

PERMIT DETERMINATION FORM

SCLAREOL PURIFICATION

REDACTED APPLICATION

Prepared for:

Optima Belle, LLC
901 W. DuPont Avenue
Belle, West Virginia 25015

Prepared by:

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Project No. 0101-14-0162-009

January 2016

The logo for Potesta features the word "POTESTA" in a bold, blue, sans-serif font. To the left of the text is a dark blue graphic element consisting of a triangle pointing right and a square below it. A thick, dark blue horizontal bar extends from the right side of the logo across the bottom of the page.

POTESTA

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SECTION I
PERMIT DETERMINATION FORM



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):

Optima Belle, LLC

2. NAME OF FACILITY (IF DIFFERENT FROM ABOVE):

Optima Belle Plant

3. NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS) CODE:

325199

4A. MAILING ADDRESS:

901 W. DuPont Avenue
Belle, West Virginia 25015

4B. PHYSICAL ADDRESS:

901 W. DuPont Avenue
Belle, West Virginia 25015

5A. DIRECTIONS TO FACILITY (PLEASE PROVIDE MAP AS ATTACHMENT A):

I-64 to Belle Exit, then Rt. 60 East exit, turn right onto DuPont Avenue, travel approximately 500 feet and the plant entrance is on the left.

5B. NEAREST ROAD:

DuPont Avenue

5C. NEAREST CITY OR TOWN:

Belle

5D. COUNTY:

Kanawha

5E. UTM NORTHING (KM):

4,232.60

5F. UTM EASTING (KM):

451.90

5G. UTM ZONE:

17

6A. INDIVIDUAL TO CONTACT IF MORE INFORMATION IS REQUIRED:

James Hook

6B. TITLE:

EHS&S Manager

6C. TELEPHONE:

(304) 949-7152

6D. FAX:

Use Email

6E. E-MAIL:

jhook@optimachem.com

7A. DAQ PLANT I.D. NO. (FOR AN EXISTING FACILITY ONLY):

039-00663

7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR19 AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIATED WITH THIS PROCESS (FOR AN EXISTING FACILITY ONLY):

R13-0882H, R30-03900001

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):

- NEW SOURCE ADMINISTRATIVE UPDATE
 MODIFICATION 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?

- YES NO N/A

9. IS DEMOLITION OR PHYSICAL RENOVATION AT AN EXISTING FACILITY INVOLVED? YES NO

10A. DATE OF ANTICIPATED INSTALLATION OR CHANGE:

02/01/2016

10B. DATE OF ANTICIPATED START-UP:

02/01/2016

11A. PLEASE PROVIDE A DETAILED PROCESS FLOW DIAGRAM SHOWING EACH PROPOSED OR MODIFIED PROCESS EMISSION POINT AS ATTACHMENT B. See Attached

11B. PLEASE PROVIDE A DETAILED PROCESS DESCRIPTION AS ATTACHMENT C. See Attached

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.
See Attached

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	0.04463	0.00402 - 180 Batches 0.1955 - 8,760 hrs/yr
PM ₁₀	0.02111	0.00190 - 180 Batches 0.0925 - 8,760 hrs/yr
VOCs	0.3111	0.0365 - 180 Batches 1.3628 - 8,760 hrs/yr
CO	NA	NA
NO _x	NA	NA
SO ₂	NA	NA
Pb	NA	NA
HAPs (AGGREGATE AMOUNT)	NA	NA
TAPs (INDIVIDUALLY)*	NA	NA
OTHER (INDIVIDUALLY)*	NA	NA

Controlled emissions are provided here since the existing permits require controls on the existing equipment that is being used to purify sclareol.

* 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, I. Gene Williams (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: President

DATE: 01 / 12 / 2016

**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

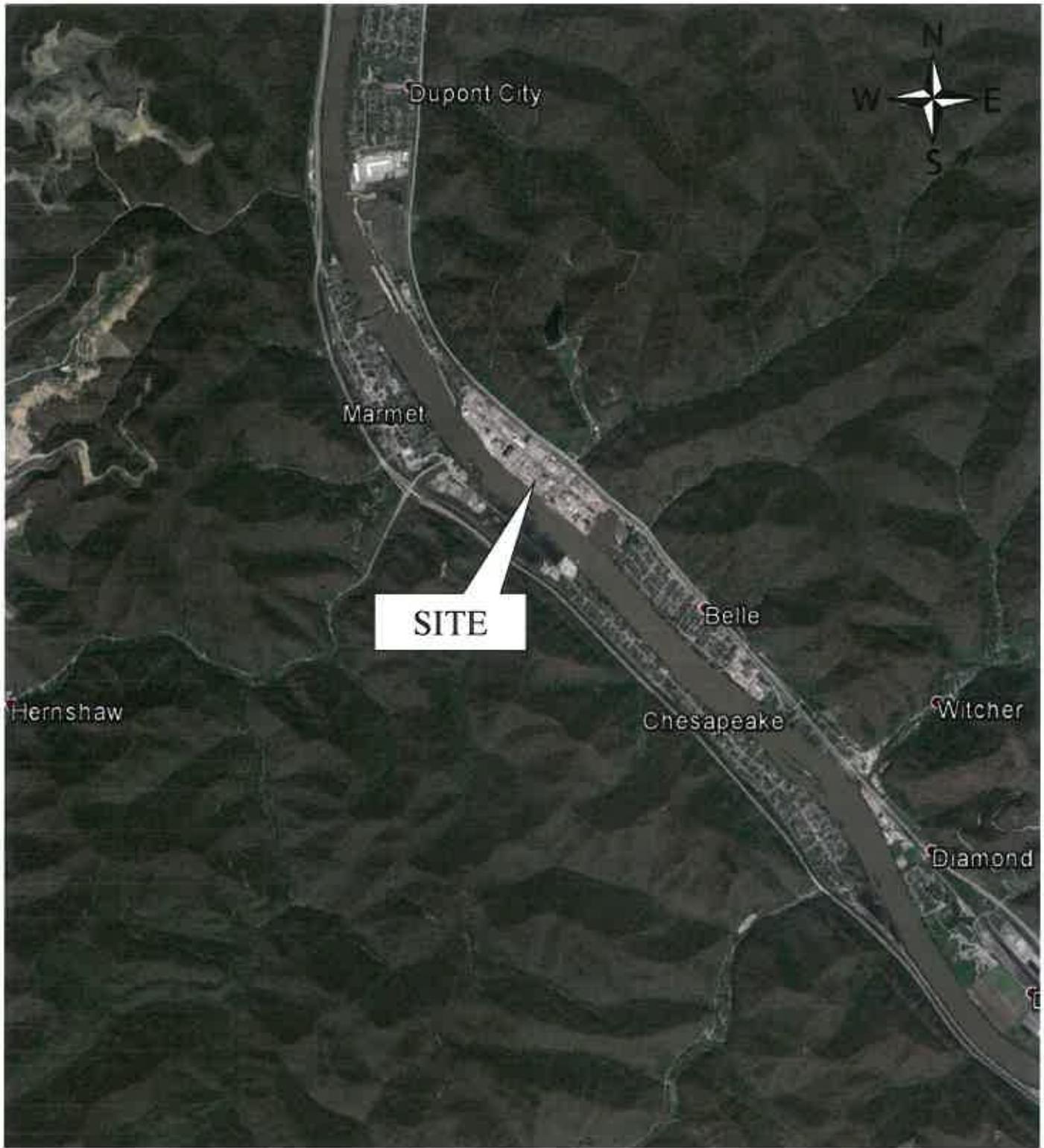
RECORDS ON ALL CHANGES ARE REQUIRED TO BE KEPT AND MAINTAINED ON-SITE FOR TWO (2) YEARS.

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

www.dep.wv.gov/daq

ATTACHMENT A

AREA MAP



DATE: January 2016

PROJECT NO. 0101-14-0162

MAPPING FOR VISUAL REPRESENTATION ONLY

**SITE LOCATION MAP 1 of 2
OPTIMA BELLE, LLC
BELLE, KANAWHA COUNTY, WV**

NOT TO SCALE



DATE: January 2016

PROJECT NO. 0101-14-0162

MAPPING FOR VISUAL REPRESENTATION ONLY

**SITE LOCATION MAP 2 of 2
OPTIMA BELLE, LLC
BELLE, KANAWHA COUNTY, WV**

NOT TO SCALE

ATTACHMENT B
PROCESS FLOW DIAGRAM

Sclareol Purification Process Flow Diagram

REDACTED

Information claimed confidential by
Optima Belle, LLC. January 5, 2016.

ATTACHMENT C
PROCESS DESCRIPTION

REDACTED

Information claimed confidential by
Optima Belle, LLC. January 5, 2016.

ATTACHMENT D
MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEET

Product identifier	SCLAREOL (crystalline)
Synonyms	1-Naphthalenepropanol, alpha-ethenyldecahydro-2-hydroxy-alpha,2,5,5,8a-pentamethyl-, (alpha.R,1R,2R,4aS,8aS)- ; (1R,2R,8aS)-Decahydro-1-(3-hydroxy-3-methyl-4-pentenyl)-2,5,5,8a-tetramethyl-2-naphthol; Sclareol (cryst)
Trade names	NA
Chemical family	Terpene hydrocarbons
Relevant identified uses of the substance or mixture and uses advised against	Chemical intermediate for fragrance manufacture. Not for human or animal consumption.

