER (195'X306') (SILVAGAS)
3 – WASTE HEAT RECOVERY UNIT(SILVAGAS)
4 – PRODUCT GAS CLEANING (90'X167') (SILVAGAS)–DAHLMAN
5 –
6 – ELECTRICAL DISTRIBUTION (15'X30') (BGE)
7A– COOLING TOWER – STEAM CONDENSOR (SOLAR)
7B– COOLING TOWER – STEAM CONDENSOR (SOLAR)
7C– COOLING TOWER – PROCESS COOLING WATER (SOLAR)
7D– COOLING TOWER – PROCESS COOLING WATER (SOLAR)
8 – STEAM TURBINE (SOLAR)
9 – SOLAR TITAN 130 (SOLAR)
10 – SOLAR TITAN 130 (SOLAR)
11 – PRODUCT GAS COMPRESSORS (60'x80') (SOLAR)
12 – COGEN SUBSTATION (40'x60') (BGE)
13 – EXISTING SUBSTATION
14 – POWER BUILDING (SOLAR)
15 – OFFICE (50'x120') (BGE)
16 – MAINTENANCE BUILDING (BGE)
17 – FIREWATER TANK (20'DIA.) (BGE)
18 – STORM WATER RETENTION POND (BGE)
19 – WATER TREATMENT BUILDING & TANKS (SOLAR)
20 – FIRE WATER PUMP (DIESEL) & FIRE WATER JOCKEY PUMP (BGE)
21 – 13.8 SWITCHGEAR BUILDING
22 – AMMONIA BULK STORAGE
23 – FSU BUILDING (50'X100')

LEGEND

PROPERTY BOUNDARY
BUILDING SETBACK/LANDSCAPE BUFFERS
RAIL SPUR CENTERLINE

NOTES:

1. BOUNDARY AND TOPOGRAPHIC INFORMATION PREPARED BY BROWARD, DAVIS AND ASSOCIATES AND RECEIVED ELECTRONICALLY ON 10/22/07.
2. SITE PLAN FEATURES PREPARED BY SOLAR TURBINES AND RECEIVED ELECTRONICALLY ON 01/10/08.
3. A COMPLETE STORMWATER ANALYSIS HAS NOT BEEN PERFORMED.

REV	DATE	DRWN BY	CHKD BY	APVD BY	DESCRIPTION

REVISIONS

Ford, Bacon & Davis
A Limited Liability Company

BIOMASS POWER PLANT

FB&D JOB NUMBER: Y7211
SCALE: NO SCALE
DATE: 03/12/08
DRAWN BY: K. SCRUGGS

CONCEPTUAL SITE PLAN

REV. A

Figure 2-2.

