

PERMIT DETERMINATION FORM

**U.S. GENERAL SERVICES ADMINISTRATION
BROADWATER FEDERAL BUILDING**

**217 West King Street #101
Martinsburg, West Virginia 25401**

March 2018

Prepared For:

U.S. General Services Administration
100 S Independence Mall W#5
Philadelphia, PA 19107

Prepared By:

EA Engineering, Science, and Technology, Inc., PBC
225 Schilling Circle, Suite 400
Hunt Valley, MD 21031

March 14, 2018

Beverly D. McKeone
Program Manager, NSR Permitting
West Virginia Department of Environmental Protection, Division of Air Quality

RE: Permit Determination Form, Broadwater Federal Building, Martinsburg, West Virginia

Dear Ms. McKeone,

Please find attached the Permit Determination Form and associated attachments for four (4) fuel-burning emission units located at the U.S. General Services Administration Broadwater Federal Building.

If you have any questions or comments, or need further information, please contact me or Naveen Devata of EA Engineering at 410-584-7000, extension 5208.

Sincerely,

A handwritten signature in black ink that reads "Gara Martin". The signature is written in a cursive, flowing style.

Gara Martin
Building Management Specialist
U.S. General Services Administration

PERMIT DETERMINATION FORM
U.S. GENERAL SERVICES ADMINISTRATION
BROADWATER FEDERAL BUILDING

TABLE OF CONTENTS

West Virginia Department of Environmental Protection Division of Air Quality
Permit Determination Form

ATTACHMENTS

Attachment A	Facility Map
Attachment B	Process Flow Diagram
Attachment C	Detailed Process Description
Attachment D	Safety Data Sheets
Attachment E	Emissions Calculations



WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475
www.dep.wv.gov/daq

**PERMIT DETERMINATION FORM
(PDF)**

FOR AGENCY USE ONLY: PLANT I.D. # _____
PDF # _____ PERMIT WRITER: _____

1. NAME OF APPLICANT (AS REGISTERED WITH THE WV SECRETARY OF STATE'S OFFICE): U.S. General Services Administration		
2. NAME OF FACILITY (IF DIFFERENT FROM ABOVE): Broadwater Federal Building		3. NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS) CODE: 9 2 2 1 1 0
4A. MAILING ADDRESS: 217 West King Street #101 Martinsburg, WV 25401		4B. PHYSICAL ADDRESS: 217 West King Street #101 Martinsburg, WV 25401
5A. DIRECTIONS TO FACILITY (PLEASE PROVIDE MAP AS ATTACHMENT A): Heading South on I-81 S, take exit 13 toward CR-15/King St./Downtown. Proceed for .03 miles and then turn left onto Boyds Gap Rc./W King St./Tuscarora Pike. The facility is on the right after 1.5 miles. A location map is provided as Attachment A.		
5B. NEAREST ROAD: Highway 11, West King Street	5C. NEAREST CITY OR TOWN: Martinsburg	5D. COUNTY: Berkeley County
5E. UTM NORTHING (KM): 4371451	5F. UTM EASTING (KM): 244797	5G. UTM ZONE: 18
6A. INDIVIDUAL TO CONTACT IF MORE INFORMATION IS REQUIRED: Gara Martin		6B. TITLE: Building Management Specialist
6C. TELEPHONE: (681) 313-4195	6D. FAX: (215) 446-6021	6E. E-MAIL: gara.martin@gsa.gov
7A. DAQ PLANT I.D. NO. (FOR AN EXISTING FACILITY ONLY): _____ - _____	7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR19 AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIATED WITH THIS PROCESS (FOR AN EXISTING FACILITY ONLY): N/A	
7C. IS THIS PDF BEING SUBMITTED AS THE RESULT OF AN ENFORCEMENT ACTION? IF YES, PLEASE LIST: No		
8A. TYPE OF EMISSION SOURCE (CHECK ONE): <input checked="" type="checkbox"/> NEW SOURCE <input type="checkbox"/> ADMINISTRATIVE UPDATE <input type="checkbox"/> MODIFICATION <input type="checkbox"/> OTHER (PLEASE EXPLAIN IN 11B)		8B. IF ADMINISTRATIVE UPDATE, DOES DAQ HAVE THE APPLICANT'S CONSENT TO UPDATE THE EXISTING PERMIT WITH THE INFORMATION CONTAINED HEREIN? <input type="checkbox"/> YES <input type="checkbox"/> NO
9. IS DEMOLITION OR PHYSICAL RENOVATION AT AN EXISTING FACILITY INVOLVED? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		
10A. DATE OF ANTICIPATED INSTALLATION OR CHANGE: _____/_____/2003	10B. DATE OF ANTICIPATED START-UP: _____/_____/2003	
11A. PLEASE PROVIDE A DETAILED PROCESS FLOW DIAGRAM SHOWING EACH PROPOSED OR MODIFIED PROCESS EMISSION POINT AS ATTACHMENT B.		
11B. PLEASE PROVIDE A DETAILED PROCESS DESCRIPTION AS ATTACHMENT C.		
12. PLEASE PROVIDE MATERIAL SAFETY DATA SHEETS (MSDS) FOR ALL MATERIALS PROCESSED, USED OR PRODUCED AS ATTACHMENT D. FOR CHEMICAL PROCESSES, PLEASE PROVIDE A MSDS FOR EACH COMPOUND EMITTED TO AIR.		

13A. REGULATED AIR POLLUTANT EMISSIONS:

⇒ **FOR A NEW FACILITY**, PLEASE PROVIDE PLANT WIDE EMISSIONS BASED ON THE POTENTIAL TO EMIT (PTE) FOR THE FOLLOWING AIR POLLUTANTS INCLUDING ALL PROCESSES.

⇒ **FOR AN EXISTING FACILITY**, PLEASE PROVIDE THE PROPOSED CHANGE IN EMISSIONS BASED ON THE PTE OF ALL PROCESS CHANGES FOR THE FOLLOWING AIR POLLUTANTS.

PTE FOR A GIVEN POLLUTANT IS TYPICALLY BEFORE AIR POLLUTION CONTROL DEVICES AND IS COLLECTED BASED ON THE MAXIMUM DESIGN CAPACITY OF PROCESS EQUIPMENT.

POLLUTANT	HOURLY PTE (LB/HR)	YEARLY PTE (TON/YR) (HOURLY PTE MULTIPLIED BY 8760 HR/YR) DIVIDED BY 2000 LB/TON
PM	0.11	0.49
PM ₁₀	0.08	0.36
VOCs	0.03	0.12
CO	0.41	1.79
NO _x	0.70	3.05
SO ₂	0.01	0.03
Pb	0.00	0.00
HAPs (AGGREGATE AMOUNT)	0.078	0.33
TAPs (INDIVIDUALLY)*	Please Refer to Appendix E. All HAPs (TAPs and Other) are calculated individually for each emission source and in aggregate. The two TAPs (Benzene and Formaldehyde) are indicated in grey line items on each calculation sheet.	
OTHER (INDIVIDUALLY)*		

* ATTACH ADDITIONAL PAGES AS NEEDED

13B. PLEASE PROVIDE ALL SUPPORTING CALCULATIONS AS ATTACHMENT E.

CALCULATE AN HOURLY AND YEARLY PTE OF EACH PROCESS EMISSION POINT (SHOWN IN YOUR DETAILED PROCESS FLOW DIAGRAM) FOR ALL AIR POLLUTANTS LISTED ABOVE INCLUDING INDIVIDUAL HAP'S (LISTED IN SECTION 112[b] OF THE 1990 CAAA), TAP'S (LISTED IN 45CSR27), AND OTHER AIR POLLUTANTS (E.G. POLLUTANTS LISTED IN TABLE 45-13A OF 45CSR13, MINERAL ACIDS PER 45CSR7, ETC.).

14. CERTIFICATION OF DATA

I, DAVID NICHOLAS (TYPE NAME) ATTEST THAT ALL THE REPRESENTATIONS CONTAINED IN THIS APPLICATION, OR APPENDED HERETO, ARE TRUE, ACCURATE, AND COMPLETE TO THE BEST OF MY KNOWLEDGE BASED ON INFORMATION AND BELIEF AFTER REASONABLE INQUIRY, AND THAT I AM A **RESPONSIBLE OFFICIAL**** (PRESIDENT, VICE PRESIDENT, SECRETARY OR TREASURER, GENERAL PARTNER OR SOLE PROPRIETOR) OF THE APPLICANT.

SIGNATURE OF RESPONSIBLE OFFICIAL: _____



TITLE: Charleston Field Office Realty Services Manager

DATE: 3, 14, 18

**THE DEFINITION OF THE PHRASE 'RESPONSIBLE OFFICIAL' CAN BE FOUND AT 45CSR13, SECTION 2.23.

NOTE: PLEASE CHECK ENCLOSED ATTACHMENTS:

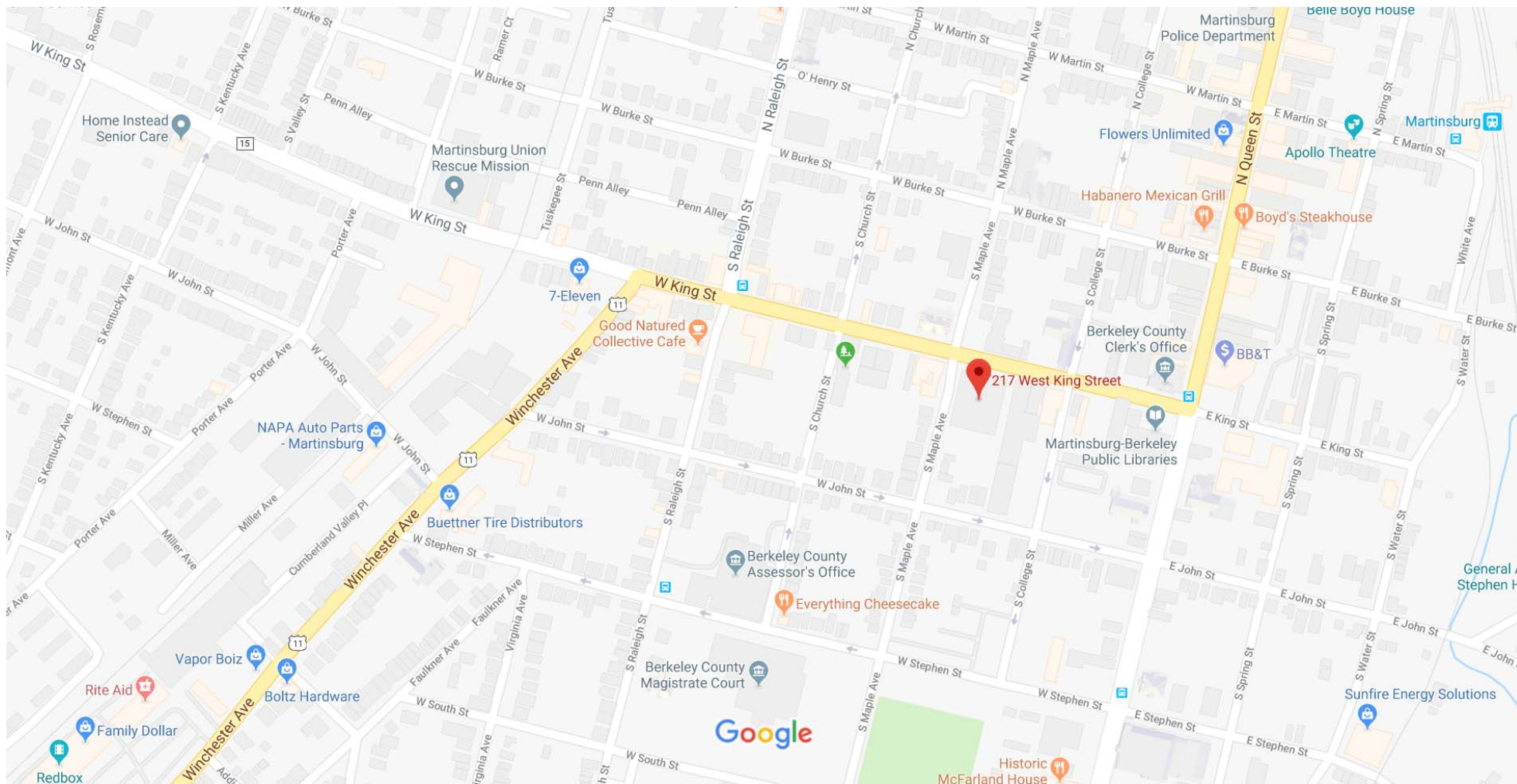
ATTACHMENT A ATTACHMENT B ATTACHMENT C ATTACHMENT D ATTACHMENT E

RECORDS ON ALL CHANGES ARE REQUIRED TO BE KEPT AND MAINTAINED ON-SITE FOR TWO (2) YEARS.