Issue Date 12 November 2015

SECTION 2 - HAZARDS IDENTIFICATION

GHS Classification of the substance or mixture

Regulation (EC) 1272/2008 May form combustible dust concentrations. Substance not yet fully tested.
OSHA HCS 2012

Label elements

CLP/GHS hazard pictogram None required

CLP/GHS signal word Warning

CLP/GHS hazard statements None required

CLP/GHS precautionary statements None required

Hazards Not Otherwise Classified (HNOC): MAY FORM COMBUSTIBLE DUST CONCENTRATIONS IN AIR (DURING PROCESSING)
May cause irritation. May be harmful if inhaled or absorbed through skin.

Note The environmental and toxicological properties of this substance have not been fully characterized.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

<u>Ingredient</u>	<u>CAS #</u>	<u>EINECS/ ELINCS#</u>	<u>Amount</u>	<u>EU Classification</u>	<u>GHS /CLP Classification</u>
Sclareol	515-03-7	208-194-0	95-100%	Not classified	May form combustible dust

Note The remaining impurities are non-hazardous and include miscellaneous terpenes (0-5%). See Section 16 for full text of GHS/CLP classifications. The EU classification is based on Directive 67/548/EEC and the GHS classification is based on Regulation (EC) 1272/2008 (EU CLP), 29 OSHA 1910.1200 and applicable GHS regulations (United Nations ST/SG/AC 10/30 rev 3).

SECTION 4 - FIRST AID MEASURES

Description of first aid measures

Eye Contact If easy to do, remove contact lenses, if worn. Immediately flush eyes with copious quantities of water for at least 15 minutes. If irritation occurs or persists, notify medical personnel and supervisor.

Skin Contact Wash exposed area with soap and water and remove contaminated clothing/shoes. If irritation occurs or persists, notify medical personnel and supervisor.

Inhalation Immediately move exposed subject to fresh air. If not breathing, give artificial respiration. If breathing is labored, administer oxygen. Immediately notify medical personnel and supervisor.

Ingestion If swallowed, call a physician immediately. Do not induce vomiting unless directed by medical personnel. Do not give anything to drink unless directed by medical personnel. Never give anything by mouth to an unconscious person. Notify medical personnel and supervisor.

Protection of first aid responders See Section 8 for Exposure Controls/Personal Protection recommendations.

Most important symptoms and effects, both acute and delayed No information available.

Indication of immediate medical attention and special treatment needed, if necessary Treat symptomatically and supportively. If accidental exposure occurs to an individual who is also taking one or more concomitant medications, consult the respective package or prescribing information for potential drug interactions.

SECTION 5 - FIREFIGHTING MEASURES

Extinguishing media	Use water spray (fog), alcohol resistant foam, dry powder, or carbon dioxide, as appropriate for surrounding fire and materials.
Specific hazards arising from the substance or mixture	No information identified. May emit toxic fumes of carbon monoxide and carbon dioxide.
Flammability/Explosivity	Warning may form combustible dust. High airborne concentrations of finely divided organic particles can potentially explode if ignited. Avoid generating dust.
Advice for firefighters	Wear full protective clothing and a self-contained breathing apparatus with a full facepiece operated in the pressure demand or other positive pressure mode. Decontaminate all equipment after use.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	If product is released or spilled, take proper precautions to minimize exposure by using appropriate personal protective equipment (see Section 8). Avoid dust formation.
Environmental precautions	Do not empty into drains. Avoid release to the environment.
Methods and material for containment and cleaning up	Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Non-sparking tools should be used. Carefully sweep up material. Place spill materials into a leak-proof container suitable for disposal. Decontaminate area a second time. Dispose of material in a manner that is compliant with federal, state and local laws.
Reference to other sections	See Sections 8 and 13 for more information

SECTION 7 - HANDLING AND STORAGE

Precautions for safe handling	Avoid contact with eyes, skin and other mucous membranes. Wash thoroughly after handling. Use personal protective equipment. Avoid breathing any dust, vapors or aerosols generated. Do not eat, drink or smoke while handling this product. Avoid prolonged or repeated exposure. Provide sufficient air exchange and/or exhaust in workrooms where dust is generated. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. Use normal preventative fire protection measures.
Conditions for safe storage including any incompatibilities	Keep container tightly closed. Keep in a cool and well ventilated area. To maintain product quality, do not store in heat or direct sunlight.
Specific end use(s)	No information identified.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters

Occupational Exposure Limits

<u>Compound</u>	<u>Issuer</u>	<u>Type</u>	<u>OEL</u>
Sclareol	--	--	--

DNEL/PNEC Limits	NA.
Risk Management Measures	Avoid creation and inhalation of dust.
Exposure/Engineering controls	Selection and use of containment devices and personal protective equipment should be based on a risk assessment of exposure potential. Use local exhaust and/or enclosure at dust/ aerosol/spray-generating points. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen- deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use only appropriately classified electrical equipment and powered industrial trucks.
Respiratory protection	Where protection from nuisance dust is desired, use an N95 (US) or type P1 (EN143) dust mask. Choice of respiratory protection should be appropriate to the task and the level of existing engineering controls. Use respirators and components tested and approved under the appropriate government standard such as NIOSH (US) or CEN (EU).
Hand protection	Wear nitrile or other impervious gloves if skin contact is possible. When the material is dissolved or suspended in an organic solvent, wear gloves that provide protection against the solvent.
Skin protection	Wear appropriate gloves, lab coat, or other protective overgarment if skin contact is likely. Base the choice of skin protection on the job activity, potential for skin contact and solvents and reagents in use.
Eye/face protection	Wear safety glasses with side shields, chemical splash goggles, or full face shield, if necessary. Base the choice of protection on the job activity and potential for contact with eyes or face. An emergency eye wash station should be available.
Environmental Exposure Controls	Do not release to drains. Implement appropriate and effective emergency response procedures to prevent release or spread of contamination and to prevent inadvertent contact by personnel.
Other protective measures	Wash hands in the event of contact with this mixture, especially before eating, drinking or smoking. Protective equipment is not to be worn outside the work area (e.g., in common areas or out-of-doors). Decontaminate all protective equipment following use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Solid
Color	White to beige
Odor	Paraffinic, medicinal
Odor threshold	No information identified.
pH	No information identified.
Melting point/freezing point	104-105 °C (literature)

Initial boiling point and boiling range	218-220 °C at 19 mm Hg (literature reference)
Flash point	169 °C (predicted)
Evaporation rate	No information identified.
Flammability (solid, gas)	Not classified as a flammable solid by GHS. Time for combustion (200 mm) 203 s.
Upper/lower flammability or explosive limits	No information identified
Vapor pressure	5.36E-8 mmHg at 25°C (literature reference)
Vapor density	No information identified.
Relative density	0.954 g/cm ³ at 20 °C. (literature reference)
Water solubility	0.0917 mg/L @ 25 °C (literature reference).
Solvent solubility	Soluble in dodecane, hexane, ethyl acetate, ethanol.
Partition coefficient (log) (n-octanol/water)	6.0 at 25 °C (KOWWIN)
Auto-ignition temperature	No information identified.
Decomposition temperature	No information identified.
Viscosity (kinematic)	No information identified.
Explosive properties	No information for sclareol crystalline. Kst 2 bar m s ⁻¹ (VDI-2263/ ASTM E1226) for the sclareol crude solid
Minimum ignition energy	No information for sclareol crystalline .< 3 mJ (ASTM E2019) for the sclareol crude solid
Particle size (mean)	No information for sclareol crystalline. 37 micron (after sieving on 63 micron sieve) for the sclareol crude solid
Oxidizing properties	No information identified.
Other information	
Molecular weight	308.50 g/mole
Molecular formula	C ₂₀ H ₃₆ O ₂

SECTION 10 - STABILITY AND REACTIVITY

Reactivity	No information identified.
Chemical stability	Stable under normal handling and storage conditions.
Possibility of hazardous reactions	Not expected to occur.
Conditions to avoid	Avoid generation and accumulation of dust. Keep away from heat, sparks, and open flame.
Incompatible materials	Strong oxidizers.
Hazardous decomposition products	No information identified.

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on toxicological effects

Route of entry May be absorbed by inhalation of dust, skin contact and ingestion.

Acute toxicity

<u>Compound</u>	<u>Type</u>	<u>Route</u>	<u>Species</u>	<u>Dose</u>
Sclareol	LD ₅₀	Oral	Rat	> 5000 mg/kg
	LD ₅₀	Dermal	Rabbit	> 5000 mg/kg

Irritation/Corrosion No studies identified.

Sensitization No studies identified.

STOT-single exposure No studies identified.

STOT-repeated exposure/Repeat-dose toxicity No studies identified.

Reproductive toxicity No studies identified.

Developmental toxicity No studies identified.

Genotoxicity No studies identified.

Carcinogenicity No studies identified. This substance is not listed by NTP, IARC, ACGIH or OSHA as a carcinogen.

