South Valley Recycling & Renewable Power Facility
8800 South 700 West
Sandy, Utah 84070
Salt Lake County

Notice of Intent (NOI)

Navitus Sustainable Industries
2825 East Cottonwood Parkway, Suite 500
Salt Lake City, Utah 84121

March 2014

Utah Division of Air Quality
New Source Review Section

Date 3/10/14

Form 1
Notice of Intent (NOI)

Application for: ☒Initial Approval Order ☐Approval Order Modification

APPROVAL ORDER MUST BE ISSUED BEFORE ANY CONSTRUCTION OR INSTALLATION CAN BEGIN. This is not a stand alone document; please refer to UAC R307-401and the published NOI guidebook for information on requirements of the specified information below. Please print or type all information requested. All outlined information requested must be accurate and completed before DAQ can determine that an NOI is complete and an engineering review can be initiated. If you have any questions, contact the Division of Air Quality at (801) 536-4000 and ask to speak with a New Source Review Engineer. Written inquiries may be addressed to: Division of Air Quality, New Source Review Section, P.O. Box 144820, Salt Lake City, Utah 84114-4820.

General Owner and Facility Information	R307-401-5(2)(k)
1. Filing Fee Paid*	2. Application Fee Paid*
3. Company name and address: Navitus Sustainable Industries 2825 East Cottonwood Parkway, Suite 500 Salt Lake City, Utah 84121 Phone No.: 801-205-6680 Fax No.:	4. Company** contact for environmental matters: Heidi Thorn Phone no.: 801-205-6680 Email: heidi.thorn@navitusrenewables.com *** Company contact only; consultant or independent contractor contact information can be provided in a cover letter*
5. Facility name and address (if different from above): South Valley Recycling & Renewable Power Facility 8800 South 700 West Sandy, Utah 84070 Phone no.: Fax no.:	6. Owners name and address: Navitus Sustainable Industries 2825 East Cottonwood Parkway, Suite 500 Salt Lake City, Utah 84121 Phone no.: 801-990-1246 Fax no.:
7. Property Universal Transverse Mercator coordinates (UTM), including System and Datum: Easting: 423,132 Northing: 4,493,846 System: UTM Zone 12 Datum: NAD27	8. County where the facility is located in: Salt Lake 9. Standard Industrial Classification Code: 4911

10. Designation of facility in an attainment, maintenance, or nonattainment area(s):

SL Co Ozone Maint Area
SL Co PM10 NAA
SL Co PM2.5 NAA
SL Co SO2 NAA

11. If request for modification, AO# to be modified: DAQE# Date:

12. Identify any current Approval Order(s) for the facility **not** being modified with this request:

AO# Date
AO# Date
AO# Date
AO# Date

13. Application for:

☒New construction
☐Existing equipment operating without permit
☐Change of permit condition
☐Modification
☐Permanent site for Portable Approval Order
☐Change of location

14. Construction or modification estimated start date:9/1/14 Estimated completion date:9/1/15

R307-401-5(2)(h)

15. Does this application contain justifiable confidential data? ☐Yes ☒ No

16. Current Title V (Operating Permit) Identification: Date

☐Requesting an enhanced Title V permit with this AO modification

17. Brief (50 words or less) description of project to post on DAQ web for public awareness
Navitus is proposing to construct and operate an industrial/MSW byproduct recovery facility to manufacture synthetic gas and generate electricity from renewable resources

Process Information

18. Appendix A: Detailed description of project including process flow diagram (See Forms 2-23)

☒Fuels and their use
☒Equipment used in process
☒Description of product(s)
☒Raw materials used
☐Description of changes to process (if applicable)
☒Stack parameters
☒Operation schedules
☒Production rates (including daily/seasonal variances)

R307-401-5(2)(a)

19. Appendix B: Site plan of facility with all emission points and elevations, building dimensions, stack parameters included

R307-401-5(2)(e)

Emissions Information

20. Appendix C: Emission Calculations that must include:
    - ☒Emissions per new/modified unit for each of the following: PM_{10}, $PM_{2.5}$, NO_x, SO_x, CO, VOC, and HAPs
    - ☒Designation of fugitive and non fugitive emissions
    - ☐Major GHG Sources: Emissions per new/modified unit for GHGs (in CO_2e short tons per year)
    - ☒References/assumptions for each Emission Factor used in calculating Criteria pollutant, HAP, and GHG emissions
    - ☒HAP emissions (in pounds per hour and tons per year) broken out by specific pollutant and summed as a total

    R307-401-5(2)(b)

21. Appendix D: DAQ Form 1a or equivalent (comparison of existing emissions to proposed emission and resulting new total emissions)

22. Appendix E: Source Size determination (Minor, Synthetic Minor, Major, or PSD)
    - ☐ If an Existing Major Source: Determination of Minor, Major or PSD modification

23. Appendix F: Offset requirements (nonattainment/maintenance areas)
    - ☐Acquired required offsets

    R307-401-420 & R307-401-421

Air Pollution Control Equipment Information

24. Appendix G: Best Available Control Technology (BACT) analysis for the proposed source or modification

    R307-401-5(2)(d)

25. Appendix H: Detailed information on all new/modified equipment controls. It is strongly recommended using DAQ forms as they outline required information, but something equivalent to the DAQ forms is acceptable.

    R307-401-5(2)(c)

26. Appendix I: Discussion of Federal/State requirement applicability (NAAQS, SIP, NSPS, NESHAP, etc)

Modeling Information

27. Appendix J: Emissions Impact Analysis (if applicable) R307-410-4

Electronic NOI

28. A complete and accurate electronic NOI submitted

    R307-401-5(1)

I hereby certify that the information and data submitted in and with this application is completely true, accurate and complete, based on reasonable inquiry made by me and to the best of my knowledge and belief.

Signature: Title:

Name (print)	Telephone Number:	Date:

with the exception of Federal Agencies who will be billed at completion of the project

Appendix A
Project Description

Facility Description and Equipment List

Navitus Sustainable Industries (Navitus) proposes to construct, own and operate an industrial byproduct recovery facility to manufacture methane gas and generate electricity from renewable resources. The facility will process 350 tons per day of mixed municipal solid waste (MSW) and mixed industrial waste. The facility will be located in Salt Lake County, 8000 South 700 West, Sandy, Utah 84070. The facility will be operated under the name of South Valley Recycling & Renewable Power Facility.

Components of the South Valley Recycling & Renewable Power Facility are detailed in the following Appendices. Figure 1 provides the project Process Flow Diagram. A large portion of the South Valley Recycling & Renewable Power Facility will be housed within an enclosed, indoor air controlled, and sprinkler equipped structure.

A.1 Process Description

The primary feedstock for the facility will be mixed MSW and mixed industrial waste. On an annual average, MSW will make up approximately 70 percent of the feedstock. The remaining of the feedstock may consist of mixed industrial waste, land clearing debris, C&D, and yard waste.

The South Valley Recycling & Renewable Power Facility will gasify the non-recyclable feedstock. The material will not be directly combusted; instead, a thermal chemical process, which is oxygen starved, converts the feed material into a synthetic gas (syngas) consisting of 90 percent methane gas and other hydrocarbons.

The syngas (methane gas) is then fed to an internal combustion engine to generate electricity to sale to the local utility grid.

Table 1 lists the equipment used in the process.