THE PERMIT DETERMINATION FORM WITH THE INSTRUCTIONS CAN BE FOUND ON DAQ'S PERMITTING SECTION WEB SITE:

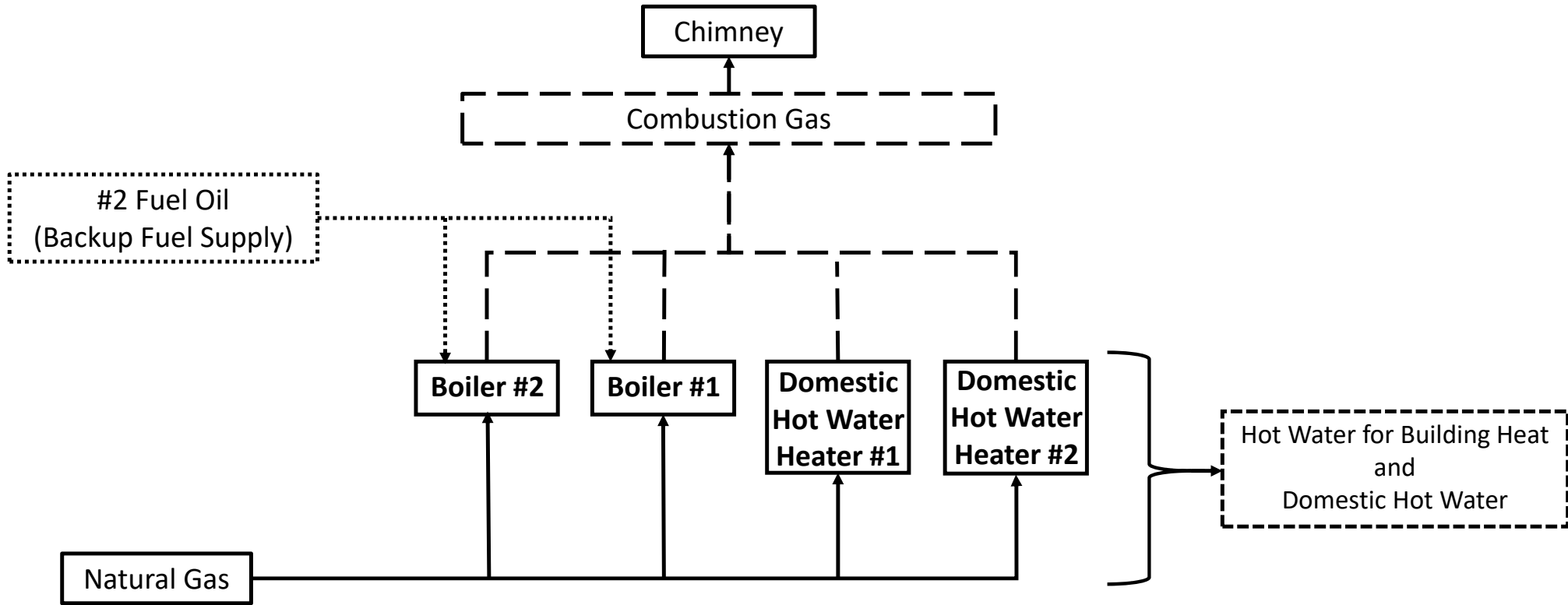
www.dep.wv.gov/daq

Attachment A
Facility Map



Attachment B
Process Flow Diagram

**Attachment B – Process Flow Diagram
Broadwater Federal Building
Martinsburg, West Virginia**



Attachment C
Detailed Process Description

Attachment C – Detailed Process Description Broadwater Federal Building, Martinsburg, West Virginia

The Broadwater Federal Building and United States Courthouse is located at 217 West King Street, Martinsburg, West Virginia. Four (4) fuel burning emission units are used to provide comfort heat and domestic hot water (DHW) to this building. In accordance with item 8A of this Permit Determination Form and West Virginia Department of Environmental Protection (DEP) request, the facility is submitting this Permit Determination Form to confirm that the emission sources present at the facility are not subject to any air permitting requirements.

DHW is produced for use in the building year-round by two (2) natural gas-fired water heaters. These water heaters are available for operation 24 hours per day, 365 days per year. Natural gas is delivered by utility pipeline. The two DHW heaters (#1 and #2) are located in the Boiler Room and have rated capacities of 0.07 MMBtu per hour and 0.199 MMBtu per hour, respectively. Combustion gases from these units are ducted to the environment through the common building chimney, which has a stack height of 56 feet above grade.

Building comfort heat is provided by two (2) dual-fuel hot water boilers. Boilers #1 and #2 have an input rating of 3.348 and 1.339 MMBtu per hour, respectively. Boiler #2, the smaller of the two boilers is typically operated full-time during the entire heating season, from October through April. Boiler #1 used to provide additional heating capacity for the building during the colder months of the heating season, which is typically from the end of December through the middle of March. These boilers produce hot water that is circulated in a closed loop system throughout the building. Natural gas is the primary fuel, delivered through the utility pipeline to the Boiler Room. #2 Fuel Oil is used only in times when natural gas is not available or for testing. The #2 fuel oil is stored in an onsite tank outside of the southeast corner of the building. Combustion gases are ducted to the environment through the common building chimney discussed above.

Attachment D
Safety Data Sheets



1. IDENTIFICATION

Product Identifier No. 2 Fuel Oil

Synonyms: No. 2 Heating Oil, #2 Fuel Oil, Heating Oil Plus™, Low Sulfur Heating Oil (LSHO), Ultra Low Sulfur Heating Oil (ULSHO)

Intended use of the product: Fuel

Contact: Global Companies LLC
Water Mill Center
800 South St.
Waltham, MA 02454-9161
www.globalp.com

Contact Information: EMERGENCY TELEPHONE NUMBER (24 hrs.): CHEMTREC (800) 424-9300
COMPANY CONTACT (business hours): 800-542-0778

2. HAZARD IDENTIFICATION

According to OSHA 29 CFR 1910.1200 HCS

Classification of the Substance or Mixture

Classification (GHS-US):

Flam. Liquid	Category 3	H226
Skin Corrosion/Irritation	Category 2	H315
Aspiration Hazard	Category 1	H304
Acute toxicity – Inhalation	Category 4	H332
STOT SE	Category 3	H336
Carcinogenicity	Category 2	H350
Aquatic Chronic	Category 2	H411
Eye damage/Irritation	Category 2	H319

Labeling Elements



Signal Word (GHS-US):

Hazard Statements (GHS-US):

Danger

H226 – Flammable liquid and vapor.
H315 – Causes Skin irritation.
H304 – May be fatal if swallowed and enters airways.
H332 – Harmful if inhaled.
H336 – May cause drowsiness or dizziness.
H350 – May cause cancer.
H411 – Toxic to aquatic life with long lasting effects.
H319 – May cause eye damage/irritation.

Precautionary Statements (GHS-US):

P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 - Keep container tightly closed.
P240 – Ground/bond container and receiving equipment.



P241 – Use explosion-proof electrical/ventilating/lighting equipment pursuant to applicable electrical code.
P242 – Use only non-sparking tools.
P243 – Take precautionary measures against static discharge.
P261 – Avoid breathing dust/fume/gas/mist/vapors/spray.
P264 – Wash skin thoroughly after handling.
P271 – Use only outdoors or in a well-ventilated area.
P273 – Avoid release to the environment.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P303+361+353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse with water/shower.
P308+311 - If exposed or concerned: Get medical advice/attention.
P301+310 - If swallowed: Immediately call a poison center/doctor/...
P331 - Do NOT induce vomiting.
P370+P378 – In case of fire use firefighting foam or other appropriate media for Class B fires to extinguish.
P403+235 - Store in a well-ventilated place. Keep cool.
P405 - Store locked up.
P501 – Dispose of contents/container in accordance with local/regional/national/international regulation.

Other information:

NFPA 704
Health: 1
Fire: 2
Reactivity: 0



3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical Composition Information

Mixture

Name	Product Identifier (CAS#)	% (w/w)	Classification
No. 2 Fuel Oil	68476-30-2	95-100	Flam Liq. 3, H226; Skin Irrit. 2, H315; Aspiration 1, H304; STOT SE 3, H336; Carc.2. H350; Aquatic chronic 2, H411
Methyl Esters	N/A	0-5	N/A
Naphthalene	91-20-3	0.1	Carc. 2, H351; Acute Tox. 4, H302; Aquatic Acute 1, H400; Aquatic Chronic 1, H411

Additional Formulation Information:

No. 2 Fuel Oil consists of C9+ hydrocarbons resulting from distillation of crude oil.

Low Sulfur Heating Oil typically contains less than 500 ppm of sulfur

Ultra Low Sulfur Heating Oil typically contains less than 15 ppm of sulfur



4. FIRST AID MEASURES

Route	Measures
Inhalation	Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.
Ingestion	Aspiration Hazard: DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Ingestion may cause gastrointestinal disturbances including irritation, nausea, vomiting, and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory failure, and death.
Eye Contact	In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention. In case of contact lenses, remove immediately.
Skin Contact	Remove contaminated clothing and shoes. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops. Thermal burns require immediate medical attention depending on the severity and of the area of the body burned.

Most Important Symptoms

Contact with eyes and face may cause irritation. Long-term exposure may cause dermatitis (itching, irritation, pain and swelling).

Inhalation may cause irritation and significant or long term exposure could cause respiratory insufficiency and pulmonary edema.

Ingestion may cause aspiration, gastrointestinal disturbance, and CNS effects.

Immediate Medical Attention and Special Treatment

For contact with skin or eyes, immediately wash or flush contaminated eyes with gently flowing water. If possible, irrigate each eye continuously with 0.9% saline (NS). If ingested, rinse mouth. Do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs).

If inhaled, administer oxygen or establish a patent airway if breathing is labored. Suction if necessary. Monitor closely, anticipate seizures. Consider orotracheal or nostracheal intubation of airway control if patient is unconscious or is in severe respiratory distress.

Discard any clothing or shoes contaminated as they may be flammable.

5. FIRE-FIGHTING MEASURES

Extinguishing Media

Foam, carbon dioxide, dry chemical are most suitable

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO₂, water spray, firefighting foam, or Halon. Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment.

LARGE FIRES: Foam, carbon dioxide, dry chemical. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Specific Hazards / Products of Combustion

Moderate fire hazard when exposed to heat or flame with a very low flash point. Product is flammable and easily ignited when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Combustion may produce smoke, carbon monoxide and other products of incomplete combustion.

Special Precautions and Protective Equipment for Firefighters

Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water.



For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied firefighting foam.

Fighting Equipment/Instructions

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH- approved pressure-demand self-contained breathing apparatus with full face piece and protective clothing.

Refer to Section 9 for fire properties of this chemical including flash point, auto ignition temperature, and explosive limits.

6. ACCIDENTAL RELEASE MEASURES

ACTIVATE FACILITY SPCC, SPILL CONTINGENCY or EMERGENCY PLAN.

Personal Precautions

Due to high vapor density, flammable / toxic vapors may be present in low lying areas, dikes, pits, drains, or trenches. Vapors may accumulate in low lying areas and reach ignitable concentrations. Ventilate the area. Use of non-sparking tools and intrinsically safe equipment is recommended. Potential for flammable atmosphere should be monitored using a combustible gas indicator positioned downwind of the spill area. Refer to Sections 2 and 7 for further hazard warnings and handling instructions.

Use appropriate personal protective equipment to prevent eye/skin contact and absorption. Use NIOSH approved respiratory protection, if warranted, to prevent exposures above permissible limits. Refer to Section 8. Contaminated clothing should not be near sources of ignition.

