

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

SECTION 1: IDENTIFICATION

(a) PRODUCT IDENTIFIER:	(b) SYNONYM:
Produced Water	Salt water, Oily water, Formation water, Process water

(c) **Recommended Use:** Industrial process chemical

Restrictions On Use: Not to be used for anything other than recommended use.

(d) **Producer:**




Chesapeake Energy Corporation and Subsidiaries • 6100 N. Western Avenue, Oklahoma City, OK 73118

Tel: 800-566-9306 • Fax: 405-753-5468

(e) **24 HR EMERGENCY ASSISTANCE PHONE NUMBER:** Verisk 3E – 800-451-8346 / Client ID 11906

SECTION 2: HAZARDS IDENTIFICATION

The categories of Health Hazards as defined in OSHA 29 CFR 1910.1200 Hazard Communication Standard have been evaluated and are listed below. Refer to Sections 3, 8, and 11 for additional information.

Hazard Classification	(a) Hazard Category	(b) Hazard Symbols	(b) Signal Word	(b) Hazard Statement	(b) Precautionary Statement
Human Health Hazards					
Acute Toxicity (Oral)	N/C	-	-	-	-
Acute Toxicity (Dermal)	N/C	-	-	-	-
Acute Toxicity (Inhalation)	N/C	-	-	-	-
Skin Corrosion/Irritation	2		Warning	Causes skin irritation	Wear protective gloves. P264, P280, P302, P321, P332, P362
Eye Damage/Irritation	2B	-	Warning	Causes eye irritation	If in eyes: Rinse with water for several minutes. P264, P305, P351, P338, P337, P313
Respiratory Sensitization	N/D	-	-	-	-
Skin Sensitization	N/D	-	-	-	-
Germ Cell Mutagenicity	1B		Danger	May cause genetic defects	Wear protective clothing P201, P202, P280, P308, P313, P405, P501
Carcinogenicity	1A		Danger	May cause cancer	Do not handle until all safety precautions have been read and understood P201, P202, P280, P308, P313, P405, P501


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Version 1.2 Revision Date: 10/03/2019

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Human Health Hazards					
Reproductive Toxicity	N/D	-	-	-	-
Specific Target Organ Toxicity (STOT) Single-Exposure	N/D	-	-	-	-
Specific Target Organ Toxicity (STOT) Repeated or Prolonged Exposure	2		Warning	May cause damage to liver, kidneys, blood, nervous system, spleen, thymus, and skin through prolonged or repeated exposure.	Get medical advice/attention if you feel unwell P260, P314, P501
Aspiration Hazard	N/D	-	-	-	-

Health Hazard Precautionary Statement

P201	Obtain special instructions before use.
P202	Do not handle until all safety precautions have been read and understood.
P260	Do not breathe dust/fume/gas/mist/vapors/spray.
P264	Wash all body parts that come into contact with material thoroughly after handling.
P280	Wear protective gloves.
P302	If on skin: Wash with plenty of mild soap and water.
P321	Specific treatment – none specified.
P332	If skin irritation occurs: Get medical advice/attention.
P362	Take off contaminated clothing and wash it before reuse.
P308+P313	If exposed or concerned. Get medical advice/attention.
P314	Get medical advice/attention if you feel unwell.
P305+P351+P338	If in eyes: Rinse with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.
P405	Store locked up.
P501	Dispose of contents/container to an approved facility.

Hazard Classification	Hazard Category	Hazard Symbols	Signal Word	Hazard Statement	Precautionary Statement
Physical Hazards					
Explosives	N/C	-	-	-	-
Flammable Gases	N/A	-	-	-	-
Flammable Aerosols	N/C	-	-	-	-
Oxidizing Gases	N/A	-	-	-	-
Gases Under Pressure	N/A	-	-	-	-
Flammable Liquids	N/C	-	-	-	-

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

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Physical Hazards					
Flammable Solids	N/C	-	-	-	-
Self-reactive Substances and Mixtures	N/C	-	-	-	-
Substances and mixtures which react with water to emit flammable gases	N/C	-	-	-	-
Oxidizing Liquids	N/C	-	-	-	-
Oxidizing Solids	N/C	-	-	-	-
Organic Peroxides	N/A	-	-	-	-
Corrosive to Metals	N/C	-	-	-	-

Hazard Classification	(a) Hazard Category	(b) Hazard Symbols	(b) Signal Word	(b) Hazard Statement	(b) Precautionary Statement
Environmental Hazards					
Acute Toxicity to the Aquatic Environment	N/D	-	-	-	-
Chronic Toxicity to the Aquatic Environment	N/D	-	-	-	-

(c) Hazards not otherwise classified: This material may contain or release poisonous hydrogen sulfide gas. In high doses, hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.