Table 1- Equipment List:

Equipment	Equipment ID
Truck Weigh Station	TWS1
Tipping Floor	TFI1
Material Recovery Facility System	MRF1
Grinder	GRIN1
Feedstock Storage Bin	FSB1
Prepared Fuel Biomass Dryers- 2 units	FBD1 FBD2
Full Enclosure Belt Conveyor Feed System	CONYS1
Thermal Chemical Conversion Reactor System equipped with Heater Assembly - 7 units	TCR1/HAB1 TCR2/HAB2 TCR3/HAB3 TCR4/HAB4 TCR5/HAB5 TCR6/HAB6 TCR7/HAB7
Syngas Storage Day Tank	SDT1
Cat 3520C Internal Combustion Engine (Lean Burn)- 4 units	ICENG1 ICENG2 ICENG3 ICENG4
Electrical Generating Equipment	EGE
Emergency Power Generator (Diesel Fuel)	EX-GEN1
Fire Water Pump Engine (Diesel Fuel)	EX-FIPU1
Emergency Flare	EX-FLARE1
Dust Collection Bag Filter System	DUCOLL1
Pollution Control System- SCR for NOx	SCR1
Pollution Control System- Catalytic System for CO, VOC and HAPS	CCS1

A.2 Feedstock Receiving and Storage

Mixed MSW and mixed industrial waste will arrive at the facility via truck to the tipping floor of the material recovery facility system. The mixed preprocessed industrial waste will be stored within an enclosed vented and sprinkler equipped structure. The material recovery facility area will include equipment for storage, handling, grinding and screening of the feedstock.

To help control fugitive particulate matter (PM) emissions all feedstock will be stored in within the enclosed, indoor air controlled, and sprinkler equipped building. The associated conveyer equipment will be enclosed. To help control odors, the enclosed

MSW storage area will be sized to accommodate a maximum of two days worth of MSW feedstock.

Trucks delivering the feedstock will be accepted on a twelve hours per day, seven days per week basis, excluding holidays. Feedstock truck trips are estimated to be less than 20 trips daily. Front- end loaders will be used to maneuver the materials from the tipping floor to the material recovery facility system (MRF) including storage and processing areas. To further reduce fugitive particulate matter (PM), an internal dust collection system will be installed equipped with a baghouse. The baghouse will not vent to the outdoors.

The MRF handling area will include a feedstock grinder since the gasifier requires the feedstock to be reduced in size (less than or equal to 2 inch minus) so as to produce sufficient surface area to allow the prepared fuel biomass (PFB) to be fully consumed during the residence time of the thermo chemical conversion reaction.

A.3 Thermal Chemical Reactor and Heater Assembly

Navitus has chosen the Tucker Engineering Associates, Inc., Tucker Advanced Pyrolysis™ or the TEA Process Technology. The TEA Process Technology consists of a patented advanced pyrolysis system (oxygen starved). The TEA Process Technology employs proprietary leading edge control systems to sequester noxious elements and produces a clean, combustible gas, consisting primarily of methane.

The TEA Process Technology unit measures 8' wide x 16' long by 10' tall. The heater assembly, which contains the burners, provides (external to the reactor) a controlled temperature zone throughout. The burners are initially fired with propane at startup and as needed for temperature stabilization, and reactor product gas (methane), which is derived from the thermal chemical conversion of the PFB. The methane gas will be the primary fuel used during normal process operations. The heater assembly has a single flue stack for discharge of the combustion gases to the inlet of the CAT 3520C engine. Seven (7) TEA Process Technology units will be installed.

The PFB begins the process of molecular disassociation as it nears the reactor chamber. The majority (greater than 90%) of the PFB material converts into methane. The thermo chemical reactor process uses additives and a catalytic process to preferentially form the methane. The thermo chemical reactor is continuous fed at a rate of 3,000 pounds per hour utilizing an enclosed screw conveyor and double bladed isolation valve. A triple-pass retort furnace with 3-propane/reactor product gas (methane) fired burners heats the PFB to temperatures between 1600^0F and 1800^0F. The heating process releases water vapor and organic gases that flow from the retort into a water-cooled condenser. In the condenser, water vapor and condensable hydrocarbons are re-introduced into the thermo chemical reactor.

The cooled fuel gas is then put through a coalescing filter to remove any entrained liquids prior to delivery to the engine.

The remaining material turns into char (solid carbonaceous material remaining when light gases have been driven out). The char is collected at the bottom of the reactor for later reuse or disposal. Laboratory testing has shown the char to be inert.

In case of an upset or emergency condition, controls are installed to shut down the TEA Process Technology unit. However, there will be a bypass line to an emergency enclosed flare with a natural gas pilot light. Expecting this flare to rarely be used, Navitus anticipates operation of the emergency enclosed flare to be less than 50 hours per year.

A.4 Engine Generator Set

The Caterpillar 3520C engine is designed to run on traditional fossil fuels like natural gas. For the South Valley Recycling & Renewable Power Facility the Cat3520C the manufacturer to use reactor produced methane gas, which has very similar characteristics to natural gas, modifies engine. Caterpillar will certify the CAT 3520C engine as an engine meeting Tier 4 emissions standards. Four (4) CAT 3520C engines will be installed.

The Caterpillar 3520C engine turns the generator and creates electricity. The Caterpillar 3520C engine has an electrical generating capacity of 1.6 MW of renewable energy on a continuous basis (base load) with availability in excess of 85 percent.

Combustion of the methane gas will occur inside of the engine. As a result, combustion emissions will be created. These emissions will be delivered to pollution control equipment and vented to the atmosphere. The emission source is identified as emission source ES-01.

In case of an upset or emergency condition, controls are installed to shut down the CAT3520C engines. However, there will be a bypass line to an emergency enclosed flare with a natural gas pilot light. Expecting this flare to rarely be used, Navitus anticipates operation of the emergency enclosed flare to be less than 50 hours per year.