Project Site Layout

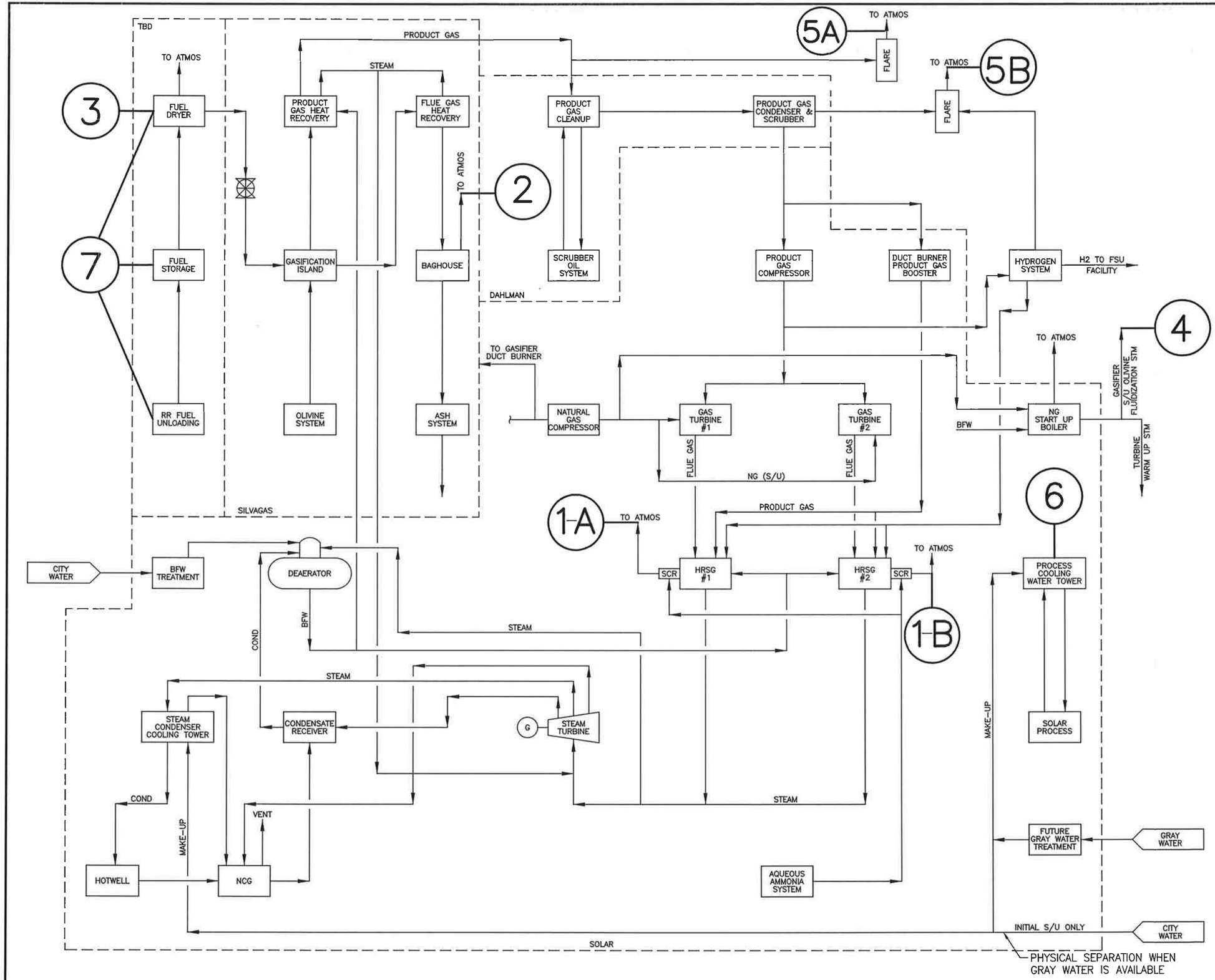


FIGURE 2–3
PROJECT PROCESS SCHEMATIC

REV	DATE	DRWN BY	CHKD BY	APVD BY	DESCRIPTION
A	03/13/08				FOR INFORMATION

REVISIONS

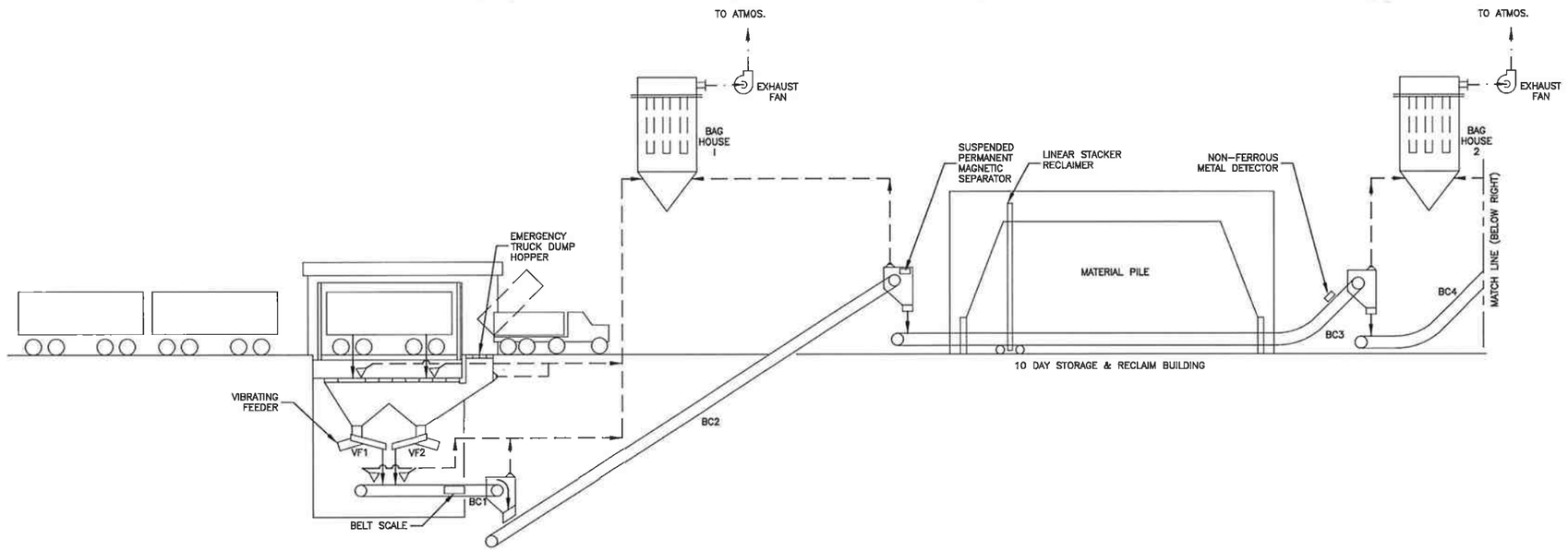
Ford, Bacon & Davis
A Limited Liability Company