Aspiration hazard No information available.

Human health data No studies identified.

Additional information Substance not yet fully tested.

SECTION 12 - ECOLOGICAL INFORMATION

Aquatic Toxicity No data available.

Additional toxicity information No data available.

Persistence and Degradability No data available

Bioaccumulative potential No data available.

Mobility in soil No data available.

Results of PBT and vPvB assessment No data available.

Other adverse effects No data available.

Note The environmental characteristics of this substance have not been fully investigated. Releases to the environment should be avoided.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste treatment methods Used product should be disposed of according to local, state, and federal regulations. Do not send down the drain or flush down the toilet. All wastes containing the material should be properly labeled. Dispose of wastes in accordance to prescribed federal, state, and local guidelines, e.g., appropriately permitted chemical waste incinerator. Rinse waters resulting from spill cleanups should be discharged in an environmentally safe manner, e.g., appropriately permitted municipal or on-site wastewater treatment facility.

SECTION 14 - TRANSPORT INFORMATION

Transport Based on the available data, this substance is not regulated as a hazardous material/ dangerous good under EU ADR/RID, US DOT, Canada TDG, IATA, or IMDG.

UN number None assigned.

UN proper shipping name None assigned.

Transport hazard classes and packing group None assigned.

Environmental hazards Based on the available data, this substance is not regulated as an environmental hazard or a marine pollutant.

Special precautions for users Substance not fully tested - avoid exposure and releases to the environment.

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable.

SECTION 15 - REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture This SDS complies with the requirements under US, EU and GHS (EU CLP - Regulation EC No 1272/2008) guidelines.

Chemical safety assessment Not conducted.

OSHA Hazardous May form combustible dust concentrations on processing.

WHMIS classification This substance does not meet any of the hazard criteria of the Controlled Products Regulations and the SDS contains all of the information required by those regulations.

Canada DSL On DSL Supplement to Canada Gazette, Part I, January 26, 1991.

US TSCA Listed on the TSCA inventory as 1-Naphthalenepropanol, alpha-ethenyldecahydro-2-hydroxy-alpha,2,5,5,8a-pentamethyl-, (alpha.R,1R,2R,4aS,8aS)-

EU REACH Sclareol is not currently registered under REACH.

China IECSC On IECSC Inventory of Existing Chemical Substances in China, 2013

SARA section 313 Not listed.

California proposition 65 This substance does not contain chemicals known to the state of California to cause cancer or reproductive harm.

SECTION 16 - OTHER INFORMATION

Full text of H phrases, P phrases and GHS classification

None available. HNOC: hazards not otherwise classified.

Sources of data

Information from published literature and internal company data. Refer to NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, for safe handling.³

Abbreviations

ACGIH - American Conference of Governmental Industrial Hygienists ADR/RID - European Agreement Concerning the International Carriage of Dangerous Goods by Road/Rail AIHA - American Industrial Hygiene Association CAS# - Chemical Abstract Services Number CLP - Classification, Labelling, and Packaging of Substances and Mixtures DNEL - Derived No Effect Level DOT - Department of Transportation EINECS - European Inventory of New and Existing Chemical Substances ELINCS - European List of Notified Chemical Substances

EU - European Union GHS - Globally Harmonized System of Classification and Labelling of Chemicals HRIPT - Human Repeated Insult Patch Test IARC - International Agency for Research on Cancer IDLH - Immediately Dangerous to Life or Health IATA - International Air Transport Association IMDG - International Maritime Dangerous Goods LOEL - Lowest Observed Effect Level LOAEL - Lowest Observed Adverse Effect Level NIOSH - The National Institute for Occupational Safety and Health NOEL - No Observed Effect Level NOAEL - No Observed Adverse Effect Level NTP - National Toxicology Program OEL - Occupational Exposure Limit OSHA - Occupational Safety and Health Administration PBT - Persistent, Bioaccumulative and Toxic PNEC - Predicted No Effect Concentration SARA - Superfund Amendments and Reauthorization Act STEL - Short Term Exposure Limit TDG - Transport Dangerous Goods TSCA - Toxic Substances Control Act TWA - Time Weighted Average WHMIS - Workplace Hazardous Materials Information System

Revisions

This is the first version of this SDS.

Disclaimer

The above information is based on data available to us and is believed to be correct. Since the information may be applied under conditions beyond our control and with which we may be unfamiliar, we do not assume any responsibility for the results of its use and all persons receiving it must make their own determination of the effects, properties and protections which pertain to their particular conditions. No representation, warranty, or guarantee, express or implied (including a warranty of fitness or merchantability for a particular purpose), is made with respect to the materials, the accuracy of this information, the results to be obtained from the use thereof, or the hazards connected with the use of the material. Caution should be used in the handling and use of the material because it is a chemical substance. The above information is offered in good faith and with the belief that it is accurate. As of the date of issuance, we are providing all information relevant to the foreseeable handling of the material. However, in the event of an adverse incident associated with this product, this Safety Data Sheet is not, and is not intended to be, a substitute for consultation with appropriately trained personnel.

SAFETY DATA SHEET

n-Heptane

Section 1. Identification

GHS product identifier : n-Heptane
Chemical name : heptane
Other means of identification : n-heptane; Heptane (n-Heptane)
Product use : Synthetic/Analytical chemistry.
Synonym : n-heptane; Heptane (n-Heptane)
SDS # : 001108

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 1
SKIN CORROSION/IRRITATION - Category 2
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
AQUATIC HAZARD (ACUTE) - Category 1
AQUATIC HAZARD (LONG-TERM) - Category 1

GHS label elements

Hazard pictograms :



Signal word :

Danger

Hazard statements :

Extremely flammable liquid and vapor.
May form explosive mixtures with air.
Causes skin irritation.
May cause drowsiness and dizziness.
Very toxic to aquatic life.
Very toxic to aquatic life with long lasting effects.

Precautionary statements

General :

Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Prevention :

Wear protective gloves. Wear eye or face protection. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing vapor. Wash hands thoroughly after handling.

Date of issue/Date of revision

: 4/29/2015.

Date of previous issue

: 10/28/2014.

Version : 0.02

1/13

Section 2. Hazards identification

- Response** : Collect spillage. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. If skin irritation occurs: Get medical attention.
- Storage** : Store locked up. Store in a well-ventilated place. Keep cool.
- Disposal** : Dispose of contents and container in accordance with all local, regional, national and international regulations.
- Hazards not otherwise classified** : None known.

Section 3. Composition/information on ingredients

- Substance/mixture** : Substance
- Chemical name** : heptane
- Other means of identification** : n-heptane; Heptane (n-Heptane)

CAS number/other identifiers

- CAS number** : 142-82-5
- Product code** : 001108

Ingredient name	%	CAS number
heptane	100	142-82-5

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

- Eye contact** : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.
- Inhalation** : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.
- Skin contact** : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Ingestion** : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention.

Section 4. First aid measures

immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

- Eye contact** : Causes serious eye irritation.
- Inhalation** : Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness.
- Skin contact** : Causes skin irritation.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Ingestion** : Can cause central nervous system (CNS) depression. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

- Eye contact** : Adverse symptoms may include the following:
 - pain or irritation
 - watering
 - redness
- Inhalation** : Adverse symptoms may include the following:
 - nausea or vomiting
 - headache
 - drowsiness/fatigue
 - dizziness/vertigo
 - unconsciousness
- Skin contact** : Adverse symptoms may include the following:
 - irritation
 - redness
- Ingestion** : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

- Notes to physician** : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
- Specific treatments** : No specific treatment.
- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

- Suitable extinguishing media** : Use dry chemical, CO₂, water spray (fog) or foam.
- Unsuitable extinguishing media** : Do not use water jet.

Section 5. Fire-fighting measures

- Specific hazards arising from the chemical** : Extremely flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. This material is very toxic to aquatic life with long lasting effects. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
- Special protective actions for fire-fighters** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

- For non-emergency personnel** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.
- For emergency responders** : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up

- Small spill** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

- Protective measures** : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Advice on general occupational hygiene** : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
- Conditions for safe storage, including any incompatibilities** : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
heptane	<p>ACGIH TLV (United States, 3/2012). STEL: 2050 mg/m³ 15 minutes. STEL: 500 ppm 15 minutes. TWA: 1640 mg/m³ 8 hours. TWA: 400 ppm 8 hours.</p> <p>NIOSH REL (United States, 1/2013). CEIL: 1800 mg/m³ 15 minutes. CEIL: 440 ppm 15 minutes. TWA: 350 mg/m³ 10 hours. TWA: 85 ppm 10 hours.</p> <p>OSHA PEL (United States, 6/2010). TWA: 2000 mg/m³ 8 hours. TWA: 500 ppm 8 hours.</p> <p>OSHA PEL 1989 (United States, 3/1989). STEL: 2000 mg/m³ 15 minutes. STEL: 500 ppm 15 minutes. TWA: 1600 mg/m³ 8 hours. TWA: 400 ppm 8 hours.</p>

- Appropriate engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Section 8. Exposure controls/personal protection

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid. [Watery liquid.]

Color : Colorless.