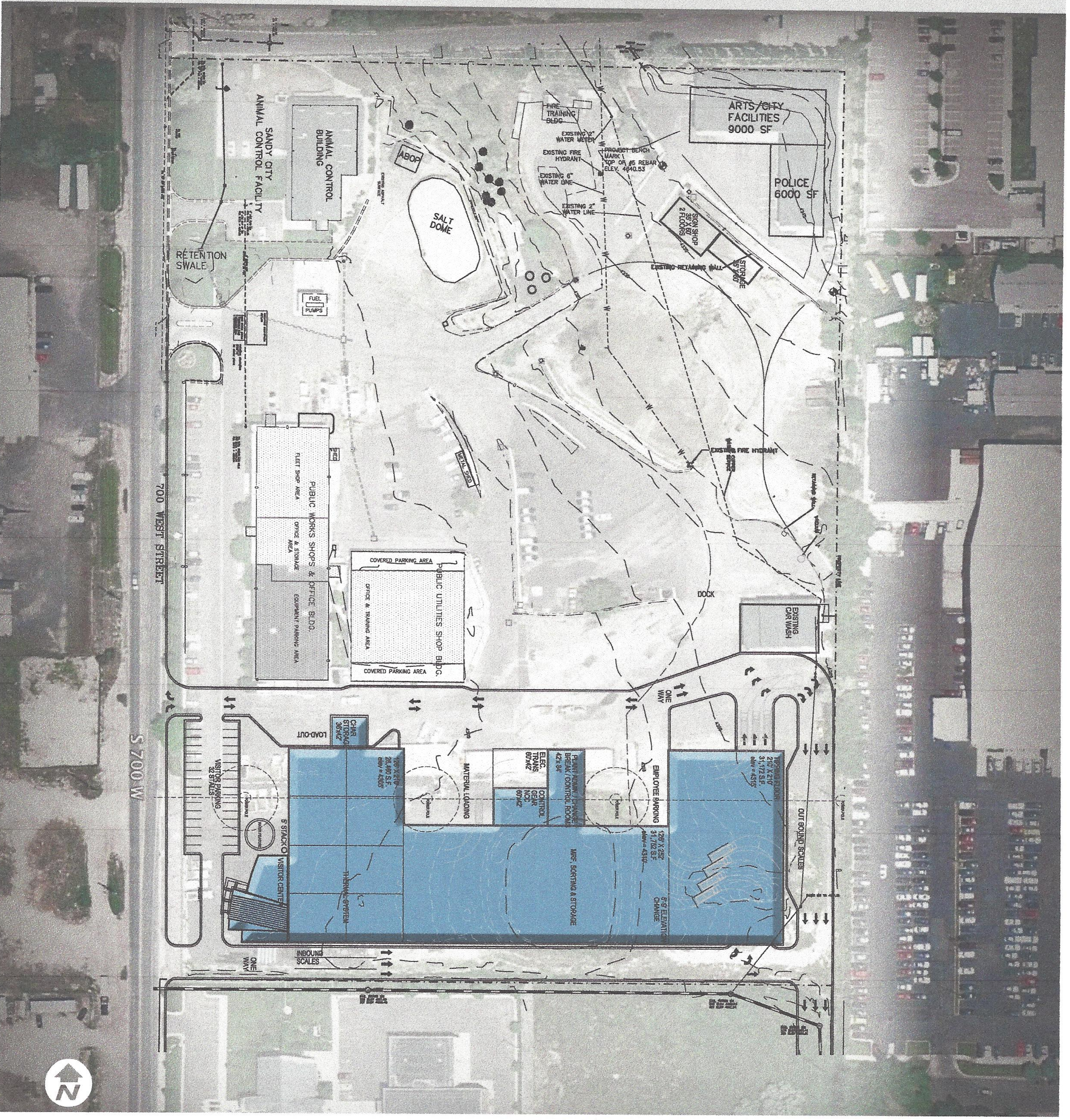
CAT 3520C engine and associated engine controls specifications are provided in Attachment C.

Appendix B- Facility Drawings

NAVITUS
SUSTAINABLE INDUSTRIES

SOUTH VALLEY RECYCLING & RENEWABLE POWER FACILITY

8800 SOUTH 700 WEST - SANDY, UTAH



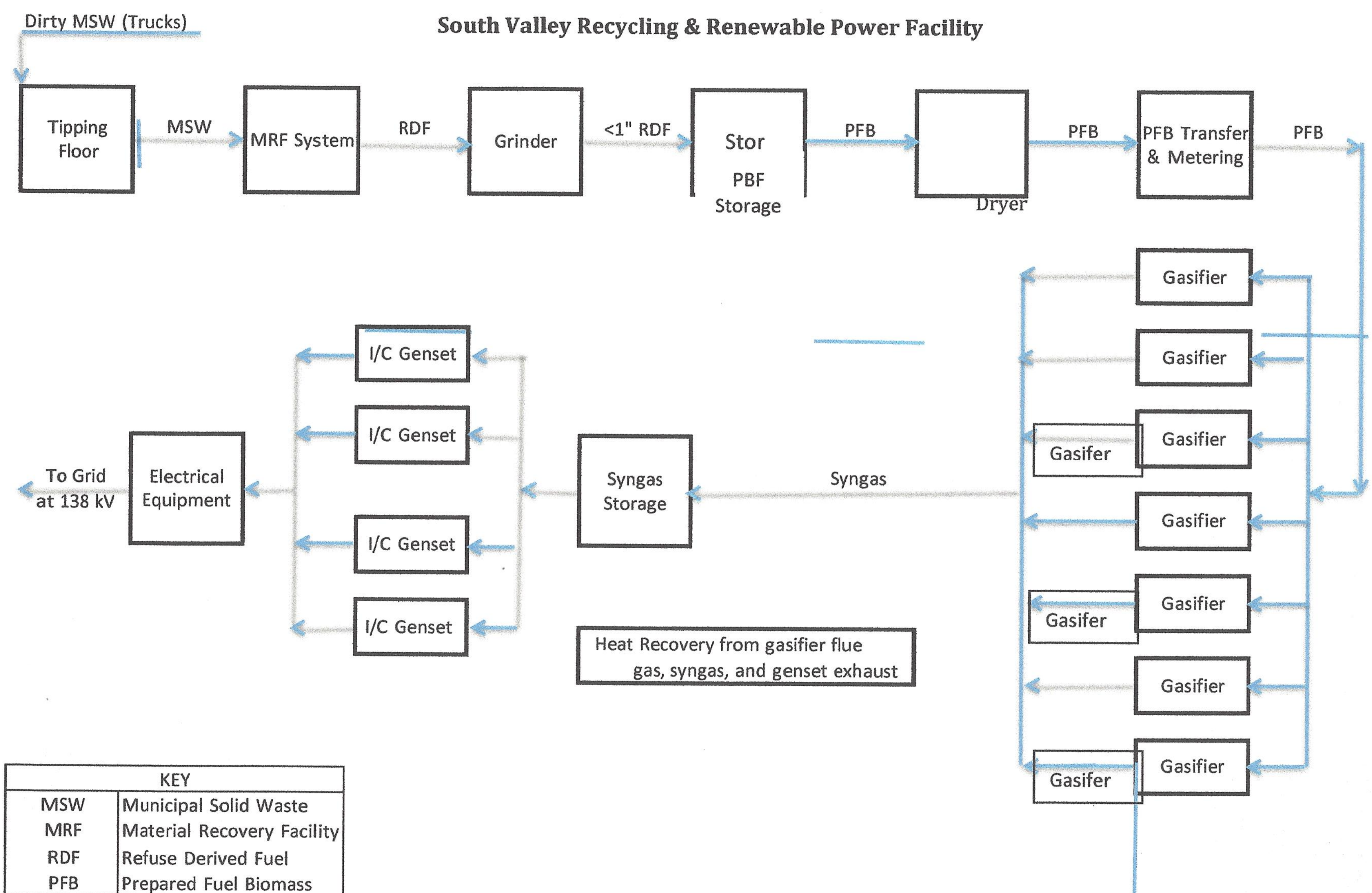
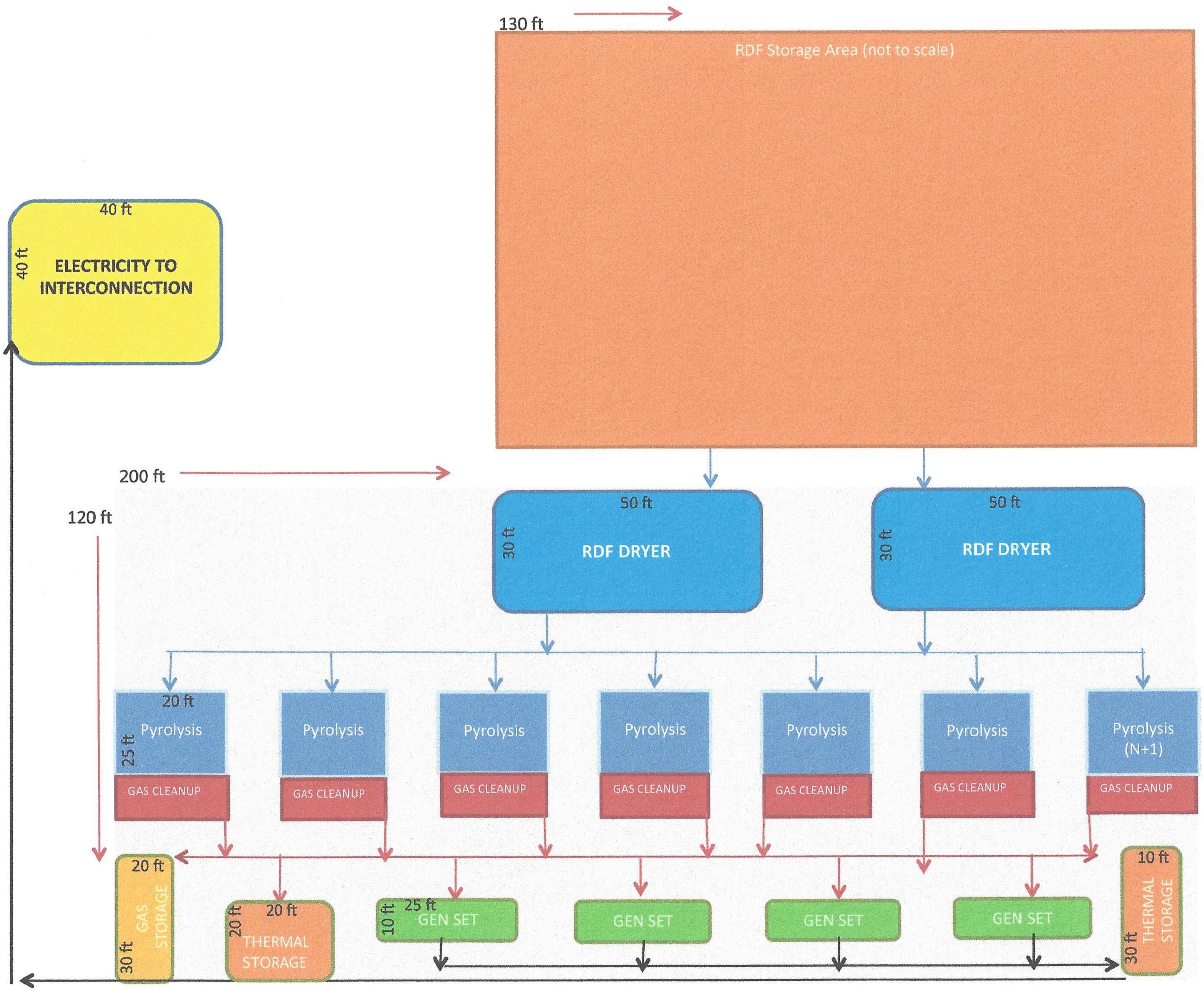