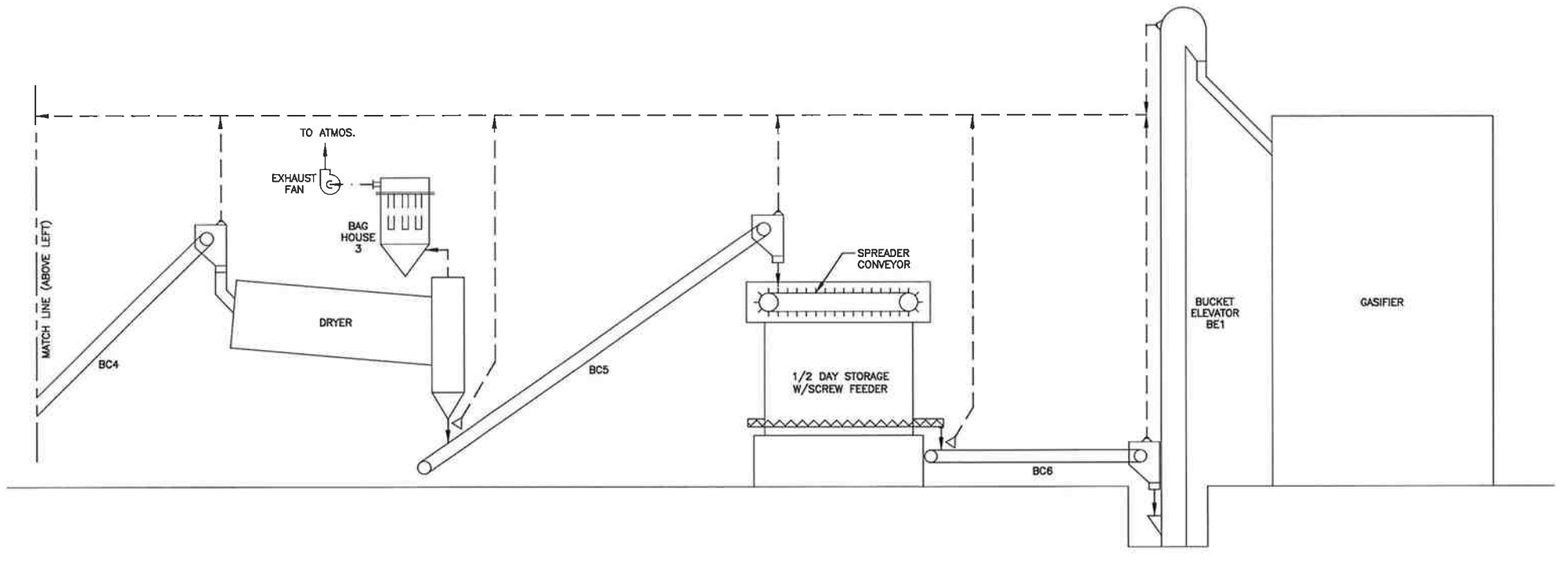
BG&E TALLAHASSEE PLANT
PROJECT FLOW SCHEMATIC

FB&D JOB NUMBER: Y7211
SCALE: NO SCALE
DATE: 03/03/2008
DRAWN BY: S. MURPHREE

PFD–ALL AREAS–01

REV. A





LEGEND

- MATERIAL FLOW
- DUST COLLECTION
- EXHAUST AIR

NOTES

1.) INFORMATION PROVIDED IN THIS DRAWING IS FOR CONCEPTUAL PURPOSE ONLY, NOT FOR CONSTRUCTION.

2.) ALL CONVEYORS SHALL HAVE COVERS TO PROVIDE WIND AND RAIN PROTECTION.

3.) NOT ALL EQUIPMENT ARE SHOWN ON THIS DRAWING.

4.) COMPRESSED AIR REQUIRED FOR BAG FILTER CLEANING IS NOT SHOWN.

5.) DUST HOODS TO BE INSTALLED AT BELT CONVEYOR HEAD PULLEYS AND TRANSFER POINTS. DUST HOOD EXHAUST TO BE CONNECTED TO DUST COLLECTOR SYSTEMS. DUST HOODS TO BE EQUIPPED WITH RUBBER SKIRTS AND CURTAINS TO MINIMIZE FUGITIVE DUST EMISSIONS.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RW

PROJECT

BIOMASS GAS & ELECTRIC
TALLAHASSEE PROJECT ROBERTS ROAD TRACT
LEON COUNTY, FLORIDA

TITLE

MATERIAL HANDLING PROCESS SCHEMATIC

Golder Associates
Conshohocken PA

PROJECT No.		073-89628	FILE No.		0738962BA001
DESIGN	PSM	02/28/03	SCALE	NONE	REV. 0
CADD	YPW	02/28/08			
CHECK	PSM	03/31/08			
REVIEW	KGK	03/31/08			

FIGURE 2-4