Molecular weight : 100.23 g/mole

Molecular formula : C7-H16

Boiling/condensation point : 98.5°C (209.3°F)

Melting/freezing point : -90.6°C (-131.1°F)

Critical temperature : 266.85°C (512.3°F)

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Flash point : Closed cup: -3.89°C (25°F)

Burning time : Not applicable.

Burning rate : Not applicable.

Section 9. Physical and chemical properties

Evaporation rate	: 3.18 (butyl acetate = 1)
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Lower: 1.05% Upper: 6.7%
Vapor pressure	: 4.6 kPa (34.502803352 mm Hg) [room temperature]
Vapor density	: 3.46 (Air = 1)
Specific Volume (ft³/lb)	: 1.462
Gas Density (lb/ft³)	: 0.684
Relative density	: 0.68
Solubility	: Not available.
Solubility in water	: Not available.
Partition coefficient: n-octanol/water	: 4.66
Auto-ignition temperature	: 285°C (545°F)
Decomposition temperature	: Not available.
SADT	: Not available.
Viscosity	: Kinematic (room temperature): 0.00641 cm ² /s (0.641 cSt)

Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	: Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.
Incompatibility with various substances	: Extremely reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
heptane	LC50 Inhalation Gas.	Rat	48000 ppm	4 hours
	LC50 Inhalation Vapor	Rat	50242 ppm	1 hours
	LC50 Inhalation Vapor	Rat	103 g/m ³	4 hours

Irritation/Corrosion

Section 11. Toxicological information

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
heptane	Category 3	Not applicable.	Narcotic effects

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

- Eye contact** : Causes serious eye irritation.
- Inhalation** : Can cause central nervous system (CNS) depression. May cause drowsiness and dizziness.
- Skin contact** : Causes skin irritation.
- Ingestion** : Can cause central nervous system (CNS) depression. Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

- Eye contact** : Adverse symptoms may include the following:
pain or irritation
watering
redness
- Inhalation** : Adverse symptoms may include the following:
nausea or vomiting
headache
drowsiness/fatigue
dizziness/vertigo
unconsciousness
- Skin contact** : Adverse symptoms may include the following:
irritation
redness
- Ingestion** : No specific data.

Section 11. Toxicological information

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
heptane	Acute LC50 375000 µg/l Fresh water	Fish - Oreochromis mossambicus	96 hours

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
heptane	4.66	552	high

Mobility in soil

Soil/water partition coefficient (K_{oc}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1206	UN1206	UN1206	UN1206	UN1206
UN proper shipping name	Heptanes	Heptanes	Heptanes	Heptanes	Heptanes
Transport hazard class(es)	3 	3 	3 	3  	3 
Packing group	II	II	II	II	II
Environment	No.	No.	No.	Yes.	No.
Additional information	-	<u>Explosive Limit and Limited Quantity Index</u> 1 <u>Passenger Carrying Road or Rail Index</u> 5	-	The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.	The environmentally hazardous substance mark may appear if required by other transportation regulations.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

- U.S. Federal regulations**
- : TSCA 8(a) PAIR: heptane
 - TSCA 8(a) CDR Exempt/Partial exemption: Not determined
 - TSCA 12(b) one-time export: heptane
 - United States inventory (TSCA 8b): This material is listed or exempted.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
heptane	100	Yes.	No.	No.	Yes.	No.

State regulations

- Massachusetts : This material is listed.
- New York : This material is not listed.
- New Jersey : This material is listed.
- Pennsylvania : This material is listed.
- Canada inventory : This material is listed or exempted.

International regulations

- International lists : Australia inventory (AICS): This material is listed or exempted.
- China inventory (IECSC): This material is listed or exempted.
- Japan inventory: This material is listed or exempted.
- Korea inventory: This material is listed or exempted.
- Malaysia Inventory (EHS Register): Not determined.
- New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
- Philippines inventory (PICCS): This material is listed or exempted.
- Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Section 15. Regulatory information

Chemical Weapons Convention List Schedule II Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals

Chemical Weapons Convention List Schedule III Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals

Canada

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2B: Material causing other toxic effects (Toxic).
CEPA Toxic substances: This material is not listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class B-2: Flammable liquid
Class D-2B: Material causing other toxic effects (Toxic).

Hazardous Material Information System (U.S.A.)

Health	2
Flammability	3
Physical hazards	0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of printing : 4/29/2015.

Date of issue/Date of revision : 4/29/2015.

Section 16. Other information

Date of previous issue	: 10/28/2014.
Version	: 0.02
Key to abbreviations	: ATE = Acute Toxicity Estimate BCF = Bioconcentration Factor GHS = Globally Harmonized System of Classification and Labelling of Chemicals IATA = International Air Transport Association IBC = Intermediate Bulk Container IMDG = International Maritime Dangerous Goods LogPow = logarithm of the octanol/water partition coefficient MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution) UN = United Nations ACGIH – American Conference of Governmental Industrial Hygienists AIHA – American Industrial Hygiene Association CAS – Chemical Abstract Services CEPA – Canadian Environmental Protection Act CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA) CFR – United States Code of Federal Regulations CPR – Controlled Products Regulations DSL – Domestic Substances List GWP – Global Warming Potential IARC – International Agency for Research on Cancer ICAO – International Civil Aviation Organisation Inh – Inhalation LC – Lethal concentration LD – Lethal dosage NDSL – Non-Domestic Substances List NIOSH – National Institute for Occupational Safety and Health TDG – Canadian Transportation of Dangerous Goods Act and Regulations TLV – Threshold Limit Value TSCA – Toxic Substances Control Act WEEL – Workplace Environmental Exposure Level WHMIS – Canadian Workplace Hazardous Material Information System

References : Not available.

✓ Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

SAFETY DATA SHEET

Product identifier	Sclareol, crude
Synonyms	(1R,2R,8aS)-Decahydro-1-(3-hydroxy-3-methyl-4-pentenyl)-2,5,5,8a-tetramethyl-2-naphthol
Trade names	NA
Chemical family	Terpene hydrocarbons

Relevant identified uses of the substance or mixture and uses advised against For R&D use only. Not for human or animal consumption.

Note The pharmacologic and toxicologic properties of this substance have not been fully characterized; this SDS will be revisited as more data become available.

Issue Date 9 January 2015

SECTION 2 - HAZARDS IDENTIFICATION

GHS Classification of the substance or mixture

**Regulation (EC) 1272/2008
OSHA HCS 2012** Not classified. Substance not yet fully tested.

Label elements

CLP/GHS hazard pictogram None required

CLP/GHS signal word None required

CLP/GHS hazard statements None required

SECTION 2 - HAZARDS IDENTIFICATION ...continued

CLP/GHS precautionary statements None required

NFPA Classification: Health Hazard: 0; Fire Hazard: 0; Reactivity Hazard: 0

Other hazards May cause irritation. May be harmful if inhaled or absorbed through skin.

Note The pharmacologic and toxicologic properties of this substance have not been fully characterized. See Section 16 for full text of GHS classifications.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

<u>Ingredient</u>	<u>CAS #</u>	<u>EINECS/ ELINCS#</u>	<u>Amount</u>	<u>EU Classification</u>	<u>GHS /CLP Classification</u>
Sclareol	515-03-7	208-194-0	60-95%	Not classified	Not classified

Note The remaining impurities are non-hazardous and include: sugar cane solids (<5.0%), buffer salts (<2.0%), and inactivated cell debris from non-pathogenic, Amyris proprietary yeast cultures (<5.0%) from *Saccharomyces cerevisiae* classified as Risk Group-1. See Section 16 for full text of GHS/CLP classifications. The EU classification is based on Directive 67/548/EEC and the GHS classification is based on Regulation (EC) 1272/2008 (EU CLP), 29 OSHA 1910.1200 and applicable GHS regulations (United Nations ST/SG/AC 10/30 rev 3).

SECTION 4 - FIRST AID MEASURES

Description of first aid measures

Eye Contact If easy to do, remove contact lenses, if worn. Immediately flush eyes with copious quantities of water for at least 15 minutes. If irritation occurs or persists, notify medical personnel and supervisor.

Skin Contact Wash exposed area with soap and water and remove contaminated clothing/shoes. If irritation occurs or persists, notify medical personnel and supervisor.

Inhalation Immediately move exposed subject to fresh air. If not breathing, give artificial respiration. If breathing is labored, administer oxygen. Immediately notify medical personnel and supervisor.

Ingestion If swallowed, call a physician immediately. Do not induce vomiting unless directed by medical personnel. Do not give anything to drink unless directed by medical personnel. Never give anything by mouth to an unconscious person. Notify medical personnel and supervisor.

Protection of first aid responders See Section 8 for Exposure Controls/Personal Protection recommendations.

Most important symptoms and effects, both acute and delayed No information available.

Indication of immediate medical attention and special treatment needed, if necessary Treat symptomatically and supportively. If accidental exposure occurs to an individual who is also taking one or more concomitant medications, consult the respective package or prescribing information for potential drug interactions.