Figure 2 Process Flow Diagram

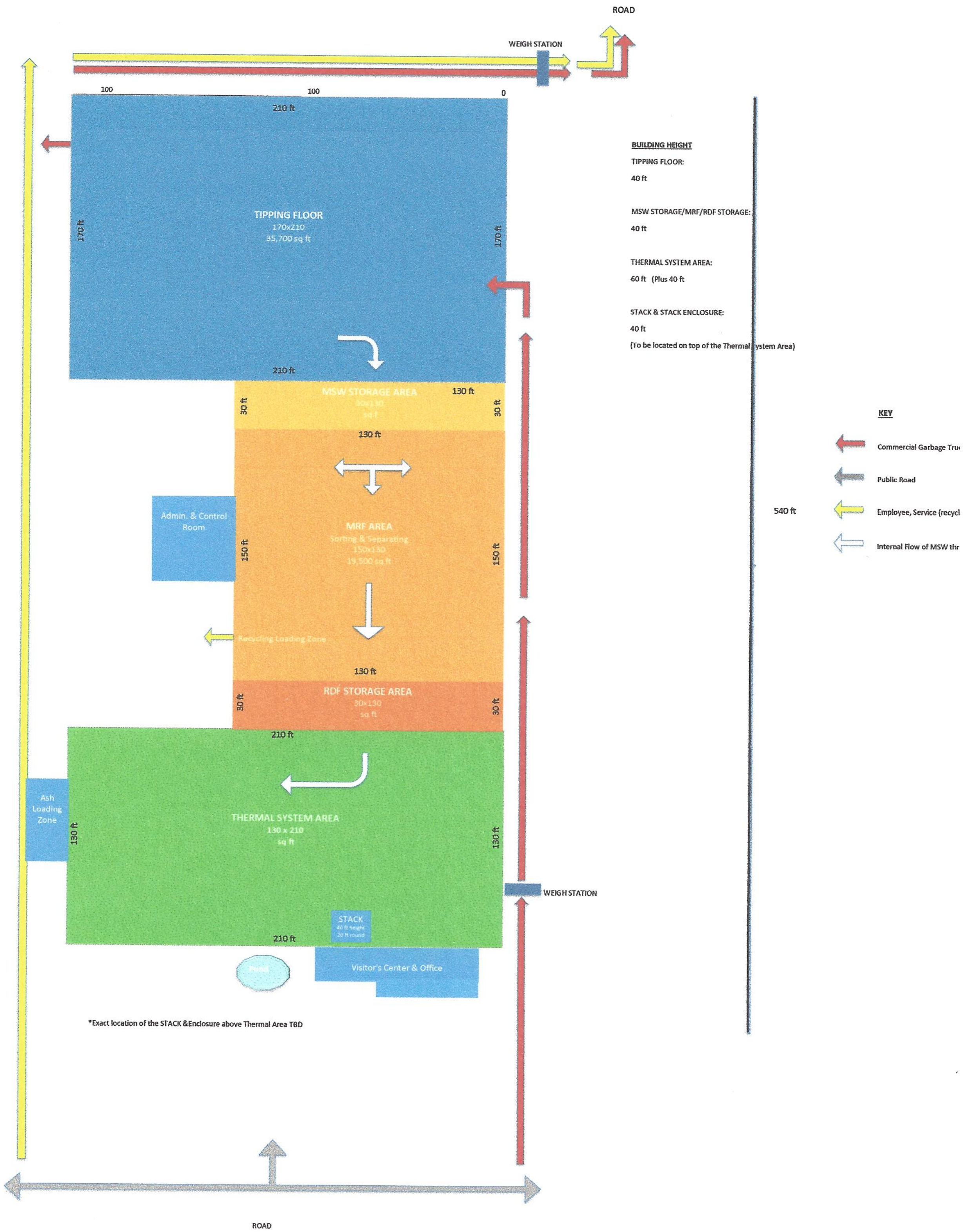
THERMAL SYSTEM LAYOUT

24,000 sq ft



South Valley Sustainability Campus

Navitus



Appendix C- Emission Calculations

NEPAC

CLIENT	PROJECT	JOB NO.
Navitus Sustainable Industries	Sandy, UT Plant	1081620214

SUBJECT	BY	DATE
Cat 3520C Uncontrolled One EngineEmission Calculations NOx, CO, PM	G. NAMIE	3/3/14
	CHECKED: G. NAMIE	DATE: 3/3/14

OBJECTIVE: Calculate emissions based on a Methane Gas flow rate and engine characteristics

APPROACH: Use manufacturer data and previously established BACT limits and emission factors

SOLUTION:

(1) NOx Emissions

NOx emission factor =	0.500	g/bhp-hr	Manufacturer Guarantee (CAT 3520C)
Engine bhp =	2,233	bhp	
Hours of operation =	8,760	hr/yr	