Emergency Measures

As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Consider wind direction. Secure all ignition sources (flame, spark, hot work, hot metal, etc.) from area. Evaluate the direction of product travel, diking sewers, etc. to confirm spill areas. Do not touch or walk-through spilled material. For large spills, isolate initial action distance downwind 1,000 ft. (300 m).

Environmental Precautions

Stop the spill to prevent environmental release if it can be done safely. Product is toxic to aquatic life. Take action to isolate environmental receptors including drains, storm sewers and natural water bodies. Keep on impervious surface if at all possible. Use water sparingly to prevent product from spreading. Foam and absorbents may be used to reduce / prevent airborne release.

Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Follow federal, state or local requirements for reporting environmental release where necessary. Refer to Section 15 for further information.

Containment and Clean-Up Methods

Carefully contain and stop the source of the spill, if safe to do so. Protect bodies of water by diking absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of firefighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Take up with dry earth, sand or other non-combustible, inert oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container with clean, non-sparking tools for reclamation or disposal. Response and cleanup crews must be properly trained and must utilize proper protective equipment. Refer to Section 8 for appropriate protective equipment.

7. HANDLING AND STORAGE

**USE ONLY AS A FUEL.
DO NOT SIPHON BY MOUTH.**

Handling Precautions

Handle as a flammable liquid. Keep away from heat, sparks, and open flame. No smoking. Electrical equipment should be approved for classified area. Bond and ground containers during product transfer pursuant to NFPA 70 and API RP 2003 to



reduce the possibility of static-initiated fire or explosion. Follow precautions to prevent static initiated fire.

Use good personal hygiene practices. Use only with protective equipment specified in Section 8. Avoid repeated and/or prolonged skin exposure. Use only outdoors or in well ventilated areas. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use solvents or harsh abrasive skin cleaners for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves. Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API RP 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage

Large quantities of fuel oil are stored in tanks or portable containers at an ambient storage temperature. Separate from incompatible chemicals (Refer to Section 10) by distance or secondary containment. Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers that are clearly labeled. Label all secondary containers that this material is transferred into with the chemical name and associated hazard(s). Empty product containers or vessels may contain flammable vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Storage tanks should have a venting system. If stored in small containers, the area should be well ventilated, away from ignition sources and protected from potential damage or vehicular traffic. Post "No Smoking" signs in product storage areas. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code" or applicable building code. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks in Flammable and Combustible Liquid Service" and API RP 2015 "Safe Entry and Cleaning of Petroleum Storage Tanks".

Incompatibles

Keep away from strong oxidizers, ignition sources and heat.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limits

Component	CAS #	List	Value
No. 2 Fuel Oil	68476-30-2	ACGIH TLV-TWA	100 mg/m3*
Naphthalene	91-20-3	ACGIH TLV-TWA	10 ppm
		OSHA PEL	10 ppm
		ACGIH STEL	15 ppm

*Critical effects; Skin; A3; CNS impairment.

Engineering Controls

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Intrinsically safe equipment and non-sparking tools shall be used in circumstances where concentrations may exceed lower flammable limits. Grounding and bonding shall be used to prevent accumulation and discharge of static electricity. Emergency shower and eyewash should be provided in proximity to handling areas in the event of exposure to decontaminate.

Personal Protective Equipment

Exposure	Equipment
Eye / Face	Wear appropriate chemical protective glasses or goggles or face shields to prevent skin and eye contact especially caused from splashing.
Skin	Wear appropriate personal protective clothing to prevent skin contact. Gloves constructed of nitrile, neoprene or PVC are recommended when handling this material. Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure.



Exposure	Equipment
Respiratory	<p>A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited. Refer to OSHA 29 CFR 1910.134, ANSI Z88.2-1992, NIOSH Respirator Decision Logic, and the manufacturer for additional guidance on respiratory protection selection and limitations.</p> <p>Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.</p>
Thermal	<p>Product is stored at ambient temperature. No thermal protection is required except for emergency operations involving actual or potential for fire. Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.</p>

9. PHYSICAL AND CHEMICAL PROPERTIES

Property	Value
Appearance	Clear or straw-colored liquid dyed red for distribution
Odor	Mild petroleum distillate odor.
Odor Threshold	<1 ppm
pH	Not available
Melting Point	-15 °F (-26 °C)
Boiling Point Range	320 to 690 °F (160 to 366 °C)
Flash Point	>125.6 °F (52 °C) PMCC
Evaporation Rate	Slow, varies with conditions
Flammability	Flammable liquid
Flammable Limits	0.6 % - 7.5%
Vapor Pressure	0.009 psia @ 70 °F
Vapor Density	>1 (air=1)
Specific Gravity	0.81-0.88 @ 60 °F (16 °C) (water=1)
Solubility	Insoluble in water; miscible with other petroleum solvents.
Partition Coefficient (N-octanol/water)	Log Kow range of 3.3 to >.6.0
Autoignition Temperature	494 °F (257 °C)
Decomposition Temperature	When heated it emits acrid smoke and irritating vapors.
Viscosity	>3 cSt
Percent Volatiles	95-100

10. STABILITY AND REACTIVITY

Stability

This is a stable material that is flammable liquid (OSHA/GHS hazard category 3). Stable during transport.

Reactivity

Material is not self-reacting. Flammable concentrations may be present in air. Compound can react with oxidizing materials.



Possibility of Hazardous Reactions

Hazardous polymerization will not occur.

Incompatibility

Keep away from strong oxidizers such as nitric and sulfuric acids.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, static electricity, welding, smoking and other ignition sources.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL INFORMATION

Acute Toxicity:

Acute Toxicity (Inhalation LC50)

No. 2 Fuel Oil (68476-30-2)
LC50 Inhalation Rat >4.6 mg/l/4h

Acute Toxicity (Dermal LD50)

No. 2 Fuel Oil (68476-30-2)
LD50 Dermal Rabbit >2000 mg/kg

Acute Toxicity (Oral LD50)

No. 2 Fuel Oil (68476-30-2)
LD50 Oral Rat >12000 mg/kg

Acute Toxicity (Oral LD50)

Methyl Esters
LD50 Oral Rat >14400 mg/kg

Skin Corrosion/Irritation: Prolonged and repeated contact may cause skin irritation leading to dermatitis. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are exposed repeatedly.

Serious Eye Damage/Irritation: Causes serious eye irritation.

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Teratogenicity: Not available

Carcinogenicity: OSHA: NO, IARC: Group 3, NTP: NO, ACGIH: NOIC:A3, NIOSH: NO

IARC: Group 3 – Not classifiable as to their carcinogenicity to humans ACGIH: A3 – Confirmed animal carcinogen with unknown relevance to humans

Petroleum middle distillates have been shown to produce skin tumors in laboratory animals following repeated and prolonged exposures. The significance of this finding to human exposure has not been determined. Other studies with active skin carcinogens have shown that washing the animal's skin with soap and water between applications reduced tumor formation.

This product is similar to Diesel Fuel. IARC classifies whole diesel fuel exhaust particulates (byproduct of combustion of this material) carcinogenic to humans (Group 1) and NIOSH regards diesel fuel exhaust particulate as a potential occupational carcinogen.

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): Not classified

Specific Target Organ Toxicity (Single Exposure): Inhalation exposure may cause drowsiness or dizziness by inhalation exposure.

Aspiration Hazard: The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.



Potential Health Effects: Vapor irritating to skin, eyes, nose, and throat. Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

WARNING: The burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

12. ECOLOGICAL INFORMATION

Toxicity

This material is expected to be toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

Data for Component: No. 2 Fuel Oil (68476-30-2)

Material is toxic to aquatic organisms based on an acute basis (LC50/EC50 >1 but ≤ 10 mg/L in the most sensitive species tested).

Material is a long-term aquatic hazard based on a chronic basis (LC50/EC50 >1 but ≤ 10 mg/L in the most sensitive species tested).

Persistence and Degradation: This material is not expected to be readily biodegradable.

Bioaccumulative Potential: Not available

Mobility in Soil: Not available

Other Adverse Effects: None known

Other Information: Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Consult federal, state and local waste regulations to determine appropriate disposal options. May be considered a hazardous waste if disposed. Direct solid waste (landfill) or incineration at a solid waste facility is not permissible. Do not discharge to sanitary or storm sewer. Personnel handling waste containers should follow precautions provided in this document.

Shipping containers must be DOT authorized packages. Follow licensure and regulations for transport of hazardous material and hazardous waste as applicable.

14. TRANSPORT INFORMATION

US DOT

UN Identification Number	NA 1993
Proper Shipping Name	Fuel oil (No. 2)
Hazard Class and Packing Group	3, PGIII
Shipping Label	Combustible liquid
Placard / Bulk Package	Combustible liquid, 1993
Emergency Response Guidebook Guide Number	128

IATA Information

UN Identification Number	UN 1993
Proper Shipping Name	Fuel oil (No. 2)
Hazard Class and Packing Group	3, PGIII
ICAO Label	3
Packing Instructions Cargo	355
Max Quantity Per Package Cargo	220L
Packing Instructions Passenger	344Y
Max Quantity per Package	60L



ICAO

UN Identification Number UN 1993
Shipping Name / Description Fuel oil (No. 2)
Hazard Class and Packing Group 3, PG III
IMDG Label 3

IMDG

UN Identification Number UN 1993
Shipping Name / Description Heating Oil, Light
Hazard Class and Packing Group 3, PGIII
IMDG Label 3
EmS Number N/A
Marine Pollutant Yes

15. REGULATORY INFORMATION

U.S. Federal, State, and Local Regulatory Information

Any spill or uncontrolled release of this product, including any substantial threat of release, may be subject to federal, state and/or local reporting requirements. This product and/or its constituents may also be subject to other federal, state, or local regulations; consult those regulations applicable to your facility/operation.

OSHA Hazard Communication Standard

This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning And Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard Yes
Delayed (Chronic) Health Hazard Yes
Fire Hazard Yes
Reactive Hazard No
Sudden Release of Pressure Hazard No

Clean Water Act (Oil Spills)

Any spill or release of this product to "navigable waters" (Essentially any surface water, including certain wetlands) or adjoining shorelines sufficient to cause a visible sheen or deposit of a sludge or emulsion must be reported immediately to the National Response Center (1-800-424-8802) or, if not practical, the U.S. Coast Guard with follow up to the National Response Center, as required by U.S. Federal Law. Also contact appropriate state and local regulatory agencies as required.

CERCLA Section 103 and SARA Section 304 (Release to the Environment)

The CERCLA definition of hazardous substances contains a "petroleum exclusion" clause which exempts this material. This product does not contain any chemicals subject to the reporting requirements of CERCLA Section 103 or SARA 304.

SARA Section 313- Supplier Notification

This product does not contain any chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

EPA Notification (Oil Spills)

If there is a discharge of more than 1,000-gallons of oil into or upon navigable waters of the United States, or if it is the second spill event of 42 gallons or more of oil into water within a twelve (12) month period, a written report must be submitted to the Regional Administrator of the EPA within sixty days of the event.

Pennsylvania Right to Know Hazardous Substance list:

The following product components are cited in the Pennsylvania Special Hazardous Substance List, and are present at levels which require reporting.

Component	CAS	Amount
No. 2 Fuel Oil	68476-30-2	100%



New Jersey Right to Know Hazardous Substance list:

The following product components are cited in the New Jersey Right to Know Hazardous Substance List, and are present at levels which require reporting.

Component	CAS	Amount
No. 2 Fuel Oil	68476-30-2	100%

California Proposition 65 WARNING: This product contains chemicals known to the State of California to cause Cancer or Reproductive Toxicity.

Component	CAS	Amount
Naphthalene	91-20-3	<0.1%

U.S. Toxic Substances Control Act

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30.

CEPA - Domestic Substances List (DSL)

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

Canadian Regulatory Information (WHMIS)

Class B3 – Combustible Liquid

Class D2A – Materials causing other toxic effects. (Very Toxic)

16. OTHER INFORMATION

Version	4
Issue Date	May 20, 2016
Prior Issue Date	May 3, 2015

Description of Revisions

Revised to meet Globally Harmonized System for chemical hazard communication requirements pursuant to OSHA regulatory revisions 77 FR 17884, March 26, 2012.