SECTION 5 - FIREFIGHTING MEASURES

Extinguishing media	Use water spray (fog), alcohol resistant foam, dry powder, or carbon dioxide, as appropriate for surrounding fire and materials.
Specific hazards arising from the substance or mixture	No information identified. May emit toxic fumes of carbon monoxide and carbon dioxide.
Flammability/Explosivity	No explosivity or flammability data identified. High airborne concentrations of finely divided organic particles can potentially explode if ignited. Avoid raising dust.
Advice for firefighters	Wear full protective clothing and a self-contained breathing apparatus with a full facepiece operated in the pressure demand or other positive pressure mode. Decontaminate all equipment after use.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	If product is released or spilled, take proper precautions to minimize exposure by using appropriate personal protective equipment (see Section 8). Avoid dust formation.
Environmental precautions	Do not empty into drains. Avoid release to the environment.
Methods and material for containment and cleaning up	Do not raise dust. Carefully sweep up material. Place spill materials into a leak-proof container suitable for disposal. Decontaminate area a second time. Dispose of material in a manner that is compliant with federal, state and local laws.
Reference to other sections	See Sections 8 and 13 for more information

SECTION 7 - HANDLING AND STORAGE

Precautions for safe handling	Avoid contact with eyes, skin and other mucous membranes. Wash thoroughly after handling. Use personal protective equipment. Avoid breathing any dust, vapors or aerosols generated. Do not eat, drink or smoke while handling this product. Avoid prolonged or repeated exposure. Provide sufficient air exchange and/or exhaust in workrooms where dust is generated. Use normal preventative fire protection measures.
Conditions for safe storage including any incompatibilities	Keep container tightly closed. Keep in a cool and well ventilated area. To maintain product quality, do not store in heat or direct sunlight.
Specific end use(s)	No information identified.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Control Parameters**Occupational Exposure Limits**

<u>Compound</u>	<u>Issuer</u>	<u>Type</u>	<u>OEL</u>
Sclareol, crude	--	--	--

DNEL/PNEC Limits NA.**Risk Management Measures** Avoid creation and inhalation of dust.**Exposure/Engineering controls** Selection and use of containment devices and personal protective equipment should be based on a risk assessment of exposure potential. Use local exhaust and/or enclosure at dust/ aerosol/spray-generating points.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory protection	Where protection from nuisance dust is desired, use an N95 (US) or type P1 (EN143) dust mask. Choice of respiratory protection should be appropriate to the task and the level of existing engineering controls. Use respirators and components tested and approved under the appropriate government standard such as NIOSH (US) or CEN (EU).
Hand protection	Wear nitrile or other impervious gloves if skin contact is possible. When the material is dissolved or suspended in an organic solvent, wear gloves that provide protection against the solvent.
Skin protection	Wear appropriate gloves, lab coat, or other protective overgarment if skin contact is likely. Base the choice of skin protection on the job activity, potential for skin contact and solvents and reagents in use.
Eye/face protection	Wear safety glasses with side shields, chemical splash goggles, or full face shield, if necessary. Base the choice of protection on the job activity and potential for contact with eyes or face. An emergency eye wash station should be available.
Environmental Exposure Controls	Do not release to drains. Implement appropriate and effective emergency response procedures to prevent release or spread of contamination and to prevent inadvertent contact by personnel.
Other protective measures	Wash hands in the event of contact with this mixture, especially before eating, drinking or smoking. Protective equipment is not to be worn outside the work area (e.g., in common areas or out-of-doors). Decontaminate all protective equipment following use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Solid
Color	Yellow-brown
Odor	Paraffinic, medicinal
Odor threshold	No information identified.
pH	No information identified.
Melting point/freezing point	104-105 °C (literature)
Initial boiling point and boiling range	218-220 °C at 19 mm Hg
Flash point	169 °C (predicted)
Evaporation rate	No information identified.
Flammability (solid, gas)	No information identified.
Upper/lower flammability or explosive limits	No information identified
Vapor pressure	5.36E-8 mmHg at 25°C
Vapor density	No information identified.
Relative density	0.954 g/cm ³ at 20 °C.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Water solubility	0.0917 mg/L @ 25 °C (literature reference).
Solvent solubility	Soluble in dodecane, hexane, ethyl acetate, ethanol.
Partition coefficient (log) (<i>n</i>-octanol/water)	6.0 at 25 °C (KOWWIN)
Auto-ignition temperature	No information identified.
Decomposition temperature	No information identified.
Viscosity (kinematic)	No information identified.
Explosive properties	No information identified.
Oxidizing properties	No information identified.

Other information

Molecular weight	308.50 g/mole
Molecular formula	C ₂₀ H ₃₆ O ₂

SECTION 10 - STABILITY AND REACTIVITY

Reactivity	No information identified.
Chemical stability	Stable under normal handling and storage conditions.
Possibility of hazardous reactions	Not expected to occur.
Conditions to avoid	Keep away from heat, sparks, and open flame.
Incompatible materials	Strong oxidizers.
Hazardous decomposition products	No information identified.

SECTION 11 - TOXICOLOGICAL INFORMATION

Information on toxicological effects

Route of entry May be absorbed by inhalation of dust, skin contact and ingestion.

Acute toxicity

<u>Compound</u>	<u>Type</u>	<u>Route</u>	<u>Species</u>	<u>Dose</u>
Sclareol, crude	LD ₅₀	Oral	Rat	> 5000 mg/kg
	LD ₅₀	Dermal	Rabbit	> 5000 mg/kg

Irritation/Corrosion No studies identified.

Sensitization No studies identified.

STOT-single exposure No studies identified.

STOT-repeated exposure/Repeat-dose toxicity No studies identified.

Reproductive toxicity No studies identified.

Developmental toxicity No studies identified.

SECTION 11 - TOXICOLOGICAL INFORMATION

Genotoxicity	No studies identified.
Carcinogenicity	No studies identified. This mixture is not listed by NTP, IARC, ACGIH or OSHA as a carcinogen.
Aspiration hazard	No information available.
Human health data	No studies identified.
Additional information	Substance not yet fully tested.

SECTION 12 - ECOLOGICAL INFORMATION

Aquatic Toxicity	No data available.
Additional toxicity information	No data available.
Persistence and Degradability	No data available
Bioaccumulative potential	No data available.
Mobility in soil	No data available.
Results of PBT and vPvB assessment	No data available.
Other adverse effects	No data available.
Note	The environmental characteristics of this substance have not been fully investigated. Releases to the environment should be avoided.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste treatment methods	Used product should be disposed of according to local, state, and federal regulations. Do not send down the drain or flush down the toilet. All wastes containing the material should be properly labeled. Dispose of wastes in accordance to prescribed federal, state, and local guidelines, e.g., appropriately permitted chemical waste incinerator. Rinse waters resulting from spill cleanups should be discharged in an environmentally safe manner, e.g., appropriately permitted municipal or on-site wastewater treatment facility.
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SECTION 14 - TRANSPORT INFORMATION

Transport	Based on the available data, this substance is not regulated as a hazardous material/ dangerous good under EU ADR/RID, US DOT, Canada TDG, IATA, or IMDG.
UN number	None assigned.
UN proper shipping name	None assigned.
Transport hazard classes and packing group	None assigned.
Environmental hazards	Based on the available data, this substance is not regulated as an environmental hazard or a marine pollutant.
Special precautions for users	Substance not fully tested - avoid exposure and releases to the environment.
Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code	Not applicable.

SECTION 15 - REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture	This SDS complies with the requirements under US, EU and GHS (EU CLP - Regulation EC No 1272/2008) guidelines.
Chemical safety assessment	Not conducted.
OSHA Hazardous	No known OSHA hazards. Substance not fully tested.
WHMIS classification	This substance does not meet any of the hazard criteria of the Controlled Products Regulations and the SDS contains all of the information required by those regulations.
Canada DSL	On DSL Supplement to Canada Gazette, Part I, January 26, 1991.
US TSCA	Listed on the TSCA 2104 inventory
EU REACH	This substance is exempt from REACH registration due to low production/import volume (< 1 tonne per year).
China IECSC	On IECSC Inventory of Existing Chemical Substances in China, 2013
SARA section 313	Not listed.
California proposition 65	Not listed.

SECTION 16 - OTHER INFORMATION

Full text of H phrases, P phrases and GHS classification	None available.
Sources of data	Information from published literature and internal company data.
Abbreviations	ACGIH - American Conference of Governmental Industrial Hygienists ADR/RID - European Agreement Concerning the International Carriage of Dangerous Goods by Road/Rail AIHA - American Industrial Hygiene Association CAS# - Chemical Abstract Services Number CLP - Classification, Labelling, and Packaging of Substances and Mixtures DNEL - Derived No Effect Level DOT - Department of Transportation EINECS - European Inventory of New and Existing Chemical Substances ELINCS - European List of Notified Chemical Substances EU - European Union GHS - Globally Harmonized System of Classification and Labelling of Chemicals HRIPT - Human Repeated Insult Patch Test IARC - International Agency for Research on Cancer IDLH - Immediately Dangerous to Life or Health IATA - International Air Transport Association IMDG - International Maritime Dangerous Goods LOEL - Lowest Observed Effect Level LOAEL - Lowest Observed Adverse Effect Level NIOSH - The National Institute for Occupational Safety and Health NOEL - No Observed Effect Level NOAEL - No Observed Adverse Effect Level NTP - National Toxicology Program OEL - Occupational Exposure Limit OSHA - Occupational Safety and Health Administration PBT - Persistent, Bioaccumulative and Toxic PNEC - Predicted No Effect Concentration SARA - Superfund Amendments and Reauthorization Act STEL - Short Term Exposure Limit TDG - Transport Dangerous Goods TSCA - Toxic Substances Control Act TWA - Time Weighted Average WHMIS - Workplace Hazardous Materials Information System

SECTION 16 - OTHER INFORMATION

Revisions

This is the first version of this SDS.