CM_{NOx} = (0.5 g/bhp-hr) * (2,233 bhp) / (453.6 g/lb)

CM_{NOx} = **2.46 lb/hr NOx**

CM_{NOx} = (2.46 lbs/hr) * (8,760 hr/yr) = **21,562 lb/yr NOx**

CM_{NOx} = (21,562 lb/yr) / (2,000lb/ton) = **10.78 tn/yr NOx**

(2) CO Emissions

CO emission factor =	2.000	g/bhp-hr	Manufacturer Guarantee (CAT 3520C)
Engine bhp =	2,233	bhp	
Hours of operation =	8,760	hr/yr	

CM_{CO} = (2.0 g/bhp-hr) * (2,233 bhp) / (453.6 g/lb)

CM_{CO} = **9.85 lb/hr CO**

CM_{CO} = (9.85 lb/hr) * (8,760 hr/yr) = **86,248 lb/yr CO**

CM_{CO} = (86,248 lb/yr) * (2,000lb/ton) = **43.12 tn/yr CO**

(3) PM Emissions

PM emission factor =	0.0000771	lb/mmBTU	AP-42, Section 3.2, Table 3.2-3
Engine bhp	235,181	BTU/min	
Hours of operation =	8,760	hr/yr	

CM_{PM} = (0.0000771 lb/mmBTU)*(235,181 BTU/min)*(1 mmBTU/10^6)*60 min) =

CM_{PM} = **0.0011 lb/hr PM**

CM_{PM} = (0.0011 lb/hr) * (8,760 hr/yr) = **9.53 lb/yr PM**

CM_{PM} = (9.53 lb/yr) * (2,000lb/ton) = **0.0048 tn/yr PM**

CLIENT	PROJECT	JOB NO.
Navitus Sustainable Industries	Sandy, UT Plant	1081620214

SUBJECT	BY	DATE
Cat 3520C Uncontrolled One Engine Emission Calculations SO_2, VOC, Formaldehyde	G. NAMIE	3/3/14
	CHECKED: G. NAMIE	DATE: 3/3/14

OBJECTIVE: Calculate emissions based on a Methane Gas flow rate and engine characteristics

APPROACH: Use manufacturer data and emission factors

SOLUTION:

(1) SO_2 Emissions

SO2 Emission Factor=	0.00059	lb/mmBTU	(AP-42, Section 3.2, Table 3.2-2)
Nat Gas BTU Contant=	905	BTU/SCF Nat Gas	LHV of Nat Gas
Hours of Operation=	8,760	hr/yr	
LHV Input=	235,181	BTU/min	Manufacturer Data at 100%

CM_{SO2} = (0.00059 lb SO2/MMBTU)*(235,181 BTU/min)*(1 MMBTU/10^6 BTU)*(60 min/hr)= **0.01 lb/hr SO2**

CM_{SO2} = (0.01 lbs/hr) * (8,760 hr/yr) = **72.93 lb/yr SO2**

CM_{SO2} = (72.93 lb/yr) / (2,000lb/ton) = **0.04 tn/yr SO2**

(2) VOC Emissions

VOC emission factor =	0.700	g/bhp-hr	Manufacturer Guarantee (CAT 3520C)
Engine bhp	2,233	bhp	
Hours of operation =	8,760	hr/yr	

CM_{VOC} = (0.7 g/bhp-hr) * (2,233 bhp) / (453.6 g/lb)

CM_{VOC} = **3.45 lb/hr VOC**

CM_{VOC} = (3.45 lb/hr) * (8,760 hr/yr) = **30,187 lb/yr VOC**

CM_{VOC} = (30,187 lb/yr) * (2,000lb/ton) = **15.09 tn/yr VOC**

(3) Hazardous Air Pollutant (HAPs) Emissions

-HAPs are calculated in a manner consistent with SO_2 which is based on lb/10^6 scf the individual HAPs are substituted into the equations

-See page 3 of this section for a summary of engine HAP emissions

EXAMPLE: Formaldehyde

Formaldehyde Emission Factor=	5.28E-02	lb/mmBTU	(AP-42, Section 3.2, Table 3.2-3)
Nat Gas BTU Content=	905	BTU/SCF Nat Gas	LHV of Nat Gas
Hours of Operation=	8,760	hr/yr	
LHV Input=	235,181	BTU/min	Manufacturer Data at 100%

CMfor = (5.28e-2 lb For/mmBTU)*(235,181 BTU/min)*(1 MMBTU/10^6 BTU)*(60 min/hr)= **0.7451 lb/hr Formaldehyde**

CMfor = (0.7451 lbs/hr) * (8,760 hr/yr) = **6,527 lb/yr Formaldehyde**

CMfor = (6,527 lb/yr) / (2,000 lb/ton) = **3.26 tn/yr Formaldehyde**

NEPAC

CLIENT	PROJECT	JOB NO.	
Navitus Sustainable Industries	Sandy, UT Plant	1081620214	
SUBJECT			DATE
Engine Emission Calculations Uncontrolled HAPs/TAPs		G.Namie	3/3/14
		G.Namie	DATE 3/3/14

(7) HAP Emissions, continued

LHV Input = **235,181** **BTU/min**

Natural Gas BTU Content = **905** **BTU/SCF**

Pollutant	CAS #	Emiss Factor (lb/10^6 scf)	Engine (lb/hr)	Engine (tons/yr)
benzene	71-43-2	3.98E-01	6.21E-03	2.72E-02
chlorobenzene	108-90-7	2.75E-02	4.29E-04	1.88E-03
formaldehyde	50-00-0	4.78E+01	7.45E-01	3.26E+00
1,1,2,2-Tetrachloroethane	79-34-5	3.62E-02	5.64E-04	2.47E-03
naphthalene	91-20-3	0.06733	1.05E-03	4.60E-03
1,1,2-Trichloroethane	79-00-5	0.02878	4.49E-04	1.97E-03
toluene	108-88-3	3.69E-01	5.75E-03	2.52E-02
1,3-Butadiene	106-99-0	2.42E-01	3.77E-03	1.65E-02
1,3-Dichloropropene	542-75-6	2.39E-02	3.73E-04	1.63E-03
Acetaldehyde	75-07-0	7.57E+00	1.18E-01	5.17E-01
Acrolein	107-02-8	4.65E+00	7.25E-02	3.18E-01
Carbon Tetrachloride	56-23-5	3.32E-02	5.18E-04	2.27E-03
Chloroform	67-66-3	2.58E-02	4.02E-04	1.76E-03
Ethylbenzene	100-41-4	3.59E-02	5.60E-04	2.45E-03
Ethyl Dibromide	106-93-4	4.01E-02	6.25E-04	2.74E-03
Methanol	67-56-1	2.26E+00	3.52E-02	1.54E-01
Methylene Chloride	74-87-3	1.81E-02	2.82E-04	1.24E-03
Styrene	100-42-5	2.14E-02	3.34E-04	1.46E-03
Vinyl Chloride	75-01-4	1.35E-02	2.10E-04	9.22E-04
Xylene	1330-20-7	1.67E-01	2.60E-03	1.14E-02
Biphenyl	92-52-4	1.92E-01	2.99E-03	1.31E-02
n-Hexane	110-54-3	1.00E+00	1.56E-02	6.83E-02
Phenol	108-95-2	2.17E-02	3.38E-04	1.48E-03
Total HAPs	**---**	**---**	**1.01**	**4.44**