(d) Unknown acute toxicity: None Identified.

Medical conditions which are generally recognized as being aggravated by exposure:

Populations with chronic respiratory, skin, or eye disease are at increased risk from exposure.

SECTION 3: COMPOSITION / INFORMATION ON INGREDIENTS			
(a) Chemical name (b) (Common name and synonyms)	(c) CAS No.	(c) EC No.	(b) % Weight
Water	7732-18-5	231-791-2	>68
Chloride and Dissolved Minerals	-	-	0 - 25
Benzene	71-43-2	200-753-7	<0.1
Variable Hydrocarbons	-	-	< 1
Hydrogen sulfide (H ₂ S)	7783-06-4	231-977-3	< 0.5 varies

*Produced water is a variable mixture containing varying amounts of water, chloride, dissolved minerals, natural gas condensate or crude oil and dissolved hydrocarbon vapors. The concentration ranges listed above are based on specific testing results and reported industry values. Composition varies depending on the source of the produced water.

SECTION 4: FIRST AID MEASURES

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

(a) Description of necessary measures:

Emergency Medical advice is available from regional poison control centers 1-800-222-1222.

INHALATION:	Move to fresh air immediately. If breathing stops, provide artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
INGESTION:	Ingestion may cause irritation of the digestive tract that may result in nausea, vomiting and diarrhea. Do not induce vomiting. If vomiting occurs, place on left side and keep head low. Seek medical help immediately. In addition, signs and symptoms of H ₂ S toxicity may be present.
SKIN CONTACT:	Wash with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). Get medical attention if irritation develops or persists. Place contaminated clothing in closed container until laundered or discarded. Contaminated clothing should be removed or laundered before reuse.
EYE CONTACT:	Flush eyes immediately with water for 15 minutes while holding eyelids open. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention. If eye is exposed to hot liquid, cover eyes with cloth and seek medical attention immediately by calling 911.

(b) Most important symptoms/effects:

- **Acute:** Skin, eye, and mucous membrane irritation. Hydrogen sulfide can cause skin, eye and respiratory tract irritation.
- **Delayed:** none identified

(c) Indication of immediate medical attention and special treatment: Significant over-exposure

Notes to physician: Medical providers are urged to contact a Regional Poison Center. Treat symptomatically and supportively. This material may contain or release hydrogen sulfide. In high doses, hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.

General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Show this safety data sheet to the doctor in attendance. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

SECTION 5: FIRE FIGHTING MEASURES

(a) Suitable extinguishing media: Dry chemical, foam, carbon dioxide, or water spray.

Unsuitable extinguishing media: N/A

(b) Specific hazards arising from the chemical: Material can vent toxic levels of hydrogen sulfide vapors.

(c) Special protective equipment and precautions for fire-fighters: Shut off flow immediately if it can be done safely. Isolate the area from personnel. Keep personnel upwind from fire. Fire fighters should use appropriate SCBA while in close proximity to fire and vapors coming from product. Move personnel upwind of any smoke or vapors.

In the event of fire and/or explosion, do not breathe fumes.

(d) Flammability/Explosivity:

NFPA RATING*: Health = 1 (Slight) (=3-Serious, if hydrogen sulfide is present)

Fire = 4 (Severe)

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

Instability = 0 (Minimal)

(0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

*Fire rating is related to the possibility of combustion by hydrocarbon vapors or hydrogen sulfide gas.

(e) Hazardous Decomposition Products: Normal combustion forms sulfur dioxide, hydrogen sulfide, nitrogen dioxide.

SECTION 6: ACCIDENTAL RELEASE MEASURES

(a) Personal precautions, Protective equipment, and Emergency procedures: Stop the source of the leak or release. Clean up the release as soon as possible, observing precautions in Personal Protection Equipment section. Contain liquid to prevent further contamination of soil and surface water. Clean up small spills using appropriate techniques. Where feasible and appropriate, remove contaminated soil or flush with fresh water. Follow prescribed procedures for reporting and responding to larger releases. Advise authorities and the National Response Center (800-424-8802) if the release is to a watercourse.