Abbreviations

°F	Degrees Fahrenheit (temperature)	mL	Milliliter
<	Less than	mm ²	Square millimeters
=	Equal to	mmHg	Millimeters of mercury (pressure)
>	Greater than	N/A	Not applicable
AP	Approximately	N/D	Not determined
C	Centigrade (temperature)	ppm	Parts per million
kg	Kilogram	sec	Second
L	Liter	ug	Micrograms
mg	Milligrams		

Acronyms

ACGIH	American Conference of Governmental Industrial Hygienists	CERCLA	Comprehensive Emergency Response, Compensation, and Liability Act
AIHA	American Industrial Hygiene Association	DOT	U.S. Department of Transportation
AL	Action Level	EC50	Ecological concentration 50%
ANSI	American National Standards Institute	EPA	U.S. Environmental Protection Agency
API	American Petroleum Institute	ERPG	Emergency Response Planning Guideline
CAS	Chemical Abstract Service	GHS	Global Harmonized System



SAFETY DATA SHEET
No. 2 Fuel Oil

HMIS	Hazardous Materials Information System	REL	Recommended Exposure Limit (NIOSH)
IARC	International Agency for Research On Cancer	RVP	Reid Vapor Pressure
IATA	International Air Transport Association	SARA	Superfund Amendments and
IMDG	International Maritime Dangerous Goods	SCBA	Self Contained Breathing Apparatus
Koc	Soil Organic Carbon	SPCC	Spill Prevention, Control, and
LC50	Lethal concentration 50%		Countermeasures
LD50	Lethal dose 50%	STEL	Short Term Exposure Limit (generally 15
MSHA	Mine Safety and Health Administration		minutes)
NFPA	National Fire Protection Association	TLV	Threshold Limit Value (ACGIH)
NIOSH	National Institute of Occupational Safety and Health	TSCA	Toxic Substances Control Act
		TWA	Time Weighted Average (8 hr.)
NOIC	Notice of Intended Change	UN	United Nations
NTP	National Toxicology Program	UNECE	United Nations Economic Commission for
OPA	Oil Pollution Act of 1990		Europe
OSHA	U.S. Occupational Safety & Health Administration	WEEL	Workplace Environmental Exposure Level (AIHA)
PEL	Permissible Exposure Limit (OSHA)	WHMIS	Canadian Workplace Hazardous Materials Information System
RCRA	Resource Conservation and Recovery Act Reauthorization Act of 1986 Title III		

Disclaimer of Expressed and Implied Warranties

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

**** End of Safety Data Sheet ****

Safety Data Sheet

Section 1: Identification

Product identifier

- Product Name** • **Natural Gas**
- Synonyms** • Natural gas-dry; Pipeline gas
- SDS Number/Grade** • NG 2008-01

Relevant identified uses of the substance or mixture and uses advised against

- Recommended use** • Residential, commercial and industrial heating, industrial feedstock, power generation and vehicle transportation

Details of the supplier of the safety data sheet

- Manufacturer** • NW Natural
220 NW 2nd Ave.
Portland, OR 97209
United States
www.nwnatural.com
- Telephone (General)** • 800-422-4012

Emergency telephone number

- Manufacturer** • 800-882-3377

Section 2: Hazard Identification

United States (US)

According to OSHA 29 CFR 1910.1200 HCS

Classification of the substance or mixture

- OSHA HCS 2012** • Flammable Gases 1 - H220
Compressed Gas - H280
Simple Asphyxiant

Label elements

OSHA HCS 2012

DANGER



- Hazard statements** • Extremely flammable gas - H220
Contains gas under pressure; may explode if heated - H280
May displace oxygen and cause rapid suffocation.

Precautionary statements

- Prevention** • Keep away from heat, sparks, open flames and/or hot surfaces. - P210
- Response** • Leaking gas fire: Do not extinguish, unless leak can be stopped safely. - P377
Eliminate all ignition sources if safe to do so. - P381

Storage/Disposal • Protect from sunlight. Store in a well-ventilated place. - P410+P403

Other hazards

OSHA HCS 2012

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

Section 3 - Composition/Information on Ingredients

Substances

- Material does not meet the criteria of a substance.

Mixtures

Composition				
Chemical Name	Identifiers	%	LD50/LC50	Classifications According to Regulation/Directive
Methane	CAS:74-82-8	93.5%	NDA	OSHA HCS 2012: Flam. Gas 1; Press. Gas - Comp.; Simp. Asphyx
Ethane	CAS:74-84-0	3.8%	NDA	OSHA HCS 2012: Flam. Gas 1; Press. Gas - Comp., Simp. Asphyx.
Nitrogen	CAS:7727-37-9	1.2%	NDA	OSHA HCS 2012: Press. Gas - Comp.; Simp. Asphyx.
Propane	CAS:74-98-6	1%	NDA	OSHA HCS 2012: Flam. Gas 1; Press. Gas - Comp., Simp. Asphyx.
Carbon dioxide	CAS:124-38-9	0.3%	Inhalation-Rat LC50 • 470000 ppm 30 Minute(s)	OSHA HCS 2012: Press. Gas - Comp.; Simp. Asphyx.
Isobutane	CAS:75-28-5	0.1%	Inhalation-Rat LC50 • 658000 mg/m ³ 4 Hour(s)	OSHA HCS 2012: Flam. Gas 1; Press Gas - Comp.; Simp. Asphyx.
Butane	CAS:106-97-8	0.1%	Inhalation-Rat LC50 • 658 g/m ³ 4 Hour(s)	OSHA HCS 2012: Flam. Gas 1; Press Gas - Comp.; Simp. Asphyx.
Pentane	CAS:109-66-0	< 0.1%	Inhalation-Rat LC50 • 364 g/m ³ 4 Hour(s)	OSHA HCS 2012: Exposure limit(s)
Hexane	CAS:110-54-3	< 0.1%	Inhalation-Rat LC50 • 627000 mg/m ³ 3 Minute(s)	OSHA HCS 2012: Exposure limit(s)
2-Methylbutane (In Liquid form)	CAS:78-78-4	< 0.1%	Inhalation-Rat LC50 • 280000 mg/m ³ 4 Hour(s)	OSHA HCS 2012: Exposure limit(s)
2-Propanethiol, 2-methyl-	CAS:75-66-1	< 30ppm	Ingestion/Oral-Rat LD50 • 4729 mg/kg Inhalation-Rat LC50 • 22200 ppm 4 Hour(s)	OSHA HCS 2012: Exposure limit(s)
Methyl ethyl sulfide	CAS:624-89-5	< 8ppm	NDA	OSHA HCS 2012: Exposure limit(s)
Hydrogen sulfide	CAS:7783-06-4	< 5ppm	Inhalation-Rat LC50 • 700 mg/m ³ 4 Hour(s)	OSHA HCS 2012: Exposure limit(s)

All percentages provided are approximate.

Section 4: First-Aid Measures

Description of first aid measures

Inhalation

- IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing. If signs/symptoms continue, get medical attention.

Skin

- Although exposure is unlikely, in case of contact immediately flush skin with running water. If skin irritation develops get medical advice/attention.

Eye

- First aid is not expected to be necessary if material is used under ordinary conditions and as recommended. If irritation develops and persists, get medical attention.

Ingestion

- Ingestion is not considered a potential route of exposure.

Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

Indication of any immediate medical attention and special treatment needed

Notes to Physician

- All treatments should be based on observed signs and symptoms of distress in the patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred. A potential health hazard associated with this gas is anoxia.

Section 5: Fire-Fighting Measures

Extinguishing media

- Suitable Extinguishing Media**
- Dry Chemical, (Potassium Bicarbonate based *Purple K* most effective), Carbon dioxide, Water.

Unsuitable Extinguishing Media

- No data available

Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards

- EXTREMELY FLAMMABLE
Will form explosive mixtures with air.
Vapors may travel to source of ignition and flash back.
Cylinders exposed to fire may vent and release flammable gas through pressure relief devices.
Containers may explode when heated.
Ruptured cylinders may rocket.

Hazardous Combustion Products

- No data available

Advice for firefighters

- Gas fires should not be extinguished unless flow of gas can be stopped. Only authorized personnel should turn off valves or attempt repairs. Fire crews should wear self-contained breathing apparatus (SCBA). Natural gas is lighter than air and will vent upward but special consideration should be given to areas that may trap or contain explosive concentrations including areas of potential migration underground or through structures. Water mist may be used to cool surrounding structures including compressed gas cylinders or tanks.

Section 6 - Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

Personal Precautions

- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Do not touch or walk through spilled material. Ventilate the area before entry.

Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions. Stop leak if you can do it without risk. Keep unauthorized personnel away. Keep out of low areas. Stay upwind. **LARGE SPILL:**

Consider initial downwind evacuation for at least 800 meters (1/2 mile)

Environmental precautions

- Prevent spreading of vapors through sewers, ventilation systems and confined areas.

Methods and material for containment and cleaning up

Containment/Clean-up Measures

- All equipment used when handling the product must be grounded. Stop leak if you can do it without risk. If possible, turn leaking containers so that gas escapes rather than liquid. Use water spray to reduce vapors; do not put water directly on leak, spill area or inside container. Do not direct water at spill or source of leak. Isolate area until gas has dispersed.

Section 7 - Handling and Storage

Precautions for safe handling

Handling

- Keep away from heat and ignition sources – No Smoking. Take precautionary measures against static charges. All equipment used when handling the product must be grounded. Use only non-sparking tools. Use only with adequate ventilation. Ventilate closed spaces before entering. Be aware of any signs of dizziness or fatigue, especially if work is done in a poorly ventilated area; exposures to fatal concentrations of this gas mixture could occur without any significant warning symptoms, due to olfactory fatigue or oxygen deficiency. Cylinders should be firmly secured to prevent falling or being knocked-over. Use explosion-proof - electrical, ventilating and/or lighting equipment. Do not attempt to repair, adjust, or in any other way modify cylinders. If there is a malfunction or another type of operational problem, contact nearest distributor immediately. Empty containers retain product residue and can be hazardous. Do not cut, weld, puncture or incinerate container.

Conditions for safe storage, including any incompatibilities

Storage

- Store in a cool/low-temperature, well-ventilated dry place away from heat and ignition sources. Protect cylinders against physical damage. Cylinders should be firmly secured to prevent falling or being knocked-over.

Section 8 - Exposure Controls/Personal Protection

Control parameters

Exposure Limits/Guidelines				
	Result	ACGIH	NIOSH	OSHA
Pentane (109-66-0)	TWAs	600 ppm TWA (listed under Pentane, all isomers)	120 ppm TWA; 350 mg/m ³ TWA	1000 ppm TWA; 2950 mg/m ³ TWA
	Ceilings	Not established	610 ppm Ceiling (15 min); 1800 mg/m ³ Ceiling (15 min)	Not established
Hexane (110-54-3)	TWAs	50 ppm TWA	50 ppm TWA; 180 mg/m ³ TWA	500 ppm TWA; 1800 mg/m ³ TWA
Isobutane (75-28-5)	STELs	1000 ppm STEL	Not established	Not established
	TWAs	Not established	800 ppm TWA; 1900 mg/m ³ TWA	Not established
Butane (106-97-8)	STELs	1000 ppm STEL	Not established	Not established
	TWAs	Not established	800 ppm TWA; 1900 mg/m ³ TWA	Not established
2-Methylbutane (In Liquid form) (78-78-4)	TWAs	600 ppm TWA (listed under Pentane, all isomers)	Not established	Not established
Carbon dioxide	TWAs	5000 ppm TWA	5000 ppm TWA; 9000 mg/m ³ TWA	5000 ppm TWA; 9000 mg/m ³ TWA

(124-38-9)	STELs	30000 ppm STEL	30000 ppm STEL; 54000 mg/m3 STEL	Not established
Propane (74-98-6)	TWAs	1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	1000 ppm TWA; 1800 mg/m3 TWA	1000 ppm TWA; 1800 mg/m3 TWA
Ethane (74-84-0)	TWAs	1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	Not established	Not established
Hydrogen sulfide (7783-06-4)	Ceilings	Not established	10 ppm Ceiling (10 min); 15 mg/m3 Ceiling (10 min)	20 ppm Ceiling
	STELs	5 ppm STEL	Not established	Not established
	TWAs	1 ppm TWA	Not established	Not established
Methane (74-82-8)	TWAs	1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	Not established	Not established

Exposure controls

Engineering Measures/Controls

- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Use explosion-proof - electrical, ventilating and/or lighting equipment.