NEPAC			
		SHEET 1 of 1	
CLIENT Navitus Sustainable Industries	PROJECT Sandy, UT Project	JOB NO. 1081620214	
SUBJECT Greenhouse Gases Emissions Calculation		BY G. Namie	DATE 3/3/14
		CHECKED G. Namie	DATE 3/3/14

From 40 CFR 98 Subpart C, GHG Emission Calculations, Tier 1

1. CO2 Emission Calculation		
CO2= 1x10^3*Fuel Usage*Emission Factor		
Fuel Usage = 14,774 scf/hr Per Manufacturers Specifcations		
HHV of Natural Gas= 1.026x10^-3		
Emission Factor= 53.06 kg/mmBtu		
a. Convert 14,774 scf/hr to mmBtu/yr (Fuel Usage*HHV of Natural Gas)		
15.158 mmBtu/hr 132,785.17 mmBtu/yr		
b. Calculate CO2 Emissions (1x10^-3*Fuel Usage*Emission Factor)		
(1X10^-3*132,785.17mmBtu/yr)*53.06 kg/mmBtu=	7,045.58	tons/yr/per unit
	28,182.32	total tons/yr
2. CH4 Emission Calculation		
Emission Factor = 1x10^-3		
CH4=Fuel Usage*Emission Factor		
a. Calculate CH4 Emissions (Fuel Usage*Emission Factor)		
(132,785.17mmBtu/yr)*0.001 kg/mmBtu=	0.13	tons/yr/per unit
	0.53	total tons/yr
3. CH4 Emission Calculation		
Emission Factor = 1x10^-4		
CH4=Fuel Usage*Emission Factor		
a. Calculate CH4 Emissions (Fuel Usage*Emission Factor)		
(132,785.17mmBtu/yr)*0.0001 kg/mmBtu=	0.0013	tons/yr/per unit
	0.005	total tons/yr

NEPAC

SHEET 1 of 1

CLIENT	PROJECT	JOB NO.	
Navitus Sustainable Industries	Sandy, UT Project	1081620214	
SUBJECT		BY	DATE
Material Handling, Feestock Dryers Emissions Calculation		G. Namie	3/3/14
		CHECKED	DATE
		G. Namie	3/3/14

1) Calculate PM10 and PM2.5 Emissions for Material Handling Process						
PM10 Emission Factor = k(0.0032)(U/5)^1.3/(M/2)^1.4= lb/ton						
Where:						
E=Emission Factor						
k= Particle Size Multiplier, from AP-42 k=0.35						
U= Mean Wind Speed, assume 1.0 mph since drop points occur indoors						
M= Material Moisture Content (%), assume 21% moisture content for MSW						
Therefore:	PM10 Emissions Factor=		5.13916E-06	lb/ton		
	Assume:		350	tons/day	127,750	tons/yr
			0.66	lb/day		
	PM10 Emissions=		239.63	lb/yr	0.12	tons/yr
PM2.5 Emission Factor = k(0.0032)(U/5)^1.3/(M/2)^1.4= lb/ton						
Where:						
E=Emission Factor						
k= Particle Size Multiplier, from AP-42 k=0.053						
U= Mean Wind Speed, assume 1.0 mph since drop points occur indoors						
M= Material Moisture Content (%), assume 21% moisture content for MSW						
Therefore:	PM2.5 Emissions Factor=		7.78215E-07	lb/ton		
	Assume:		350	tons/day	127,750	tons/yr
			0.10	lb/day		
	PM2.5 Emissions=		36.29	lb/yr	0.02	tons/yr

2) Calculate Emissions for Feedstock Dryers					
	The AP-42 calculations using 1020 Btu/scf of Natural Gas are as folows"				
	87.6 kBtu/hr/1020 Btu/scf= 0.086 kscf/hr * 8.76 khr/yr=			0.752	Mscf/yr
	Nox Emission Factor=	32	lb/10^6 Scf	0.0120	Tons/yr
	CO Emission Factor=	84	lb/10^6 Scf	0.0316	Tons/yr
	PM10 Emission Factor=	7.6	lb/10^6 Scf	0.00286	Tons/yr
	SO2 Emission Factor=	0.6	lb/10^6 Scf	0.00023	Tons/yr
	VOC Emission Factor=	5.5	lb/10^6 Scf	0.00207	Tons/yr

EMISSION FACTOR REFERENCES

1. CATERPILLAR G3520C ENGINE DATA RPROVIDED BY ENGINE MANUFACTURER
2. AP-42, FIFTH EDITION, VOLUME1. CHAPTER 3-STATIONERY INTERNAL COMBUSTION SOURCES, SECTION 3.2- NATURAL GAS-FIRED RECEIPROCATING ENGINES, FINAL SECTION-SUPPLEMENT F, AUGUST 2000,TABLE 3.2.2
3. 40 CFR 98, SUBPART C, INTERNAL CONBUSTION SOURCES, TIER 1 CALCULATION PROCEDURE

Appendix D- DAQ Form 1a

Utah Division of Air Quality
New Source Review Section

Company: Navitus Sustainable Industries
Site Source: South Valley Recycling & Renewable Power Facility
Date: Mar-14

Form 1a
Emissions Information

Pollutants	Permitted Emissions (tons/year)	Emissions Increases (tons/yr)	Proposed Emissions (tons/yr)
Criteria Pollutants			
PM10		0.02	0.02
PM2.5		0.02	0.02
NOx		4.32	4.32
SO2		0.16	0.16
CO		17.25	17.25
VOC		6.04	6.04
Greenhouse Gases			
Carbon Dioxide (CO2)		28,180	28,180
Methane (CH4)		0.52	0.52
Nitrous Oxide (N2O)		0.052	0.052
Total Hazardous Air Pollutants		1.78	1.78
Individual HAPs			
Benzene		0.011	0.011
Chlorobenzene		0.0007	0.0007
Formaldehyde		1.30	1.30
1,1,2,2-Tetrachloroethane		0.0009	0.0009
Naphthalene		0.0018	0.0018
1,1,2-Trichloroethane		0.0008	0.0008
Toluene		0.010	0.010

Pollutants	Permitted Emissions (tons/year)	Emissions Increases (tons/yr)	Proposed Emissions (tons/yr)
1,3-Butadiene		0.007	0.007
1,3-Dichloropropene		0.0006	0.0006
Acetaldehyde		0.207	0.207
Acrolein		0.127	0.127
Carbon Tetrachloride		0.0009	0.0009
Chloroform		0.0007	0.0007
Ethylbenzene		0.0009	0.0009
Ethyl Dibromide		0.0011	0.0011
Methanol		0.062	0.062
Methylene Chloride		0.0005	0.0005
Styrene		0.0006	0.0006
Vinyl Chloride		0.0004	0.0004
Xylene		0.0046	0.0046
Biphenyl		0.0052	0.0052
n-Hexane		0.0274	0.0274
Phenol		0.0006	0.0006