(b) Methods and materials for containment and cleaning up: Stop the source of the release, if safe to do so. Isolate area until gas has dispersed. Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ventilate and gas test area before entering. Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Clean up spilled material immediately, observing precautions in Section 8, Personal Protection. Place contaminated material in suitable labeled containers for recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements. If molten sulfur is accidentally released into a confined or enclosed space, monitor for hydrogen sulfide and sulfur dioxide build-up in the vapor space above the spill.

Potentially incompatible absorbents: none identified

CERCLA Hazardous substances and corresponding RQs :

Benzene 71-43-2 10 lbs.

Hydrogen Sulfide 7783-06-4 100 lbs.

SECTION 7: HANDLING AND STORAGE

(a) Precautions for safe handling: Do not handle near food or drinking water. Wash after handling. Avoid vapors when opening tank hatches and dome covers. Wear appropriate personal protective equipment including flame resistant clothing.

(b) Conditions for safe storage, including any incompatibilities: Store containers in a well-ventilated area.

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

SECTION 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits:			
Components	(a) OSHA PEL ¹	(a) ACGIH TLV ²	(a) IDLH ³
Benzene	1 ppm (TWA) 5 ppm (STEL)	0.5 ppm (TWA) 2.5 ppm (STEL) Skin	500 ppm
Hydrogen sulfide	20 ppm (C)	1 ppm (TWA) 5 ppm (STEL)	100 ppm

Notes:

1. OSHA PEL are 8-hour TWA (Time-weighted average) concentrations unless otherwise noted. A (“C”) designation denotes a ceiling limit, which should not be exceeded during any part of the working exposure unless otherwise noted. A Short Term Exposure Limit (STEL) is defined as a 15-minute exposure, which should not be exceeded at any time during a workday.
2. Threshold Limit Values – TWA established by the ACGIH represents the TWA concentration for a conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, for a working lifetime without adverse effect; Short-Term Exposure Limit (TLV-STEL) represents a 15-minute TWA exposure that should not be exceeded at any time during a work day. ACGIH TLV’s are for guideline purposes only and as such are not legal, regulatory limits for compliance purposes (ACGIH, 2014). The “Skin” notation refers to the potential significant contribution to the overall exposure by the cutaneous (skin) route.
3. The “immediately dangerous to life or health air concentration values (IDLHs)” are used by NIOSH as part of a respiratory selection criteria.
4. No exposure limits have been developed by the producer.

(b) Appropriate engineering controls: Use adequate ventilation. Supply sufficient replacement air to make up for air removed by the exhaust system.

Eye/face protection: Wear approved safety glasses/goggles with side shields and/or an appropriate full-face shield. All eye protection should be selected and worn in accordance with the OSHA eye and face protection guidelines outlined in 29 CFR 1910.132 and 1910.133.

Skin Protection: Wear appropriate clothing to prevent skin contact. Thoroughly decontaminate any articles of clothing that come into contact with product. All PPE should be selected and worn in accordance with 29 CFR 1910.132 and 1910.138. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.

Respiratory protection: Respiratory protection is not required for normal use. A positive pressure air line with full-face mask and escape bottle or a self-contained breathing apparatus (SCBA) should be available in case of an emergency and cases when the IDLH is exceeded. All respirators should be selected and worn in accordance with 29 CFR 1910.132 and 1910.134.

General hygiene considerations: Always observe good personal hygiene measures, such as washing after handling the material, and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

General: Wear appropriate chemical protective equipment. Launder contaminated clothing before reuse.

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical and Chemical Properties	
	Solution:
(a) Appearance:	Clear or opaque
(b) Odor:	Salty with slight hydrocarbon odor
(c) Odor Threshold:	N/A
(d) pH:	4.9 – 8.5
(e) Melting point/Freezing point:	N/A
(f) Boiling point/range:	212°F/100°C Approx.
(g) Flash Point:	N/A
(h) Evaporation rate:	N/A
(i) Flammability:	N/A
(j) LFL/UFL or LEL/UFL:	4% (LFL) / 46% (UFL)
(k) Vapor pressure:	N/A
(l) Vapor density:	1.2
(m) Relative density:	N/A
(n) Solubility:	Soluble
(o) Partition coefficient:	N/A
(p) Auto-ignition temperature:	N/A
(q) Decomposition temperature:	N/A
(r) Viscosity:	N/A
(s) Specific Gravity:	>1.0 Approx.

*Properties of this material will vary with actual composition.