Personal Protective Equipment

Respiratory

- In case of insufficient ventilation, wear suitable respiratory equipment. Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.

Eye/Face

- Wear safety glasses.

Skin/Body

- Wear leather gloves when handling cylinders.

Environmental Exposure Controls

- Follow best practice for site management and disposal of waste. Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene
 NIOSH = National Institute of Occupational Safety and Health
 OSHA = Occupational Safety and Health Administration

STEL = Short Term Exposure Limits are based on 15-minute exposures
 TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

Section 9 - Physical and Chemical Properties

Information on Physical and Chemical Properties

Material Description			
Physical Form	Gas	Appearance/Description	Colorless, tasteless gas that has no odor or if trace amounts of sulfur compounds are added as an odorant the gas has a garlic/rotten-egg/skunk odor.
Color	Colorless	Odor	Odorless or with trace amounts of sulfur compounds added as an odorant resulting in a garlic/rotten-egg/skunk odor.
Odor Threshold	No data available		
General Properties			

Boiling Point	-258.7 F(-161.5 C) at 14.73 psig	Melting Point	No data available
Decomposition Temperature	No data available	pH	No data available
Specific Gravity/Relative Density	0.55 to 0.64 Water=1 depending on composition	Density	0.044 lb(s)/ft ³
Bulk Density	No data available	Water Solubility	Slightly Soluble 0.1 to 1 %
Viscosity	No data available		
Volatility			
Vapor Pressure	No data available	Vapor Density	No data available
Evaporation Rate	No data available		
Flammability			
Flash Point	-306 F(-187.7778 C)	UEL	15 % Limits vary slightly with composition
LEL	4.8 % Limits vary slightly with composition	Autoignition	1004 F(540 C)
Flammability (solid, gas)	Flammable gas.		
Environmental			
Octanol/Water Partition coefficient	No data available		

Section 10: Stability and Reactivity

Reactivity

- No dangerous reaction known under conditions of normal use.

Chemical stability

- Stable under normal temperatures and pressures.

Possibility of hazardous reactions

- Hazardous polymerization will not occur.

Conditions to avoid

- Keep away from heat, sparks, and flame.

Incompatible materials

- Strong oxidizers.

Hazardous decomposition products

- Oxides of carbon (CO, CO₂), "soot"

Section 11 - Toxicological Information

Information on toxicological effects

Components		
Methane (93.5%)	74-82-8	Acute Toxicity: Inhalation-Mouse LC50 • 326 g/m ³ 2 Hour(s)
Isobutane (0.1%)	75-28-5	Acute Toxicity: Inhalation-Rat LC50 • 57 pph 15 Minute(s); <i>Behavioral:Tremor; Behavioral:Convulsions or effect on seizure threshold; Lungs, Thorax, or Respiration:Respiratory depression</i>
Butane (0.1%)	106-97-8	Acute Toxicity: Inhalation-Rat LC50 • 658 g/m ³ 4 Hour(s)

2-Methylbutane (In Liquid form) (< 0.1%)	78-78-4	Acute Toxicity: Inhalation-Rat LC50 • 280000 mg/m ³ 4 Hour(s)
Pentane (< 0.1%)	109-66-0	Acute Toxicity: Ingestion/Oral-Rat LD50 • >2000 mg/kg
Hexane (< 0.1%)	110-54-3	Acute Toxicity: Ingestion/Oral-Rat LD50 • 25 g/kg; Inhalation-Rat LC50 • 48000 ppm 4 Hour(s); Irritation: Eye-Rabbit • 10 mg • Mild irritation
Carbon dioxide (0.3%)	124-38-9	Acute Toxicity: Inhalation-Rat LC50 • 470000 ppm 30 Minute(s); Reproductive: Inhalation-Rat TCLO • 6 pph 24 Hour(s)(10D preg); <i>Reproductive Effects:Specific Developmental Abnormalities:Musculoskeletal system; Reproductive Effects:Specific Developmental Abnormalities:Cardiovascular (circulatory) system; Reproductive Effects:Specific Developmental Abnormalities:Respiratory system</i>

GHS Properties	Classification
Acute toxicity	OSHA HCS 2012 • No data available
Aspiration Hazard	OSHA HCS 2012 • No data available
Carcinogenicity	OSHA HCS 2012 • No data available
Germ Cell Mutagenicity	OSHA HCS 2012 • No data available
Skin corrosion/Irritation	OSHA HCS 2012 • No data available
Skin sensitization	OSHA HCS 2012 • No data available
STOT-RE	OSHA HCS 2012 • No data available
STOT-SE	OSHA HCS 2012 • No data available
Toxicity for Reproduction	OSHA HCS 2012 • No data available
Respiratory sensitization	OSHA HCS 2012 • No data available
Serious eye damage/Irritation	OSHA HCS 2012 • No data available

Route(s) of entry/exposure ● Inhalation, Skin, Eye, Ingestion

Potential Health Effects

Inhalation

Acute (Immediate)

- If this material is released in a small, poorly ventilated area (i.e. an enclosed or confined space), an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of over-exposure, death may occur. The following effects associated with decreased levels of oxygen: increase in breathing and pulse rate, emotional upset, abnormal fatigue, nausea, vomiting, collapse, loss of consciousness, convulsive movements, respiratory collapse and death.

Chronic (Delayed)

- No data available

Skin

Acute (Immediate)

- Under normal conditions of use, no health effects are expected.

Chronic (Delayed)

- Under normal conditions of use, no health effects are expected.

Eye

Acute (Immediate)

- Under normal conditions of use, no health effects are expected.

Chronic (Delayed)

- Under normal conditions of use, no health effects are expected.

Ingestion

Acute (Immediate)

- Ingestion is not anticipated to be a likely route of exposure to this product.

Chronic (Delayed)

- Ingestion is not anticipated to be a likely route of exposure to this product.

Key to abbreviations

LD = Lethal Dose

MLD = Mild

TC = Toxic Concentration

Section 12 - Ecological Information**Toxicity**

- Material data lacking.

Persistence and degradability

- Material data lacking.

Bioaccumulative potential

- Material data lacking.

Mobility in Soil

- Material data lacking.

Results of PBT and vPvB assessment

- PBT and vPvB assessment has not been conducted for this material.

Other adverse effects

- No studies have been found.

Section 13 - Disposal Considerations**Waste treatment methods****Product waste**

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	UN number	UN proper shipping name	Transport hazard class(es)	Packing group	Environmental hazards
DOT	UN1971	Methane, compressed or Natural gas, compressed (with high methane content)	2.1	NDA	NDA

Special precautions for user

- Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

- Not relevant.

Section 15 - Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture**SARA Hazard Classifications** • Acute, Fire, Pressure(Sudden Release of)

Inventory		
Component	CAS	TSCA
2-Methylbutane (In Liquid form)	78-78-4	Yes
2-Propanethiol, 2-methyl-	75-66-1	Yes
Butane	106-97-8	Yes
Carbon dioxide	124-38-9	Yes
Ethane	74-84-0	Yes
Hexane	110-54-3	Yes
Hydrogen sulfide	7783-06-4	Yes
Isobutane	75-28-5	Yes
Methane	74-82-8	Yes
Methyl ethyl sulfide	624-89-5	Yes
Nitrogen	7727-37-9	Yes
Pentane	109-66-0	Yes
Propane	74-98-6	Yes

United States**Labor****U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals**

• Hydrogen sulfide	7783-06-4	1500 lb TQ
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - OSHA - Specifically Regulated Chemicals

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed

• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

Environment

U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Hydrogen sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Hydrogen sulfide	7783-06-4	100 lb EPCRA RQ
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• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Hydrogen sulfide	7783-06-4	500 lb TPQ
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Hydrogen sulfide	7783-06-4	1.0 % de minimis concentration
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	1.0 % de minimis concentration
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed

• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

United States - California

Environment

U.S. - California - Proposition 65 - Carcinogens List

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - California - Proposition 65 - Developmental Toxicity

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Female

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Male

• Hydrogen sulfide	7783-06-4	Not Listed
• Pentane	109-66-0	Not Listed
• Ethane	74-84-0	Not Listed
• 2-Methylbutane (In Liquid form)	78-78-4	Not Listed
• Isobutane	75-28-5	Not Listed
• Carbon dioxide	124-38-9	Not Listed
• Propane	74-98-6	Not Listed
• Butane	106-97-8	Not Listed
• Hexane	110-54-3	Not Listed
• Nitrogen	7727-37-9	Not Listed
• Methane	74-82-8	Not Listed
• 2-Propanethiol, 2-methyl-	75-66-1	Not Listed
• Methyl ethyl sulfide	624-89-5	Not Listed

Section 16 - Other Information

Last Revision Date	• 17/June/2014
Preparation Date	• 26/February/2006
Disclaimer/Statement of Liability	• The data contained in this SDS are believed to be accurate, but are not so warranted whether or not they originated at NW Natural. Recipients of this SDS are advised to confirm ahead of time that the data are current and suitable to their needs.