Disclaimer

The above information is based on data available to us and is believed to be correct. Since the information may be applied under conditions beyond our control and with which we may be unfamiliar, we do not assume any responsibility for the results of its use and all persons receiving it must make their own determination of the effects, properties and protections which pertain to their particular conditions. No representation, warranty, or guarantee, express or implied (including a warranty of fitness or merchantability for a particular purpose), is made with respect to the materials, the accuracy of this information, the results to be obtained from the use thereof, or the hazards connected with the use of the material. Caution should be used in the handling and use of the material because it is a chemical substance. The above information is offered in good faith and with the belief that it is accurate. As of the date of issuance, we are providing all information relevant to the foreseeable handling of the material. However, in the event of an adverse incident associated with this product, this Safety Data Sheet is not, and is not intended to be, a substitute for consultation with appropriately trained personnel.

ATTACHMENT E
EMISSIONS CALCULATIONS

By: PEW
 Date: 1/7/2016

Checked By: JJD
 Date: 1/7/2016

Total Emissions Estimate for a Campaign of Sclareol

Number of Batches in Process 3 No.
 Number of Batches Per Year 180 No.
 VOC Control Efficiency 99.9 %

Emissions	Total Emissions						
	pph (Max Rate)(2)	Uncontrolled		Controlled			
		pppy	tpy	pph (Max Rate)	pppy	tpy (180 batches)	tpy (pph x 8,760 hrs/yr)
VOC - Process (1)	84.2586	32,085.8277	16.0429	0.0843	32.0858	0.0160	0.3691
VOC - Filter Changeout	0.22688	40.8389	0.0204	0.2269	40.8389	0.0204	0.9937
Total VOC	84.4855	32,126.6665	16.0633	0.3111	72.9247	0.0365	1.3628
PM	0.04463	8.03398	0.00402	0.04463	8.03398	0.00402	0.1955
PM10	0.02111	3.79985	0.00190	0.02111	3.79985	0.00190	0.0925
PM2.5	0.00320	0.57541	0.00029	0.00320	0.57541	0.00029	0.0140

(1) Uncontrolled VOC emissions are back calculated from the controlled emissions based on the control efficiency.

(2) Hourly emissions rate is the max rate of emissions based on Emissions Master multiplied by the number of batches that could be in process. The batches will not be at the same point within the process. This is a conservative estimate that all batches will be emitting the maximum hourly emissions value for a single batch.

Total Emissions Estimate for a Batch of Sclareol - Emissions Master (Provided by Client)

Product: Sclareol
 Process Name: Sclareol-4
 Production Quantity: 1200.0 lb
 Process Cycle Time: 63.75 hr
 Date: 12/21/2015
 File: C:\Users\Public\Documents\Emission Master\Sclareol5.emm
 Comments:

Compound	Activities Emitting	Emissions		Percent Removal
		Uncontrolled (lb)	Controlled (lb)	
Air	4	5.763887452	5.763887452	0
Diatomaceous Earth	6	0	0	
Heptane	59	177.9663166	0.177966317	99.9
Nitrogen	82	143.742132	143.742132	0
Sclareol	49	0	0	
Water	9	0.116982171	0.116982171	0

Compound	Process Cycle	Compound Emission	Compound Emission	Max Rate (lb/hr)
	Average (lb/hr)	Hours	Average (lb/hr)	Within 1 hour
Air	0.090413921	30.49861111	0.188988522	5.158703854
Diatomaceous Earth	0	1.75	0	0
Heptane	0.002791628	72.40388889	0.002457966	0.028084237
Nitrogen	2.254778542	68.2375	2.10649763	19.17727373
Sclareol	0	67.24416667	0	0
Water	0.001835014	6.25	0.018717147	0.048595109

- (1) Process Cycle Average = Compound emission quantity / Total process cycle time in hours.
 (2) Compound Emission Average = Compound emission quantity / Compound emission time in hours.

Classification	Activities Emitting	Emissions		Emissions Percent Removal
		Uncontrolled (lb)	Controlled (lb)	
All Emissions	86	327.5893183	149.800968	54.27171778
Acid	0	0	0	
Acid Gases	0	0	0	
Asbestos	0	0	0	
Base	0	0	0	
Biological	0	0	0	
CO	0	0	0	
Company List	0	0	0	
CR+6	0	0	0	
Dioxin	0	0	0	
ETG	0	0	0	
EVOS	0	0	0	
Exclude	0	0	0	
Gas	0	0	0	
HAP	0	0	0	
Hydrogen	0	0	0	
LOC	0	0	0	
Metal	0	0	0	
NOx	0	0	0	
Other	0	0	0	
Particulate	0	0	0	
Pb	0	0	0	
PM10	0	0	0	
PM2.5	0	0	0	
Radionuclide	0	0	0	
SO2	0	0	0	
TSP	0	0	0	
TVOS	0	0	0	
VCM	0	0	0	
VOC	59	177.9663166	0.177966317	99.9
Heptane	59	177.9663166	0.177966317	99.9
Unclassified	86	149.6230017	149.6230017	0
Air	4	5.763887452	5.763887452	0
Diatomaceous Earth	6	0	0	
Nitrogen	82	143.742132	143.742132	0
Sclareol	49	0	0	
Water	9	0.116982171	0.116982171	0

Classification	Process Cycle		Emission		Max Rate (lb/hr)
	Average (lb/hr)	Hours	Average (lb/hr)	Within 1 hour	
All Emissions	2.349819105	68.23722222	2.195296981	19.19162916	
Acid	0	0	0	0	
Acid Gases	0	0	0	0	
Asbestos	0	0	0	0	
Base	0	0	0	0	
Biological	0	0	0	0	
CO	0	0	0	0	
Company List	0	0	0	0	
CR+6	0	0	0	0	
Dioxin	0	0	0	0	
ETG	0	0	0	0	
EVOS	0	0	0	0	
Exclude	0	0	0	0	
Gas	0	0	0	0	
HAP	0	0	0	0	
Hydrogen	0	0	0	0	
LOC	0	0	0	0	
Metal	0	0	0	0	
NOx	0	0	0	0	
Other	0	0	0	0	
Particulate	0	0	0	0	
Pb	0	0	0	0	
PM10	0	0	0	0	
PM2.5	0	0	0	0	
Radionuclide	0	0	0	0	
SO2	0	0	0	0	
TSP	0	0	0	0	
TVOS	0	0	0	0	
VCM	0	0	0	0	
VOC	0.002791628	72.40388889	0.002457966	0.028084237	
Unclassified	2.347027477	68.23722222	2.192688928	19.17727373	

- (1) Process Cycle Average = Classification emission quantity / Total process cycle time in hours.
(2) Emission Average = Classification emission quantity / Classification emission time in hours.

Vessel	Vent ID	Device # 1	Device # 1 Temp (°C)
CE-1	CE-1-TO	Incinerator (Bldg 216)	1500
DR-1	Dryer-TO	Incinerator (Bldg 216)	1500
Drum 216	Dryer-TO	Incinerator (Bldg 216)	1500
DS-1	RX-6-TO	Incinerator (Bldg 216)	1500
FV-3	RX-3-TO	Incinerator (Bldg 216)	1500
FW Tank	RX-3-TO	Incinerator (Bldg 216)	1500
J-tank	J-tk-TO	Incinerator (Bldg 218)	1500
MLDT	MLDT-TO	Incinerator (Bldg 216)	1500
RX-1	RX-1-TO	Incinerator (Bldg 216)	1500
RX-2	RX-2-TO	Incinerator (Bldg 216)	1500
RX-3	RX-3-TO	Incinerator (Bldg 216)	1500
RX-5	RX-5-TO	Incinerator (Bldg 216)	1500
RX-6	RX-6-TO	Incinerator (Bldg 216)	1500
Virtual Tanker		Incinerator (Bldg 216)	1500
Virtual Tanker	TO	Incinerator (Bldg 216)	1500
Wet Cake Bin	WCB-TO	Incinerator (Bldg 216)	1500

Uncontrolled Emissions

Process: Sclareol-4

Emissions reported in Pounds.