SECTION 10: STABILITY AND REACTIVITY

- (a) **Reactivity:** No data available.
- (b) **Chemical stability:** Material is stable under normal conditions.
- (c) **Possibility of hazardous reactions:** Hydrogen sulfide and hydrocarbon vapors are flammable and may present an explosion hazard in a confined space.
- (d) **Conditions to avoid (e.g., static discharge, shock, or vibration):** Excess heat, incompatible materials ignition sources, excess heat. Fire can cause containers to burst/explode.
- (e) **Incompatible materials:** Chlorates, nitrates, other oxidizers, carbides, halogens, potassium, phosphorus, and heavy metals.
- (f) **Hazardous decomposition products:** May produce hydrogen sulfide, sulfur dioxide, and carbon disulfide.
- (g) **Hazardous Polymerization:** Not known to occur.

SECTION 11: TOXICOLOGICAL INFORMATION

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

- (a) **Information on likely routes of exposure:**
- **Inhalation:** Inhalation may cause slight throat and lung irritation.
 - **Accidental Ingestion:** May cause gastrointestinal irritation
 - **Skin contact:** May cause skin irritation.
 - **Eye contact:** May cause slight irritation.
- (b) **Symptoms related to physical, chemical and toxicological characteristics:** Skin contact may cause dermal irritation.
- (c) **Delayed and immediate effects and also chronic effects from short- and long-term exposure:**
Chronic skin exposures can lead to dermatitis.
- (d) **Numerical measures of toxicity:**

Acute Toxicity (Oral)			
Chemical	Tested % Weight	Model	LD ₅₀ Range (mg/kg bw)
	100	Rat	3,306 mg/kg
Hydrogen Sulfide		No data available	
Chloride as Sodium Chloride		Rat	3,000 mg/kg bw
Water		Rat	>90,000 mg/kg

Acute Toxicity (Dermal)			
Chemical	% Weight	Model	LD ₅₀ Range (mg/kg bw)
Benzene	100	Rabbit	>8,260 mg/kg
Hydrogen Sulfide		No data available	
Chloride as Sodium Chloride			> 10,000 mg/kg bw

Acute Toxicity (Inhalation)			
Chemical		Model	LC ₅₀ Range (mg/L)
Benzene		Rat	31.9 mg/L
Hydrogen Sulfide		Rat	0.47 mg/L
Chloride as Sodium Chloride		Rat	> 42 mg/L

Skin corrosion and/or irritation:	Mildly irritating.
Serious eye damage and/or eye irritation:	Moderately irritating.
Respiratory sensitization:	No data available.
Skin sensitization:	No data available.
Germ cell mutagenicity;	Negative. Benzene may cause chromosomal aberrations.
Reproductive toxicity:	Data not sufficient for classification.
Specific target organ toxicity (single exposure):	Data not sufficient for classification.
Specific target organ toxicity (repeated exposure):	Data not sufficient for classification.
Aspiration hazard:	No data available.

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

(e) Carcinogenicity:

Carcinogenicity				
Compound	ACGIH	IARC	NTP	OSHA
Benzene	A1 – Confirmed Human Carcinogen	Group 1 – Carcinogenic to Humans	Known to be a human carcinogen	Carcinogen
Hydrogen sulfide	Not classified	Not classified	Not listed	Not classified
Sodium Chloride	Not listed	Not listed	Not listed	Not listed

SECTION 12: ECOLOGICAL INFORMATION

(a) Ecotoxicity: Ecotoxicity data have not been determined specifically for this mixture.

Fisher and Bidwell (2006) reported the following for produced water: Acute toxicity test results for the four test organisms were similar within species over the period monitored. Similar survival responses (48-h LC50's) were observed for the cladocerans: *D. pulex* (1.33 to 4.13%), *D. magna* (2.68 to 5.36%), and *C. dubia* (2.06 to 3.12%). Produced water had less of an effect on fathead minnow acute survival (7.71 to 8.54%). Chronic toxicity test results appeared more consistent than acute results. Produced water had a greater effect at 7 days on *C. dubia* survival (LC50: 1.78 to 2.54%) and reproduction (EC50: 1.00 to 1.57%) than on fathead minnow survival (LC50: 3.67 to 5.07%) or growth (EC50: 3.22 to 5.33%).

(b) Persistence and degradability: Most nonvolatile components are not biodegradable. Some components are persistent in water. Lighter components will tend to evaporate but the heavier components may become dispersed in water or absorbed to soil or sediment.