Key to abbreviations

NDA = No Data Available

Attachment E
Emissions Calculations

**Attachment E - Broadwater Federal Building, Martinsburg, West Virginia
Criteria Pollutants PTE**

Emission Unit ID	Source Description	Source Process	Source Process Material	Annual Process Throughput		Annual Process Duration		Criteria Pollutant	Emission Factors			Emission Estimates	
				rate*	unit	rate	unit		rate	unit	source	lb/hr	tons/yr
1	Boiler #1 (3.348 MMBtu/hr)	Fuel combustion	Natural Gas	28.75	MMcf	8760	hr	VOC	5.50	lb/MMcf	1	1.81E-02	7.91E-02
				28.75	MMcf	8760	hr	NO _x	100.00	lb/MMcf	1	3.28E-01	1.44E+00
				28.75	MMcf	8760	hr	CO	84.00	lb/MMcf	1	2.76E-01	1.21E+00
				28.75	MMcf	8760	hr	PM	7.60	lb/MMcf	1	2.49E-02	1.09E-01
				28.75	MMcf	8760	hr	PM ₁₀	7.60	lb/MMcf	1	2.49E-02	1.09E-01
				28.75	MMcf	8760	hr	SO ₂	0.60	lb/MMcf	1	1.97E-03	8.63E-03
			28.75	MMcf	8760	hr	Pb	5.00E-04	lb/MMcf	1	1.64E-06	7.19E-06	
			No. 2 Fuel Oil	209.49	1000 gal	8760	hr	VOC	0.56	lb/1000 Gal	3***	1.33E-02	5.82E-02
				209.49	1000 gal	8760	hr	NO _x	20.00	lb/1000 Gal	4	4.78E-01	2.09E+00
				209.49	1000 gal	8760	hr	CO	5.00	lb/1000 Gal	4	1.20E-01	5.24E-01
				209.49	1000 gal	8760	hr	PM	3.30	lb/1000 Gal	2	7.89E-02	3.46E-01
				209.49	1000 gal	8760	hr	PM ₁₀	2.38	lb/1000 Gal	2	5.69E-02	2.49E-01
209.49	1000 gal	8760		hr	SO ₂	0.21	lb/1000 Gal	4**	5.09E-03	2.23E-02			
209.49	1000 gal	8760	hr	Pb	1.26E-03	lb/1000 Gal	5	3.01E-05	1.32E-04				
2	Boiler #2 (1.339 MMBtu/hr)	Fuel combustion	Natural Gas	11.50	MMcf	8760	hr	VOC	5.50	lb/MMcf	1	7.22E-03	3.16E-02
				11.50	MMcf	8760	hr	NO _x	100.00	lb/MMcf	1	1.31E-01	5.75E-01
				11.50	MMcf	8760	hr	CO	84.00	lb/MMcf	1	1.10E-01	4.83E-01
				11.50	MMcf	8760	hr	PM	7.60	lb/MMcf	1	9.98E-03	4.37E-02
				11.50	MMcf	8760	hr	PM ₁₀	7.60	lb/MMcf	1	9.98E-03	4.37E-02
				11.50	MMcf	8760	hr	SO ₂	0.60	lb/MMcf	1	7.88E-04	3.45E-03
			11.50	MMcf	8760	hr	Pb	5.00E-04	lb/MMcf	1	6.56E-07	2.87E-06	
			No. 2 Fuel Oil	83.78	1000 gal	8760	hr	VOC	0.56	lb/1000 Gal	3***	5.32E-03	2.33E-02
				83.78	1000 gal	8760	hr	NO _x	20.00	lb/1000 Gal	4	1.91E-01	8.38E-01
				83.78	1000 gal	8760	hr	CO	5.00	lb/1000 Gal	4	4.78E-02	2.09E-01
				83.78	1000 gal	8760	hr	PM	3.30	lb/1000 Gal	2	3.16E-02	1.38E-01
				83.78	1000 gal	8760	hr	PM ₁₀	2.38	lb/1000 Gal	2	2.28E-02	9.97E-02
83.78	1000 gal	8760		hr	SO ₂	0.21	lb/1000 Gal	4**	2.04E-03	8.92E-03			
83.78	1000 gal	8760	hr	Pb	1.26E-03	lb/1000 Gal	5	1.21E-05	5.28E-05				
3	Hot Water Heater #1 (0.07 MMBtu/hr)	Fuel combustion	Natural Gas	0.60	MMcf	8760	hr	VOC	5.50	lb/MMcf	1	3.77E-04	1.65E-03
				0.60	MMcf	8760	hr	NO _x	100.00	lb/MMcf	1	6.86E-03	3.01E-02
				0.60	MMcf	8760	hr	CO	84.00	lb/MMcf	1	5.76E-03	2.52E-02
				0.60	MMcf	8760	hr	PM	7.60	lb/MMcf	1	5.22E-04	2.28E-03
				0.60	MMcf	8760	hr	PM ₁₀	7.60	lb/MMcf	1	5.22E-04	2.28E-03
				0.60	MMcf	8760	hr	SO ₂	0.60	lb/MMcf	1	4.12E-05	1.80E-04
				0.60	MMcf	8760	hr	Pb	5.00E-04	lb/MMcf	1	3.43E-08	1.50E-07
4	Hot Water Heater #2 (0.199 MMBtu/hr)	Fuel combustion	Natural Gas	1.71	MMcf	8760	hr	VOC	5.50	lb/MMcf	1	1.07E-03	4.70E-03
				1.71	MMcf	8760	hr	NO _x	100.00	lb/MMcf	1	1.95E-02	8.55E-02
				1.71	MMcf	8760	hr	CO	84.00	lb/MMcf	1	1.64E-02	7.18E-02
				1.71	MMcf	8760	hr	PM	7.60	lb/MMcf	1	1.48E-03	6.49E-03
				1.71	MMcf	8760	hr	PM ₁₀	7.60	lb/MMcf	1	1.48E-03	6.49E-03
				1.71	MMcf	8760	hr	SO ₂	0.60	lb/MMcf	1	1.17E-04	5.13E-04
				1.71	MMcf	8760	hr	Pb	5.00E-04	lb/MMcf	1	9.75E-08	4.27E-07

1. AP-42 Emission Factors, Chapter 1.4, Table 1.4-1 and 1.4-2

2. AP-42 Emission Factors, Chapter 1.3, Table 1.3-2 and 1.3-7

3. AP-42 Emission Factors, Chapter 1.3, Table 1.3-3

4. AP-42 Emission Factors, Chapter 1.3, Table 1.3-1

5. AP-42 Emission Factors, Chapter 1.3, Table 1.3-10

* Heating value for natural gas is assumed as 1020 Btu/Scf and distillate oil is assumed as 140 MMBtu/1,000 gal

**Ultra low sulfur diesel fuel was used for calculation purposes, with a sulfur content of 15 ppm.

***The TOC value was used for No. 2 Fuel Oil VOC emissions calculations.

Note: The boilers will primarily burn natural gas and #2 Fuel Oil will be used as a back up fuel only. For the purposes of the PTE calculations, the PTE for each pollutant utilizes the larger of the Natural Gas PTE and the Fuel Oil PTE based on 8760 annual hours of use.

	PTE Emissions	
	lb/hr	tons/yr
VOC	0.03	0.12
NO _x	0.70	3.05
CO	0.41	1.79
PM	0.11	0.49
PM ₁₀	0.08	0.36
SO ₂	0.01	0.03
Pb	0.00	0.00

**Attachment E - Broadwater Federal Building, Martinsburg, West Virginia
Hazardous Air Pollutants (HAPs) PTE**

HAPS	NG Emission Factor ¹	Distillate Oil Emission Factor ²	Boiler #1 PTE		Boiler #2 PTE		Hot Water Heater #1 PTE		Hot Water Heater #2 PTE		Total PTE	
	lb/MMScf	lb/1000 gal	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
2-Methylnaphthalene	2.40E-05		7.88E-08	3.45E-07	2.40E-05	3.45E-07	1.65E-09	7.21E-09	4.68E-09	2.05E-08	1.64E-07	6.83E-07
3-Methylchloranthrene	1.80E-06		5.91E-09	2.59E-08	1.80E-06	2.59E-08	1.24E-10	5.41E-10	3.51E-10	1.54E-09	1.23E-08	5.12E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05		5.25E-08	2.30E-07	1.60E-05	2.30E-07	1.10E-09	4.81E-09	3.12E-09	1.37E-08	1.09E-07	4.56E-07
Acenaphthene	1.80E-06	2.11E-05	5.91E-09	2.59E-08	1.80E-06	2.11E-05	1.24E-10	5.41E-10	3.51E-10	1.54E-09	7.07E-07	3.12E-06
Acenaphthylene	1.80E-06	2.53E-07	5.91E-09	2.59E-08	1.80E-06	2.53E-07	1.24E-10	5.41E-10	3.51E-10	1.54E-09	1.24E-08	7.77E-08
Anthracene	2.40E-06	1.22E-06	7.88E-09	3.45E-08	2.40E-06	1.22E-06	1.65E-10	7.21E-10	4.68E-10	2.05E-09	4.15E-08	2.13E-07
Benz(a)anthracene	1.80E-06	4.01E-06	5.91E-09	2.59E-08	1.80E-06	4.01E-06	1.24E-10	5.41E-10	3.51E-10	1.54E-09	1.35E-07	6.13E-07
Benzene	2.10E-03	2.14E-04	6.89E-06	3.02E-05	2.10E-03	2.14E-04	1.44E-07	6.31E-07	4.10E-07	1.79E-06	1.43E-05	8.22E-05
Benzo(a)pyrene	1.20E-06		3.94E-09	1.73E-08	1.20E-06	1.73E-08	8.24E-11	3.61E-10	2.34E-10	1.03E-09	8.19E-09	3.42E-08
Benzo(g,h,i)perylene	1.20E-06	2.26E-06	3.94E-09	1.73E-08	1.20E-06	2.26E-06	8.24E-11	3.61E-10	2.34E-10	1.03E-09	7.60E-08	3.48E-07
Benzo(k)fluoranthene	1.80E-06		5.91E-09	2.59E-08	1.80E-06	2.59E-08	1.24E-10	5.41E-10	3.51E-10	1.54E-09	1.23E-08	5.12E-08
Butane	2.10E+00		6.89E-03	3.02E-02	2.10E+00	3.02E-02	1.44E-04	6.31E-04	4.10E-04	1.79E-03	1.43E-02	5.98E-02
Chrysene	1.80E-06	2.38E-06	5.91E-09	2.59E-08	1.80E-06	2.38E-06	1.24E-10	5.41E-10	3.51E-10	1.54E-09	8.02E-08	3.74E-07
Dibenzo(a,h)anthracene	1.20E-06	1.67E-06	3.94E-09	1.73E-08	1.20E-06	1.67E-06	8.24E-11	3.61E-10	2.34E-10	1.03E-09	5.62E-08	2.62E-07
Dichlorobenzene	1.20E-03		3.94E-06	1.73E-05	1.20E-03	1.73E-05	8.24E-08	3.61E-07	2.34E-07	1.03E-06	8.19E-06	3.42E-05
Ethane	3.10E+00		1.02E-02	4.46E-02	3.10E+00	4.46E-02	2.13E-04	9.32E-04	6.05E-04	2.65E-03	2.12E-02	8.83E-02
Ethylbenzene		6.36E-05	0.00E+00	0.00E+00	0.00E+00	6.36E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.13E-06	9.33E-06
Fluoranthene	3.00E-06	4.84E-06	9.85E-09	4.31E-08	3.00E-06	4.84E-06	2.06E-10	9.02E-10	5.85E-10	2.56E-09	1.63E-07	7.52E-07
Fluorene	2.80E-06	4.47E-06	9.19E-09	4.03E-08	2.80E-06	4.47E-06	1.92E-10	8.42E-10	5.46E-10	2.39E-09	1.50E-07	6.95E-07
Formaldehyde	7.50E-02	3.30E-02	2.46E-04	1.08E-03	7.50E-02	3.30E-02	5.15E-06	2.25E-05	1.46E-05	6.41E-05	1.12E-03	5.90E-03
Hexane	1.80E+00		5.91E-03	2.59E-02	1.80E+00	2.59E-02	1.24E-04	5.41E-04	3.51E-04	1.54E-03	1.23E-02	5.12E-02
Indeno(1,2,3-cd)pyrene	1.80E-06	2.14E-06	5.91E-09	2.59E-08	1.80E-06	2.14E-06	1.24E-10	5.41E-10	3.51E-10	1.54E-09	7.21E-08	3.39E-07
Naphthalene	6.10E-04	1.13E-03	2.00E-06	8.77E-06	6.10E-04	1.13E-03	4.19E-08	1.83E-07	1.19E-07	5.21E-07	3.80E-05	1.74E-04
Pentane	2.60E+00		8.53E-03	3.74E-02	2.60E+00	3.74E-02	1.78E-04	7.82E-04	5.07E-04	2.22E-03	1.78E-02	7.40E-02
Phenanthrene	1.70E-05	1.05E-05	5.58E-08	2.44E-07	1.70E-05	1.05E-05	1.17E-09	5.11E-09	3.32E-09	1.45E-08	3.56E-07	1.78E-06
Propane	1.60E+00		5.25E-03	2.30E-02	1.60E+00	2.30E-02	1.10E-04	4.81E-04	3.12E-04	1.37E-03	1.09E-02	4.56E-02
Propylene			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	5.00E-06	4.25E-06	1.64E-08	7.19E-08	5.00E-06	4.25E-06	3.43E-10	1.50E-09	9.75E-10	4.27E-09	1.44E-07	6.94E-07
1,1,1-Trichloroethane		2.36E-04	0.00E+00	0.00E+00	0.00E+00	2.36E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.90E-06	3.46E-05
Xylene		1.09E-04	0.00E+00	0.00E+00	0.00E+00	1.09E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.65E-06	1.60E-05
1,3-Butadiene			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	2.00E-04		6.56E-07	2.88E-06	2.00E-04	2.88E-06	1.37E-08	6.01E-08	3.90E-08	1.71E-07	1.37E-06	5.69E-06
Beryllium	1.20E-05		3.94E-08	1.73E-07	1.20E-05	1.73E-07	8.24E-10	3.61E-09	2.34E-09	1.03E-08	8.19E-08	3.42E-07
Cadmium	1.10E-03		3.61E-06	1.58E-05	1.10E-03	1.58E-05	7.55E-08	3.31E-07	2.15E-07	9.40E-07	7.51E-06	3.13E-05
Chromium	1.40E-03		4.60E-06	2.01E-05	1.40E-03	2.01E-05	9.61E-08	4.21E-07	2.73E-07	1.20E-06	9.56E-06	3.99E-05
Cobalt	8.40E-05		2.76E-07	1.21E-06	8.40E-05	1.21E-06	5.76E-09	2.52E-08	1.64E-08	7.18E-08	5.74E-07	2.39E-06
Copper	8.50E-04		2.79E-06	1.22E-05	8.50E-04	1.22E-05	5.83E-08	2.56E-07	1.66E-07	7.26E-07	5.80E-06	2.42E-05
Manganese	3.80E-04		1.25E-06	5.46E-06	3.80E-04	5.46E-06	2.61E-08	1.14E-07	7.41E-08	3.25E-07	2.59E-06	1.08E-05
Mercury	2.60E-04		8.53E-07	3.74E-06	2.60E-04	3.74E-06	1.78E-08	7.82E-08	5.07E-08	2.22E-07	1.78E-06	7.40E-06
Molybdenum	1.10E-03		3.61E-06	1.58E-05	1.10E-03	1.58E-05	7.55E-08	3.31E-07	2.15E-07	9.40E-07	7.51E-06	3.13E-05
Nickel	2.10E-03		6.89E-06	3.02E-05	2.10E-03	3.02E-05	1.44E-07	6.31E-07	4.10E-07	1.79E-06	1.43E-05	5.98E-05
Selenium	2.40E-05		7.88E-08	3.45E-07	2.40E-05	3.45E-07	1.65E-09	7.21E-09	4.68E-09	2.05E-08	1.64E-07	6.83E-07
Vanadium	2.30E-03		7.55E-06	3.31E-05	2.30E-03	3.31E-05	1.58E-07	6.91E-07	4.49E-07	1.97E-06	1.57E-05	6.55E-05
Zinc	2.90E-02		9.52E-05	4.17E-04	2.90E-02	4.17E-04	1.99E-06	8.72E-06	5.66E-06	2.48E-05	1.98E-04	8.26E-04
Total HAP Emissions			3.72E-02	1.63E-01	1.13E+01	2.03E-01	7.77E-04	3.40E-03	2.21E-03	9.68E-03	7.82E-02	3.27E-01