Activity	Recipe Step	Vessel	Air	Diatomac	Heptane	Nitrogen	Sclareol	Water
1		RX-1		0		1.33E-02		
2		RX-1		0	0.14197	0.81165		
3		RX-1		0	0.13648	0.78029		
4		RX-1				0		
4		FV-3		0	0.14418	0.82429		
5		RX-3				2.3409		
6		RX-3				2.1212	0	3.19E-02
7		RX-3			2.6355	15.0367	0	1.98E-02
8		RX-3			1.0012	0.74699	0	3.11E-03
9		RX-3			14.7819	4.6817	0	4.76E-02
10		RX-6				13.3001		
11		DS-1				0.133		
12		RX-3			2.1487	0.42161	0	6.91E-03
13		RX-3			0	0	0	
13		DS-1			0.13325	1.0652		2.35E-03
14		FW Tank	0.60518		0.10236			
15		DS-1			0	0		
15		Virtual Tanker				4.44E-02		3.44E-04
16		DS-1				0		
16		RX-6			0.15867	1.0321		
17		RX-3				0		
17		FV-3		0	2.7267	15.5889	0	
18		FV-3		0	0	0	0	
18		RX-2			23.2576	7.1768	0	
19		RX-2			4.8267	0.91995	0	
20		RX-2			0	0	0	
20		RX-6			0.92263	6.0016		
21		RX-2				0		
21		RX-5			10.1007	3.1169	0	
22		RX-5			2.5287	0.78029	0	
23		RX-5			0	0	0	
24		RX-5			1.12E-02	7.01E-03	0	
25		RX-5			0	0	0	
26		RX-5			12.5058	7.8029	0	
27		RX-5				0		
27		CE-1			0.70948	7.1181	0	
28		RX-6			0	0		
28		CE-1			4.99E-02	0.50062	0	
29		CE-1			0	0	0	
29		MLDT			0.49721	4.9884	0	
30		CE-1				0		
30		Wet Cake Bin			0.26217	2.6303	0	
31		MLDT				0		
31		J-tank	5.1587		0.49721		0	
32		Wet Cake Bin				0		
32		DR-1			0.26217	2.6303	0	
33		DR-1			1.5824	2.3992	0	
34		J-tank	0		0			
34		RX-2			0.45489	2.959	0	
35		RX-2			38.4615	8.5574	0	
36		RX-2			0	0	0	
36		RX-6			5.8069	0.3426		
37		FW Tank	0					
37		Virtual Tanker			0.10236	0.60149		2.82E-03
38		RX-2				0		
38		RX-5			1.7634	0.38315	0	
39		RX-5			35.9126	7.8029	0	
40		RX-5			0	0	0	
41		RX-5			1.01E-02	7.42E-03	0	
42		RX-5			10.6577	7.8029	0	
43		RX-5			0	0	0	
44		DR-1				0	0	
44		RX-6			8.31E-02	0.5405		
45		DR-1				0		
45		Drum 216				1.5696	0	
46		RX-5				0		
46		CE-1			0.10713	1.0748	0	
47		CE-1			0	0	0	
47		MLDT			6.25E-02	0.62681	0	
48		RX-6			0	0		
48		CE-1			9.45E-03	9.48E-02	0	
49		CE-1			0	0	0	
49		MLDT			5.20E-03	5.21E-02	0	
50		MLDT				0		
50		J-tank			6.77E-02	0.67895	0	
61		CE-1				0		
51		Wet Cake Bin			4.89E-02	0.49073	0	
52		Wet Cake Bin				0		
52		DR-1			4.89E-02	0.49073	0	
53		DR-1			2.1015	3.1861	0	
54		DR-1				0	0	
54		RX-6			2.80E-02	0.1821		
55		DR-1				0		
55		Drum 216				0.18334	0	
56		J-tank				0		
56		Virtual Tanker			0.10998	1.1	0	2.19E-03

Controlled Emissions

Process: Sclareol-4

Emissions reported in Pounds.

Activity	Recipe Step	Vessel	Air	Diatomac	Heptane	Nitrogen	Sclareol	Water
1		RX-1		0		1.33E-02		
2		RX-1		0	1.42E-04	0.81165		
3		RX-1		0	1.36E-04	0.78029		
4		RX-1				0		
4		FV-3		0	1.44E-04	0.82429		
5		RX-3				2.3409		
6		RX-3				2.1212	0	3.19E-02
7		RX-3			2.64E-03	15.0367	0	1.98E-02
8		RX-3			1.00E-03	0.74698	0	3.11E-03
9		RX-3			1.48E-02	4.6817	0	4.76E-02
10		RX-6				13.3001		
11		DS-1				0.133		
12		RX-3			2.15E-03	0.42161	0	6.91E-03
13		RX-3			0	0	0	
13		DS-1			1.33E-04	1.0652		2.35E-03
14		FW Tank	0.60518		1.02E-04			
15		DS-1			0	0		
15		Virtual Tanker				4.44E-02		3.44E-04
16		DS-1				0		
16		RX-6			1.59E-04	1.0321		
17		RX-3				0		
17		FV-3		0	2.73E-03	15.5889	0	
18		FV-3		0	0	0	0	
18		RX-2			2.33E-02	7.1768	0	
19		RX-2			4.83E-03	0.91995	0	
20		RX-2			0	0	0	
20		RX-6			9.23E-04	6.0016		
21		RX-2				0		
21		RX-5			1.01E-02	3.1169	0	
22		RX-5			2.53E-03	0.78029	0	
23		RX-5			0	0	0	
24		RX-5			1.12E-05	7.01E-03	0	
25		RX-5			0	0	0	
26		RX-5			1.25E-02	7.8029	0	
27		RX-5				0		
27		CE-1			7.09E-04	7.1181	0	
28		RX-6			0	0		
28		CE-1			4.99E-05	0.50082	0	
29		CE-1			0	0	0	
29		MLDT			4.97E-04	4.9884	0	
30		CE-1				0		
30		Wet Cake Bin			2.62E-04	2.6303	0	
31		MLDT				0		
31		J-tank	5.1587		4.97E-04		0	
32		Wet Cake Bin				0		
32		DR-1			2.62E-04	2.6303	0	
33		DR-1			1.58E-03	2.3992	0	
34		J-tank	0		0			
34		RX-2			4.55E-04	2.959	0	
35		RX-2			3.85E-02	8.5574	0	
36		RX-2			0	0	0	
36		RX-6			5.81E-03	0.3426		
37		FW Tank	0					
37		Virtual Tanker			1.02E-04	0.60149		2.82E-03
38		RX-2				0		
38		RX-5			1.76E-03	0.38315	0	
39		RX-5			3.59E-02	7.8029	0	
40		RX-5			0	0	0	
41		RX-5			1.01E-05	7.42E-03	0	
42		RX-5			1.07E-02	7.8029	0	
43		RX-5			0	0	0	
44		DR-1				0	0	
44		RX-6			8.31E-05	0.5405		
45		DR-1				0		
45		Drum 216				1.5696	0	
46		RX-5				0		
46		CE-1			1.07E-04	1.0748	0	
47		CE-1			0	0	0	
47		MLDT			6.25E-05	0.62681	0	
48		RX-6			0	0		
48		CE-1			9.45E-06	9.48E-02	0	
49		CE-1			0	0	0	
49		MLDT			5.20E-06	5.21E-02	0	
50		MLDT				0		
50		J-tank			6.77E-05	0.67895	0	
51		CE-1				0		
51		Wet Cake Bin			4.89E-05	0.49073	0	
52		Wet Cake Bin				0		
52		DR-1			4.89E-05	0.49073	0	
53		DR-1			2.10E-03	3.1861	0	
54		DR-1				0	0	
54		RX-6			2.80E-05	0.1821		
55		DR-1				0		
56		Drum 216				0.18334	0	
56		J-tank				0		
56		Virtual Tanker			1.10E-04	1.1	0	2.19E-03

REDACTED
Information claimed confidential by Optima Belle, LLC. January 5, 2016

Activity	Recipe Step	Type	Activity Title	Start Time (hr)	Time (hr)
1					
2					
3					
4					
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9					
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Emissions Estimate for a Heptane Tank - Emissions Master (Provided by Client)

Product: Sclareol
 Process Name: Heptane Tank
 Production Quantity:
 Process Cycle Time: 8783.9997 hr
 Date: 1/6/2016
 File: C:\Users\Public\Documents\Emission Master\Sclareol - Heptane Tank.emm
 Comments:

Compound	Activities Emitting	Emissions		Emissions Percent Removal
		Uncontrolled (lb)	Controlled (lb)	
Air	1	408.9819344	408.9819344	0
Heptane	1	51.89067017	0.05189067	99.9

Compound	Process Cycle	Compound Emission	Compound Emission	Max Rate (lb/hr)
	Average (lb/hr)	Hours	Average (lb/hr)	Within 1-hour
Air	0.046559876	8783.999722	0.046559876	0.046559876
Heptane	5.90741E-06	8783.999722	5.90741E-06	5.90741E-06

- (1) Process Cycle Average = Compound emission quantity / Total process cycle time in hours.
 (2) Compound Emission Average = Compound emission quantity / Compound emission time in hours.