Form 1d Emissions Information

Table 2. Uncontrolled and Uncontrolled Emissions

Pollutants	**Controlled Emissions (tons/yr)**	**Uncontrolled Emissions (tons/yr)**
Criteria Pollutants		
PM10	0.02	0.02
PM2.5	0.02	0.02
NOx	4.32	43.12
SO2	0.16	0.16
CO	17.25	172.48
VOC	6.04	60.36
Greenhouse Gases		
Carbon Dioxide (CO2)	28,180	28,180
Methane (CH4)	0.52	0.52
Nitrous Oxide (N2O)	0.052	0.052
Total Hazardous Air Pollutants	1.78	17.76
Individual HAPs		
Benzene	0.011	0.109
Chlorobenzene	0.0007	0.007
Formaldehyde	1.30	13.04
1,1,2,2-Tetrachloroethane	0.0009	0.009
Naphthalene	0.0018	0.018
1,1,2-Trichloroethane	0.0008	0.008
Toluene	0.010	0.101
1,3-Butadiene	0.007	0.066
1,3-Dichloropropene	0.0006	0.006
Acetaldehyde	0.207	2.07
Acrolein	0.127	1.27
Carbon Tetrachloride	0.0009	0.009
Chloroform	0.0007	0.007
Ethylbenzene	0.0009	0.009
Ethyl Dibromide	0.0011	0.011
Methanol	0.062	0.62
Methylene Chloride	0.0005	0.005
Styrene	0.0006	0.006
Vinyl Chloride	0.0004	0.004
Xylene	0.0046	0.046
Biphenyl	0.0052	0.052
n-Hexane	0.0274	0.274
Phenol	0.0006	0.006

Form 1d Emissions Information

Table 3. Hourly HAP Emissions

Hazardous Air Pollutants	Maximum Emission Rate (lbs/hr)
Benzene	0.0025
Chlorobenzene	0.0002
Formaldehyde	0.2980
1,1,2,2-Tetrachloroethane	0.0002
Naphthalene	0.0004
1,1,2-Trichloroethane	0.0002
Toluene	0.0023
1,3-Butadiene	0.0015
1,3-Dichloropropene	0.00015
Acetaldehyde	0.0472
Acrolein	0.0290
Carbon Tetrachloride	0.0002
Chloroform	0.0002
Ethylbenzene	0.0002
Ethyl Dibromide	0.0003
Methanol	0.0141
Methylene Chloride	0.0001
Styrene	0.0001
Vinyl Chloride	0.0001
Xylene	0.0010
Biphenyl	0.0012
n-Hexane	0.0063
Phenol	0.0001

Appendix E
Source Size Determination

Table E.1 Summary of Controlled Facility Wide Potential to Emit Emissions (tons per year)

Pollutant	Controlled Reactor/Engine Gen Set/Pollution Control Equipment (ES-01)	Source Size Determination
NOx	4.31	Minor
CO	17.25	Minor
PM_{10}	0.02	Minor
$PM_{2.5}$	0.02	Minor
SO_2	0.16	Minor
VOCs	6.04	Minor
HAPs	1.78	Minor
Formaldehyde	1.30	Minor
CO_2	28,180	Minor
CO_2(e)	28,180.56	Minor
N_2O	0.052	Minor
CH_4	0.52	Minor

Appendix G
Best Available Control Technology Analysis

The following provides insight into how the US EPA has incorporated BAT analysis into its regulatory requirements.

New Source Review Permitting

In the US there are federal regulations termed "new source permitting" that require a new major source (or an existing major facility undertaking major modification) to obtain pre-approval under the New Source Review (NSR) program before commencing construction of an air pollution source. The federal requirements vary for different areas of the country depending on whether the air quality in the area complies with the National Ambient Air Quality Standards (NAAQS). Areas designated, as being in attainment will be required to adhere to the requirements under the Prevention of Significant Deterioration (PSD) program. Areas that are designated as being non-attainment will be required to adhere to stricter requirements under the Non-attainment Area (NAA) program.

Prevention of Significant Deterioration Permitting

Prevention of Significant Deterioration (PSD) program permitting requires that an applicant analyze all technically feasible emission control alternatives and demonstrate that the emission rate(s) proposed is reflective of the best available control technology (BACT). A BACT analysis evaluates each emission control alternative relative to energy, environmental and economic impacts. The procedure is called a top-down BACT, meaning that the lowest possible emission rate must be considered first. The control technique with the lowest emission rate may only be dropped from consideration if there are legitimate energy, environmental or economic reasons. If so, the emission control technique with the next lowest emission rate may then be considered. The progression continues until an emission rate is identified as BACT. Another PSD requirement is to evaluate the projected impact of the new emissions on the existing ambient air levels in order to show that the attainment area will not fall into non-attainment.

Non-attainment Area Permitting

Non-attainment Area (NAA) program permitting requires that an applicant analyze all technically feasible emission control alternatives and demonstrate that the emission rate(s) proposed is reflective of the lowest achievable emission rate (LAER). A LAER analysis is essentially the same as a BACT analysis, except that economic factors are not considered. As with the BACT analysis, a LAER analysis follows a top-down procedure, but only evaluating energy and environmental factors. A further NAA requirement is to purchase emission offset credits such that there is a net decrease of emissions to the non-attainment area.

State Implementation Plans

While the federal permitting requirements are applicable to major new sources, or major modifications to existing major sources, each state may have its own construction permitting program for smaller sources of air pollution. Many of the US states have added the requirement for BACT to their construction permitting requirements for minor sources. For existing sources, in states located in non-attainment areas, EPA requires that a state implement regulations mandating improved emission controls in order to bring the area into attainment. The emission control level for existing sources is called "reasonably available control technology" (RACT). Attainment is re-evaluated each year through ambient monitoring. If attainment is not achieved, the state will lower its RACT limits.

Construction Permitting

As stated above, most states have their own construction permitting regulations for sources that are below the level of applicability of the federal New Source Review (NSR) program. In many states, the construction permitting requirements incorporate the use of BACT to enable the permit reviewer to push for improved emission control (lower emissions) on a case-by-case basis.

Procedures for BAT Implementation

There are several factors to consider when choosing which emission control option is the best available technology (BAT). From an environmental perspective, the best option is the one that minimizes the total emission levels of the pollutant considered. However, use of the most effective pollution control option is not always feasible because of the economic, energy, environmental or technical impacts that it might impose. Therefore, a top-down process is used to determine which technology or process would be most suitable for each specific application. This method is relatively fast and simple, and is easily repeatable for all pollutants and all sources under consideration. This section describes this process in detail.

The threshold level of emissions to trigger a BAT analysis in the US is either a new major source (100 to 250 tons per year [tpy]) or a major modification to an existing major source (10 to 50 tpy increase). Some states implement the BAT process for approval of a new process with emission increases greater than 1 tpy.

Step1: Identify Possible Control Technologies

The first step in a top-down analysis is to identify all available control options. Available options are those air pollution control technologies or techniques with a practical potential for application to the emission unit and the pollutant under evaluation. Air pollution control technologies and techniques include the application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques, for control of the affected pollutant. This includes technologies used elsewhere in the world. Technologies required under LAER determinations are available for BACT purposes and must also be included as control alternatives and usually represent the top alternative.

Step2: Eliminate Infeasible Options

In the second step, the technical feasibility of the control options identified in step one is evaluated with respect to the source-specific (or emissions unit–specific) factors. Demonstration that an option is not technically feasible should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option. Control options that are not technically feasible are then eliminated from further consideration in the BACT analysis.

Step3: Sort and Rank Feasible Options

In step 3, all remaining control alternatives not eliminated in step 2 are ranked and listed in order of over-all control effectiveness for the pollutant under review, with the most effective control alternative at the top. A list should be prepared for each pollutant and for each emission unit (or grouping of similar units) subject to a BACT analysis. The list should present an array of control technology alternatives and should include the following types of information:

- emission reductions (percent pollutant removed);
- expected emission rate (tons per year, pounds per hour);
- energy impacts;
- environmental impacts (includes any significant or unusual other media impacts, such as water or solid waste, and affect on toxic or hazardous air contaminants);
- economic impacts (cost effectiveness). An applicant proposing the top control alternative need not provide cost and other detailed information in regard to other control options. In such cases the applicant should document to the satisfaction of the review agency that the control option chosen is, indeed, the top.