1. AP-42 Emission Factors, Chapter 1.4, Table 1.4-3 and 1.4-4

2. AP-42 Emission Factors, Chapter 1.3, Table 1.3-9

Note 1: The boilers will primarily burn natural gas and #2 Fuel Oil will be used as a back up fuel only. For the purposes of the PTE calculations, the PTE for each HAP utilizes the larger of the Natural Gas PTE and the Fuel Oil PTE based on 8760 annual hours of use.

Note 2: TAPs, as listed in 45CSR27, Table A, are indicated by line items with grey fill. Two TAPs, (Benzene and Formaldehyde) are included in the PTE calculations.

**Broadwater Federal Building, Martinsburg, West Virginia
Hazardous Air Pollutants (HAPs)**

HAPS	NG Emission Factor ¹	Distillate Oil Emission Factor ²	Boiler #1 Natural Gas Combustion Emissions		Boiler #1 #2 Fuel Oil Combustion Emissions		Boiler #1 PTE	
	lb/MMScf	lb/1000 gal	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
2-Methylnaphthalene	2.40E-05		7.88E-08	3.45E-07	0.00E+00	0.00E+00	7.88E-08	3.11E-07
3-Methylchloranthrene	1.80E-06		5.91E-09	2.59E-08	0.00E+00	0.00E+00	5.91E-09	2.33E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05		5.25E-08	2.30E-07	0.00E+00	0.00E+00	5.25E-08	2.07E-07
Acenaphthene	1.80E-06	2.11E-05	5.91E-09	2.59E-08	5.05E-07	2.21E-06	5.05E-07	2.23E-06
Acenaphthylene	1.80E-06	2.53E-07	5.91E-09	2.59E-08	6.05E-09	2.65E-08	6.05E-09	4.98E-08
Anthracene	2.40E-06	1.22E-06	7.88E-09	3.45E-08	2.92E-08	1.28E-07	2.92E-08	1.59E-07
Benz(a)anthracene	1.80E-06	4.01E-06	5.91E-09	2.59E-08	9.59E-08	4.20E-07	9.59E-08	4.43E-07
Benzene	2.10E-03	2.14E-04	6.89E-06	3.02E-05	5.12E-06	2.24E-05	6.89E-06	4.96E-05
Benzo(a)pyrene	1.20E-06		3.94E-09	1.73E-08	0.00E+00	0.00E+00	3.94E-09	1.55E-08
Benzo(g,h,i)perylene	1.20E-06	2.26E-06	3.94E-09	1.73E-08	5.40E-08	2.37E-07	5.40E-08	2.52E-07
Benzo(k)fluoranthene	1.80E-06		5.91E-09	2.59E-08	0.00E+00	0.00E+00	5.91E-09	2.33E-08
Butane	2.10E+00		6.89E-03	3.02E-02	0.00E+00	0.00E+00	6.89E-03	2.72E-02
Chrysene	1.80E-06	2.38E-06	5.91E-09	2.59E-08	5.69E-08	2.49E-07	5.69E-08	2.73E-07
Dibenzo(a,h)anthracene	1.20E-06	1.67E-06	3.94E-09	1.73E-08	3.99E-08	1.75E-07	3.99E-08	1.90E-07
Dichlorobenzene	1.20E-03		3.94E-06	1.73E-05	0.00E+00	0.00E+00	3.94E-06	1.55E-05
Ethane	3.10E+00		1.02E-02	4.46E-02	0.00E+00	0.00E+00	1.02E-02	4.01E-02
Ethylbenzene		6.36E-05	0.00E+00	0.00E+00	1.52E-06	6.66E-06	1.52E-06	6.66E-06
Fluoranthene	3.00E-06	4.84E-06	9.85E-09	4.31E-08	1.16E-07	5.07E-07	1.16E-07	5.46E-07
Fluorene	2.80E-06	4.47E-06	9.19E-09	4.03E-08	1.07E-07	4.68E-07	1.07E-07	5.04E-07
Formaldehyde	7.50E-02	3.30E-02	2.46E-04	1.08E-03	7.89E-04	3.46E-03	7.89E-04	4.43E-03
Hexane	1.80E+00		5.91E-03	2.59E-02	0.00E+00	0.00E+00	5.91E-03	2.33E-02
Indeno(1,2,3-cd)pyrene	1.80E-06	2.14E-06	5.91E-09	2.59E-08	5.12E-08	2.24E-07	5.12E-08	2.47E-07
Naphthalene	6.10E-04	1.13E-03	2.00E-06	8.77E-06	2.70E-05	1.18E-04	2.70E-05	1.26E-04
Pentane	2.60E+00		8.53E-03	3.74E-02	0.00E+00	0.00E+00	8.53E-03	3.36E-02
Phenanthrene	1.70E-05	1.05E-05	5.58E-08	2.44E-07	2.51E-07	1.10E-06	2.51E-07	1.32E-06
Propane	1.60E+00		5.25E-03	2.30E-02	0.00E+00	0.00E+00	5.25E-03	2.07E-02
Propylene			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	5.00E-06	4.25E-06	1.64E-08	7.19E-08	1.02E-07	4.45E-07	1.02E-07	5.10E-07
1,1,1-Trichloroethane		2.36E-04	0.00E+00	0.00E+00	5.64E-06	2.47E-05	5.64E-06	2.47E-05
Xylene		1.09E-04	0.00E+00	0.00E+00	2.61E-06	1.14E-05	2.61E-06	1.14E-05
1,3-Butadiene			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	2.00E-04		6.56E-07	2.88E-06	0.00E+00	0.00E+00	6.56E-07	2.59E-06
Beryllium	1.20E-05		3.94E-08	1.73E-07	0.00E+00	0.00E+00	3.94E-08	1.55E-07
Cadmium	1.10E-03		3.61E-06	1.58E-05	0.00E+00	0.00E+00	3.61E-06	1.42E-05
Chromium	1.40E-03		4.60E-06	2.01E-05	0.00E+00	0.00E+00	4.60E-06	1.81E-05
Cobalt	8.40E-05		2.76E-07	1.21E-06	0.00E+00	0.00E+00	2.76E-07	1.09E-06
Copper	8.50E-04		2.79E-06	1.22E-05	0.00E+00	0.00E+00	2.79E-06	1.10E-05
Manganese	3.80E-04		1.25E-06	5.46E-06	0.00E+00	0.00E+00	1.25E-06	4.92E-06
Mercury	2.60E-04		8.53E-07	3.74E-06	0.00E+00	0.00E+00	8.53E-07	3.36E-06
Molybdenum	1.10E-03		3.61E-06	1.58E-05	0.00E+00	0.00E+00	3.61E-06	1.42E-05
Nickel	2.10E-03		6.89E-06	3.02E-05	0.00E+00	0.00E+00	6.89E-06	2.72E-05
Selenium	2.40E-05		7.88E-08	3.45E-07	0.00E+00	0.00E+00	7.88E-08	3.11E-07
Vanadium	2.30E-03		7.55E-06	3.31E-05	0.00E+00	0.00E+00	7.55E-06	2.98E-05
Zinc	2.90E-02		9.52E-05	4.17E-04	0.00E+00	0.00E+00	9.52E-05	3.75E-04
Total HAP Emissions			3.72E-02	1.63E-01	9.81E-04	4.30E-03	3.79E-02	1.51E-01

1. AP-42 Emission Factors, Chapter 1.4, Table 1.4-3 and 1.4-4

2. AP-42 Emission Factors, Chapter 1.3, Table 1.3-9

Note 1: The boilers will primarily burn natural gas and #2 Fuel Oil will be used as a back up fuel only. For the purposes of the PTE calculations, the PTE for each HAP utilizes the larger of the Natural Gas PTE (Columns D and E) and the Fuel Oil PTE (Columns F and G) based on 8760 annual hours of use.

Note 2: TAPs, as listed in 45CSR27, Table A, are indicated by line items with grey fill. Two TAPs, (Benzene and Formaldehyde) are included in the PTE calculations.