(c) Bioaccumulative potential: The octanol water coefficient (Log K_{ow}) values for the hydrocarbon components of this material range from less than 2 to greater than 6, and therefore would be regarded as having the potential to bioaccumulate.

(d) Mobility in soil: Some components may be mobile and contaminate groundwater.

(e) Other adverse effects: None identified.

SECTION 13: DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: It is the responsibility of the user to determine if disposal material is hazardous according to federal, state and local regulations. Dispose waste in accordance with the federal, state, and local laws and regulations.

Containers should be completely used and emptied prior to discarding. Residues from containers can possibly be considered to be hazardous wastes.

SECTION 14: TRANSPORT INFORMATION

US DOT Information

Shipping Name: Not Regulated

Consult state and local regulations because there are some state regulations on transportation of produced water.

Additional Information: This may not apply to all shipping situations. Consult 49 CFR 172 for additional information.

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

SECTION 15: REGULATORY INFORMATION

The components of this product are listed on the EPA/TSCA inventory of chemical substances.

In accordance with SARA Title III, Section 313, the EDS should always be copied and sent with the SDS.

CERCLA/SARA-Section 302

This material contains components which are subject to the reporting requirements of SARA 302 and 40 CFR 372:

Component	TPQ	EPCRA RQ
Benzene		10 lb.
Hydrogen sulfide	500 lb.	100 lb.

US EPCRA (SARA Title III) Section 313-Toxic Chemical: De minimis concentration

Component	De minimis
Benzene	0.1%

California Proposition 65: Warning: This material may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects or other reproductive harm, and which may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): benzene.

Component Analysis - State

Component	CAS	CA	MA	MN	NJ	PA	RI
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	Yes
Hydrogen sulfide	7783-06-4	Yes	Yes	Yes	Yes	Yes	Yes

The following component is identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Benzene	71-43-2	0.1 %
Hydrogen sulfide	7783-06-4	1 %

SECTION 16: OTHER INFORMATION

This Safety Data Sheet is authored pursuant to the OSHA Hazard Communication/HazCom 2012 Final Rule.

COMMON TERMS AND ACRONYMS:

- ACGIH:** American Conference of Governmental Industrial Hygienists
- C:** Ceiling Limit
- CAS#:** Chemical Abstracts System Number
- CERCLA:** Comprehensive Environmental Response, Compensation, and Liability Act
- CNS:** Central Nervous System
- DOT:** Department of Transportation
- DSL:** Domestic Substance List
- EC₅₀:** Effective concentration that inhibits the endpoint to 50% of control population
- EINECS:** European List of Notified Chemical Substances
- EPA:** U.S. Environmental Protection Agency
- ESIS:** European Chemical Substances Information System
- HMIS:** Hazardous Materials Identification System
- IARC:** International Agency for Research on Cancer

SAFETY DATA SHEET

Produced Water

Version 1.2 Revision Date: 10/03/2019

IDLH:	Immediately Dangerous to Life and Health
IATA:	International Air Transport Association
IMDG:	International Maritime Dangerous Goods
LC₅₀:	Concentration of air resulting in death to 50% of experimental animals
LD₅₀:	Administered dose resulting in death to 50% of experimental animals
LEL:	Lower Explosive Limit
MSHA:	Mine Safety and Health Administration
NFPA:	National Fire Protection Association
NIOSH:	National Institute for Occupational Safety and Health
N/A:	Not Available
N/C:	Not Classified
N/D:	No data sufficient for classification
NE:	Not Established
NOAEC:	No Observed Adverse Effect Concentration
NTP:	National Toxicology Program
OECD:	Organisation for Economic Co-operation and Development
OSHA:	Occupational Safety and Health Administration
PEL:	Permissible Exposure Limit
PPE :	Personal Protective Equipment
RCRA:	Resource Conservation and Recovery Act
SARA:	Superfund Amendments and Reauthorization Act
SCBA:	Self-Contained Breathing Apparatus
STEL:	Short Term Exposure Limit
STP:	Standard Temperature and Pressure
TLV:	Threshold Limit Value
TSCA:	Toxic Substances Control Act
TWA:	Time Weighted Average
UEL:	Upper Explosive Limit
WHMIS:	Workplace Hazardous Materials Information System

Disclaimer:

The 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 it 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 acknowledgement.

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.

Date of SDS Revisions: 10/03/2019 (HSE&R)
5/24/2018 (EHS&R)
Date of SDS Preparation: 5/27/2015
SDS Prepared by: Center for Toxicology and Environmental Health, LLC.