Evaluate Most Effective Option

After identification of available and technically feasible control technology options, the associated energy, environmental, and economic factors are evaluated in order to arrive at the final level of control. At this point the analysis presents the associated impacts of the control option in the listing. For each option, the applicant is responsible for presenting an objective evaluation of each impact. Both beneficial and adverse impacts should be discussed and, where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative. If the applicant accepts the top alternative in the listing as BACT and there are no outstanding issues regarding collateral environmental impacts, the analysis has ended and the results are proposed as BACT. In the event that the control candidate is shown to be inappropriate, due to energy, environmental or economic impacts, the rationale for this finding should be documented. Then, the next most stringent alternative in the listing becomes the new control candidate and is similarly evaluated. This process continues until the technology under consideration cannot be eliminated by any source-specific environmental, energy, or economic impacts which demonstrate that option to be inappropriate as BACT. The economic impact tends to be the most direct factor, as environmental and energy issues can often be overcome by more expensive systems. The determination of what is economically feasible is a subjective, case-by-case assessment by the regulatory agency. The objective is to establish an acceptable level of cost impact. As such, the cost impact (dollars per ton per year of emissions reduced) determined to be economically feasible can simply be the value that another similar process operation agreed to spend. In the US, controls for nitrogen oxides (NOx) have been deemed economically affordable at levels of $10,000 to $15,000 per tpy. Sulfur dioxide (SO2) controls are less costly, and economic feasibility may be in the $1,000 to $3,000 per tpy range.

Step5: Select BACT

At this point, there should be one option that has been chosen as the best available, feasible emission reduction option. There should also be significant documentation available to support this decision. This decision, along with all the pertinent documentation that led to it, is then submitted to an environmental official for review. Ultimately, the reviewer makes the decision as to which control option is the best and most reasonable. This process is then repeated for each pollutant and each process of interest.

It is important to note that the level of control deemed BAT is a moving target. As emission control technologies improve and/or cost impacts decrease, the emission rates deemed BAT will gradually go down, which is the objective of the program. As an example, gas turbines had a new source performance standard several years ago of 65 parts per million (ppm) NOx. With improvements to the combustion technology, turbines were able to meet 42 ppm. Then, with the use of water and/or steam injection, turbines were able to meet 9 ppm. The advancement of selective catalytic reduction (SCR) post-combustion NOx controls now has gas turbines in the US being required to meet a BAT level as low as 2 ppm.

RBLC Overview

The US Environmental Protection Agency (EPA) maintains a publicly available database that is a compilation of emission control techniques that have been approved as RACT, BACT or LAER during a stationary source permitting process. The database is called the RACT, BACT, LAER Clearinghouse (RBLC). The RBLC database is accessible via EPA's web site, at its Clean Air Technology Center (CATC) on its Technology Transfer Network (TTN), at <www.epa.gov/ttn/catc>. This section describes the layout of the site, and gives insight into how to efficiently use the RBLC to search for past projects, their target emission rates and the technologies or practices that each facility used to achieve attainment. Words or phrases that are scripted in bold indicate active links on the RBLC webpage.

The RBLC has four search levels, from basic to advanced, and contains a **Reference**

Library with links to other technical information and a **Tool Box** with links to software tools to aid in a BAT analysis. The search capabilities include:

Basic Search, which is the easiest to use;

Find Lowest Emission Rate, which produces a basic search result automatically arranged by emission rate (currently only available for combustion sources);

Standard Search, which allows any combination of 24 search criteria; and

Advanced Search, which can be used for a more complex search. Currently the RBLC compiles over 5,184 facilities, with over 13,378 processes. However, the input to the database is a voluntary effort by states. As such, it may not have a record of every BACT determination in the US. Also, delays to the data input process can result in as much as a yearlong lag time for the newest determinations. With any BACT determination entered, there is a state contact identified to allow for the request of additional information.

BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

The following text provides analyses of process design, operating practices and best available emission control technologies (BACT) that were considered in determining CO, NOX and PM10/PM2.5 emission limits for the proposed project process and equipment operations.

CAT 3520C Engines

G.1- Particulate Matter (PM10/PM2.5)

Very low PM10/PM2.5 emissions will result for the combustion of methane gas in the CAT 3520C engines. Spark ignition IC engines are generally low emitters of PM. NSPS Subpart JJJJ, which specifies performance standards for spark ignition engines, does not set any PM emission limits for engine manufacturers.

Based on the RBLC database review, proper maintenance and good combustion practices are both considered BACT for PM10/PM2.5 controls for the CAT 3520C engines.

G.2- Nitrogen Oxides (NOx)

NOx emissions from the CAT 3520C engines consist of nitric oxide (NO) and nitrogen dioxide (NO2). NOx is formed by the oxidation of nitrogen contained in the fuel (fuel NOx), and by the combination elemental nitrogen and oxygen in the high temperature-environment of the combustion zone (thermal NOx). Essentially all NOx emissions originate as NO, which subsequently oxidizes in the IC exhaust or in the atmosphere to the more stable NO2 molecule NO2 molecule. Factors affecting the generation of NOx, include flame temperature, residence time, quantity of excess air, and nitrogen content of the fuel.

The BACT analysis was performed based on those available and feasible technologies that can provide the maximum degree of emission reduction for NOx emissions. The primary methods to reduce NOx emissions are through either combustion process controls or add-on catalytic or non-catalytic reactions.

The CAT3520C engines have adopted combustion process controls through the use of 'lean burning' technology, the engines are equipped with an electronic air/fuel ratio controller. Therefore the level 1 of BACT for NOX is combustion process controls.

Level 2 BACT included a review of post combustion catalytic and non-catalytic control equipment. Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR) were examined for post combustion NOX control. Based on previous BACT determinations, there are no applications of SCR or SNCR controls for methane fired IC engines. However, SCR has been used for diesel-fired IC engines.

Based on BACT selection procedures, Navitus proposes to use combustion controls with air/fuel ratio and lean burn design in combination with SCR to reduce overall NOx emissions by 90 percent. The CAT 3520C engine is manufacturer certified to comply with NSPS Subpart JJJJ emission standards and Navitus is working with several SCR vendors to provide additional technical specifications.

G-3 Carbon Monoxide and VOC

As part of the BACT analysis, a review was performed of previous CO BACT determinations. The analysis indicated that CO BACT determinations for new IC engines have exclusively been good combustion practices. The CAT 3520C engines are designed for high-combustion efficiency, which will inherently minimize the production of CO. The engines are also equipped with electronic control to automatically adjust the ignition timing and air to fuel ratio to minimize incomplete combustion and maintain a proper balance between CO and NOx emissions.

For VOC control, oxidation catalyst technology is the primary method to reduce VOC emissions. Based on the BACT analysis the use of oxidation catalyst technology has shown difficulty for IC engines burning landfill gas as fuel.

Based on the BACT analysis, Navitus proposes as level 1 CO and VOC control to use combustion controls and good combustion practices. The CO and VOC emission limit will meet the requirements of NSPS Subpart JJJJ.

Level 2 CO and VOC control will employ the us of oxidation catalyst technology for post combustion control to reduce overall CO and VOC emissions by 90 percent.