**Broadwater Federal Building, Martinsburg, West Virginia
Hazardous Air Pollutants (HAPs)**

HAPS	NG Emission Factor ¹	Distillate Oil Emission Factor ²	Boiler #2 Natural Gas Combustion Emissions		Boiler #2 #2 Fuel Oil Combustion Emissions		Boiler #2 PTE	
	lb/MMScf	lb/1000 gal	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
2-Methylnaphthalene	2.40E-05		7.88E-08	3.45E-07	0.00E+00	0.00E+00	7.88E-08	3.45E-07
3-Methylchloranthrene	1.80E-06		5.91E-09	2.59E-08	0.00E+00	0.00E+00	5.91E-09	2.59E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05		5.25E-08	2.30E-07	0.00E+00	0.00E+00	5.25E-08	2.30E-07
Acenaphthene	1.80E-06	2.11E-05	5.91E-09	2.59E-08	2.02E-07	8.84E-07	2.02E-07	8.84E-07
Acenaphthylene	1.80E-06	2.53E-07	5.91E-09	2.59E-08	2.42E-09	1.06E-08	5.91E-09	2.59E-08
Anthracene	2.40E-06	1.22E-06	7.88E-09	3.45E-08	1.17E-08	5.11E-08	1.17E-08	5.11E-08
Benz(a)anthracene	1.80E-06	4.01E-06	5.91E-09	2.59E-08	3.84E-08	1.68E-07	3.84E-08	1.68E-07
Benzene	2.10E-03	2.14E-04	6.89E-06	3.02E-05	2.05E-06	8.96E-06	6.89E-06	3.02E-05
Benzo(a)pyrene	1.20E-06		3.94E-09	1.73E-08	0.00E+00	0.00E+00	3.94E-09	1.73E-08
Benzo(g,h,i)perylene	1.20E-06	2.26E-06	3.94E-09	1.73E-08	2.16E-08	9.47E-08	2.16E-08	9.47E-08
Benzo(k)fluoranthene	1.80E-06		5.91E-09	2.59E-08	0.00E+00	0.00E+00	5.91E-09	2.59E-08
Butane	2.10E+00		6.89E-03	3.02E-02	0.00E+00	0.00E+00	6.89E-03	3.02E-02
Chrysene	1.80E-06	2.38E-06	5.91E-09	2.59E-08	2.28E-08	9.97E-08	2.28E-08	9.97E-08
Dibenzo(a,h)anthracene	1.20E-06	1.67E-06	3.94E-09	1.73E-08	1.60E-08	7.00E-08	1.60E-08	7.00E-08
Dichlorobenzene	1.20E-03		3.94E-06	1.73E-05	0.00E+00	0.00E+00	3.94E-06	1.73E-05
Ethane	3.10E+00		1.02E-02	4.46E-02	0.00E+00	0.00E+00	1.02E-02	4.46E-02
Ethylbenzene		6.36E-05	0.00E+00	0.00E+00	6.08E-07	2.66E-06	6.08E-07	2.66E-06
Fluoranthene	3.00E-06	4.84E-06	9.85E-09	4.31E-08	4.63E-08	2.03E-07	4.63E-08	2.03E-07
Fluorene	2.80E-06	4.47E-06	9.19E-09	4.03E-08	4.28E-08	1.87E-07	4.28E-08	1.87E-07
Formaldehyde	7.50E-02	3.30E-02	2.46E-04	1.08E-03	3.16E-04	1.38E-03	3.16E-04	1.38E-03
Hexane	1.80E+00		5.91E-03	2.59E-02	0.00E+00	0.00E+00	5.91E-03	2.59E-02
Indeno(1,2,3-cd)pyrene	1.80E-06	2.14E-06	5.91E-09	2.59E-08	2.05E-08	8.96E-08	2.05E-08	8.96E-08
Naphthalene	6.10E-04	1.13E-03	2.00E-06	8.77E-06	1.08E-05	4.73E-05	1.08E-05	4.73E-05
Pentane	2.60E+00		8.53E-03	3.74E-02	0.00E+00	0.00E+00	8.53E-03	3.74E-02
Phenanthrene	1.70E-05	1.05E-05	5.58E-08	2.44E-07	1.00E-07	4.40E-07	1.00E-07	4.40E-07
Propane	1.60E+00		5.25E-03	2.30E-02	0.00E+00	0.00E+00	5.25E-03	2.30E-02
Propylene			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pyrene	5.00E-06	4.25E-06	1.64E-08	7.19E-08	4.06E-08	1.78E-07	4.06E-08	1.78E-07
1,1,1-Trichloroethane		2.36E-04	0.00E+00	0.00E+00	2.26E-06	9.89E-06	2.26E-06	9.89E-06
Xylene		1.09E-04	0.00E+00	0.00E+00	1.04E-06	4.57E-06	1.04E-06	4.57E-06
1,3-Butadiene			0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic	2.00E-04		6.56E-07	2.88E-06	0.00E+00	0.00E+00	6.56E-07	2.88E-06
Beryllium	1.20E-05		3.94E-08	1.73E-07	0.00E+00	0.00E+00	3.94E-08	1.73E-07
Cadmium	1.10E-03		3.61E-06	1.58E-05	0.00E+00	0.00E+00	3.61E-06	1.58E-05
Chromium	1.40E-03		4.60E-06	2.01E-05	0.00E+00	0.00E+00	4.60E-06	2.01E-05
Cobalt	8.40E-05		2.76E-07	1.21E-06	0.00E+00	0.00E+00	2.76E-07	1.21E-06
Copper	8.50E-04		2.79E-06	1.22E-05	0.00E+00	0.00E+00	2.79E-06	1.22E-05
Manganese	3.80E-04		1.25E-06	5.46E-06	0.00E+00	0.00E+00	1.25E-06	5.46E-06
Mercury	2.60E-04		8.53E-07	3.74E-06	0.00E+00	0.00E+00	8.53E-07	3.74E-06
Molybdenum	1.10E-03		3.61E-06	1.58E-05	0.00E+00	0.00E+00	3.61E-06	1.58E-05
Nickel	2.10E-03		6.89E-06	3.02E-05	0.00E+00	0.00E+00	6.89E-06	3.02E-05
Selenium	2.40E-05		7.88E-08	3.45E-07	0.00E+00	0.00E+00	7.88E-08	3.45E-07
Vanadium	2.30E-03		7.55E-06	3.31E-05	0.00E+00	0.00E+00	7.55E-06	3.31E-05
Zinc	2.90E-02		9.52E-05	4.17E-04	0.00E+00	0.00E+00	9.52E-05	4.17E-04
Total HAP Emissions			3.72E-02	1.63E-01	3.92E-04	1.72E-03	3.73E-02	1.63E-01

1. AP-42 Emission Factors, Chapter 1.4, Table 1.4-3 and 1.4-4

2. AP-42 Emission Factors, Chapter 1.3, Table 1.3-9

Note 1: The boiler will primarily burn natural gas and #2 Fuel Oil will be used as a back up fuel only. For the purposes of the PTE calculations, the PTE for each HAP utilizes the larger of the Natural Gas PTE (Columns D and E) and the Fuel Oil PTE (Columns F and G) based on 8760 annual hours of use.

Note 2: TAPs, as listed in 45CSR27, Table A, are indicated by line items with grey fill. Two TAPs, (Benzene and Formaldehyde) are included in the PTE calculations.

**Broadwater Federal Building, Martinsburg, West Virginia
Hazardous Air Pollutants (HAPs)**

HAPS	NG Emission Factor ¹	Hot Water Heater #1 Natural Gas Combustion PTE	
	lb/MMScf	lb/hr	tpy
2-Methylnaphthalene	2.40E-05	1.65E-09	7.21E-09
3-Methylchloranthrene	1.80E-06	1.24E-10	5.41E-10
7,12-Dimethylbenz(a)anthracene	1.60E-05	1.10E-09	4.81E-09
Acenaphthene	1.80E-06	1.24E-10	5.41E-10
Acenaphthylene	1.80E-06	1.24E-10	5.41E-10
Anthracene	2.40E-06	1.65E-10	7.21E-10
Benz(a)anthracene	1.80E-06	1.24E-10	5.41E-10
Benzene	2.10E-03	1.44E-07	6.31E-07
Benzo(a)pyrene	1.20E-06	8.24E-11	3.61E-10
Benzo(g,h,i)perylene	1.20E-06	8.24E-11	3.61E-10
Benzo(k)fluoranthene	1.80E-06	1.24E-10	5.41E-10
Butane	2.10E+00	1.44E-04	6.31E-04
Chrysene	1.80E-06	1.24E-10	5.41E-10
Dibenzo(a,h)anthracene	1.20E-06	8.24E-11	3.61E-10
Dichlorobenzene	1.20E-03	8.24E-08	3.61E-07
Ethane	3.10E+00	2.13E-04	9.32E-04
Ethylbenzene		0.00E+00	0.00E+00
Fluoranthene	3.00E-06	2.06E-10	9.02E-10
Fluorene	2.80E-06	1.92E-10	8.42E-10
Formaldehyde	7.50E-02	5.15E-06	2.25E-05
Hexane	1.80E+00	1.24E-04	5.41E-04
Indeno(1,2,3-cd)pyrene	1.80E-06	1.24E-10	5.41E-10
Naphthalene	6.10E-04	4.19E-08	1.83E-07
Pentane	2.60E+00	1.78E-04	7.82E-04
Phenanthrene	1.70E-05	1.17E-09	5.11E-09
Propane	1.60E+00	1.10E-04	4.81E-04
Propylene		0.00E+00	0.00E+00
Pyrene	5.00E-06	3.43E-10	1.50E-09
1,1,1-Trichloroethane		0.00E+00	0.00E+00
Xylene		0.00E+00	0.00E+00
1,3-Butadiene		0.00E+00	0.00E+00
Arsenic	2.00E-04	1.37E-08	6.01E-08
Beryllium	1.20E-05	8.24E-10	3.61E-09
Cadmium	1.10E-03	7.55E-08	3.31E-07
Chromium	1.40E-03	9.61E-08	4.21E-07
Cobalt	8.40E-05	5.76E-09	2.52E-08
Copper	8.50E-04	5.83E-08	2.56E-07
Manganese	3.80E-04	2.61E-08	1.14E-07
Mercury	2.60E-04	1.78E-08	7.82E-08
Molybdenum	1.10E-03	7.55E-08	3.31E-07
Nickel	2.10E-03	1.44E-07	6.31E-07
Selenium	2.40E-05	1.65E-09	7.21E-09
Vanadium	2.30E-03	1.58E-07	6.91E-07
Zinc	2.90E-02	1.99E-06	8.72E-06
Total HAP Emissions		7.77E-04	3.40E-03

1. AP-42 Emission Factors, Chapter 1.4, Table 1.4-3 and 1.4-4

2. AP-42 Emission Factors, Chapter 1.3, Table 1.3-9

Note: TAPs, as listed in 45CSR27, Table A, are indicated by line items with grey fill. Two TAPs, (Benzene and Formaldehyde) are included in the PTE calculations.

**Broadwater Federal Building, Martinsburg, West Virginia
Hazardous Air Pollutants (HAPs)**

HAPS	NG Emission Factor ¹	Hot Water Heater #2 Natural Gas Combustion PTE	
	lb/MMScf	lb/hr	tpy
2-Methylnaphthalene	2.40E-05	4.68E-09	2.05E-08
3-Methylchloranthrene	1.80E-06	3.51E-10	1.54E-09
7,12-Dimethylbenz(a)anthracene	1.60E-05	3.12E-09	1.37E-08
Acenaphthene	1.80E-06	3.51E-10	1.54E-09
Acenaphthylene	1.80E-06	3.51E-10	1.54E-09
Anthracene	2.40E-06	4.68E-10	2.05E-09
Benz(a)anthracene	1.80E-06	3.51E-10	1.54E-09
Benzene	2.10E-03	4.10E-07	1.79E-06
Benzo(a)pyrene	1.20E-06	2.34E-10	1.03E-09
Benzo(g,h,i)perylene	1.20E-06	2.34E-10	1.03E-09
Benzo(k)fluoranthene	1.80E-06	3.51E-10	1.54E-09
Butane	2.10E+00	4.10E-04	1.79E-03
Chrysene	1.80E-06	3.51E-10	1.54E-09
Dibenzo(a,h)anthracene	1.20E-06	2.34E-10	1.03E-09
Dichlorobenzene	1.20E-03	2.34E-07	1.03E-06
Ethane	3.10E+00	6.05E-04	2.65E-03
Ethylbenzene		0.00E+00	0.00E+00
Fluoranthene	3.00E-06	5.85E-10	2.56E-09
Fluorene	2.80E-06	5.46E-10	2.39E-09
Formaldehyde	7.50E-02	1.46E-05	6.41E-05
Hexane	1.80E+00	3.51E-04	1.54E-03
Indeno(1,2,3-cd)pyrene	1.80E-06	3.51E-10	1.54E-09
Naphthalene	6.10E-04	1.19E-07	5.21E-07
Pentane	2.60E+00	5.07E-04	2.22E-03
Phenanthrene	1.70E-05	3.32E-09	1.45E-08
Propane	1.60E+00	3.12E-04	1.37E-03
Propylene		0.00E+00	0.00E+00
Pyrene	5.00E-06	9.75E-10	4.27E-09
1,1,1-Trichloroethane		0.00E+00	0.00E+00
Xylene		0.00E+00	0.00E+00
1,3-Butadiene		0.00E+00	0.00E+00
Arsenic	2.00E-04	3.90E-08	1.71E-07
Beryllium	1.20E-05	2.34E-09	1.03E-08
Cadmium	1.10E-03	2.15E-07	9.40E-07
Chromium	1.40E-03	2.73E-07	1.20E-06
Cobalt	8.40E-05	1.64E-08	7.18E-08
Copper	8.50E-04	1.66E-07	7.26E-07
Manganese	3.80E-04	7.41E-08	3.25E-07
Mercury	2.60E-04	5.07E-08	2.22E-07
Molybdenum	1.10E-03	2.15E-07	9.40E-07
Nickel	2.10E-03	4.10E-07	1.79E-06
Selenium	2.40E-05	4.68E-09	2.05E-08
Vanadium	2.30E-03	4.49E-07	1.97E-06
Zinc	2.90E-02	5.66E-06	2.48E-05
Total HAP Emisions		2.21E-03	9.68E-03

1. AP-42 Emission Factors, Chapter 1.4, Table 1.4-3 and 1.4-4

Note: TAPs, as listed in 45CSR27, Table A, are indicated by line items with grey fill. Two TAPs, (Benzene and Formaldehyde) are included in the PTE caluclations.