Classification	Activities Emitting	Emissions		Percent Removal
		Uncontrolled (lb)	Controlled (lb)	
All Emissions	1	460.8726046	409.0338251	11.24796288
Acid	0	0	0	
Acid Gases	0	0	0	
Asbestos	0	0	0	
Base	0	0	0	
Biological	0	0	0	
CO	0	0	0	
Company List	0	0	0	
CR+6	0	0	0	
Dioxin	0	0	0	
ETG	0	0	0	
EVOS	0	0	0	
Exclude	0	0	0	
Gas	0	0	0	
HAP	0	0	0	
Hydrogen	0	0	0	
LOC	0	0	0	
Metal	0	0	0	
NOx	0	0	0	
Other	0	0	0	
Particulate	0	0	0	
Pb	0	0	0	
PM10	0	0	0	
PM2.5	0	0	0	
Radionuclide	0	0	0	
SO2	0	0	0	
TSP	0	0	0	
TVOS	0	0	0	
VCM	0	0	0	
VOC	1	51.89067017	0.05189067	99.9
Heptane	1	51.89067017	0.05189067	99.9
Unclassified	1	408.9819344	408.9819344	0
Air	1	408.9819344	408.9819344	0

Classification	Process Cycle	Emission	Emission	Max Rate (lb/hr)
	Average (lb/hr)	Hours	Average (lb/hr)	Within 1 hour
All Emissions	0.046565783	8783.999722	0.046565783	0.046565783
Acid	0	0	0	0
Acid Gases	0	0	0	0
Asbestos	0	0	0	0
Base	0	0	0	0
Biological	0	0	0	0
CO	0	0	0	0
Company List	0	0	0	0
CR+6	0	0	0	0
Dioxin	0	0	0	0
ETG	0	0	0	0
EVOS	0	0	0	0
Exclude	0	0	0	0
Gas	0	0	0	0
HAP	0	0	0	0
Hydrogen	0	0	0	0
LOC	0	0	0	0
Metal	0	0	0	0
NOx	0	0	0	0
Other	0	0	0	0
Particulate	0	0	0	0
Pb	0	0	0	0
PM10	0	0	0	0
PM2.5	0	0	0	0
Radionuclide	0	0	0	0
SO2	0	0	0	0
TSP	0	0	0	0
TVOS	0	0	0	0
VCM	0	0	0	0
VOC	5.90741E-06	8783.999722	5.90741E-06	5.90741E-06
Unclassified	0.046559876	8783.999722	0.046559876	0.046559876

- (1) Process Cycle Average = Classification emission quantity / Total process cycle time in hours.
(2) Emission Average = Classification emission quantity / Classification emission time in hours.

Yeast	Vent ID	Device # 1	Device # 1 Temp (°C)
PCF Tank		Incinerator (Bldg 216)	1500

Uncontrolled Emissions

Process: Heptane Tank

Emissions reported in Pounds.

Activity	Recipe Step	Vessel	Air	Heptane
1		PCF Tank	408.9819	51.8907

Controlled Emissions

Process: Heptane Tank

Emissions reported in Pounds.

Activity	Recipe Step	Vessel	Air	Heptane
1		PCF Tank	408.9819	5.19E-02

Activity ID	Activity Name	Type	Activity Title
1		Storage	Heptane Storage

Optima Belle, LLC
Sclareol
PM Drop Emissions
(Provided by Client)

Description: Particulate emissions are generated through the drop of solid materials into process vessels, notably Scclareol (Crude) into RX-3, Scclareol (Product) from dryer to container, and D.E. into RX-1.

Basis: AP-42 Equation 13.2.4-3 is used to generate emissions from this operation. No control factor for the building enclosure and dust collector is being claimed even though there is dust collection on the building.

Compound	Number of Batches	Pounds per Batch (lb)	Tons per Campaign (ton)	U (mph) (1)	M (%)	Emissions (lb/ton)(1)			Emissions (lb/hr)		
						PM	PM10	PM2.5	PM	PM10	PM2.5
Scclareol (Crude)	180	1826.6	164.394	7.0	2	0.0037	0.0017	0.0003	0.0033	0.0016	0.0002
Scclareol (Product)	180	1200	108	7.0	0.25	0.0674	0.0319	0.0048	0.0404	0.0191	0.0029
Diatomaceous Earth	180	25	2.25	7.0	0.25	0.0674	0.0319	0.0048	0.0008	0.0004	0.0001
Total Emissions									0.0446	0.0211	0.0032

Compound	Emissions (ppy)			Emissions (tpy)		
	PM	PM10	PM2.5	PM	PM10	PM2.5
Scclareol (Crude)	0.60288	0.28515	0.04318	0.00030	0.00014	0.00002
Scclareol (Product)	7.27944	3.44298	0.52137	0.00364	0.00172	0.00026
Diatomaceous Earth	0.15165	0.07173	0.01086	0.00008	0.00004	0.00001
Total Emissions	8.03398	3.79985	0.57541	0.00402	0.00190	0.00029

(1) From AP-42:

$$E = k(0.0002) \frac{\left(\frac{U}{5}\right)^{1.5}}{\left(\frac{M}{2}\right)^{1.6}} \text{ (pound (lb)/ton)}$$

where:

- E = emissions factor
- k = particle size multiplier (dimensionless)
- U = mean wind speed, meters per second (m/s) (miles per hour (mph))
- M = material moisture content (%)

The particle size multiplier in the equation, k, varies with aerodynamic particle size range, as follows:

Aerodynamic Particle Size Multiplier (k) For Equation 1				
< 30 µm	< 15 µm	< 10 µm	< 5 µm	< 2.5 µm
0.74	0.48	0.35	0.20	0.053*

* Multiplier for < 2.5 µm taken from Reference 14.

**Optima Belle, LLC
 Sclareol Emissions
 Filter Changeouts
 (Provided by Client)**

Process: The filters are opened to atmosphere for changeout between batches.

Basis: It is assumed that the liquids have been removed from the vessel after blowout, and that the vapor space is full of nitrogen and heptane.

Equation: $PV = nRT$

Item	Value	Unit	Source
Filter Size	0.417	m ³	Equipment
Temperature	25	°C	Operators (65 F)
Temperature	298.15	K	-
VP Heptane	6.11	kPa	MSDS
R	8.314	J / K * mol	Constant
n	1.0270	mol	Calculated
MW	100.21	g/mol	-
Conversion	0.0022	lb/g	-
Mass Emitted	0.22688	lb	Calculated
Estimated Time	1	hr	Estimated
Hourly Emissions	0.23	pph	Calculated
Number of Changes	180	No.	Provided
Total Emissions	40.84	ppy	Calculated
	0.02	tpy	Calculated

APPENDIX
BUSINESS CONFIDENTIAL CLAIMS

Precautionary Notice Claims of Confidentiality

The person submitting this information may assert that some or all of the information submitted is entitled to confidential treatment as provided by West Virginia Legislative Rule 45CSR31, entitled Confidential Information. Information covered by such a claim will be disclosed by the Division of Air Quality (DAQ) only to the extent, and by means of the procedures, set forth in 45CSR31. Please contact the West Virginia Secretary of State's Office at 304/558-6000 to obtain a copy of 45CSR31 in order to ensure that all required procedures are followed.

Information concerning the types and amounts of air pollutants discharged as that term is defined in WVCSR §45-31-2.4, shall not be claimed as confidential.

Any claim of confidentiality shall be made in accordance with the requirements of 45CSR31 and must accompany the information at the time it is submitted to the DAQ. **If no claim of confidentiality is made at the time of submission or is not made in accordance with the requirements of 45CSR31, the DAQ may make the information available to the public without further notice.**

Included below are procedures to be followed in submitting information claimed as confidential. This information is intended to assist a person with claiming confidential information and is not meant to relieve a person of his/her obligation to review the provisions of 45CSR31 and to comply with such rule. The procedures are as follows:

1. Indicate clearly the items of information claimed confidential by marking each page with the term Claimed Confidential, with the date of such claim of confidentiality. With the exception of documents of a size greater than 8½" x 14", information claimed confidential must be submitted on colored paper.
2. Include a cover document which justifies the claim of confidentiality in accordance with the specific criteria under WVCSR §45-31-4.1. A sample cover document is attached for your information and use. The cover document will be available for public disclosure and must include the following information:
 - (a) The identity of the person making the submission of information claimed confidential;
 - (b) The reason for the submission of information;
 - (c) The name, an address in the State of West Virginia and telephone number of the designee who shall be contacted in accordance with 45CSR31;
 - (d) Identification of each segment of information within each page that is submitted as confidential and the justification for each segment claimed confidential, including the criteria under WVCSR 45-31-4.1;

- (e) The period of time for which confidential treatment is desired (e.g., until a certain date, until the occurrence of a specified event or permanently); and,
 - (f) Signature of a responsible official or an authorized representative of such person.
3. At the same time as the information claimed confidential is submitted to the DAQ on colored paper, a complete set of the information, including the cover document previously required under paragraph 2, must be submitted on white paper with the information claimed to be confidential blacked or whited out and the words Redacted Copy Claim of Confidentiality marked clearly on each such page, so that the information is suitable for public disclosure. In the case of drawings and blueprints, mark each page with the words Redacted Copy Claim of Confidentiality, include the title or legend of the drawing, and black or white out the information claimed confidential. The redacted page may be 8½" x 11" in size.
 4. In the case of a permit application or supplemental information to an application, DAQ requires an applicant to submit three (3) copies of the application. Of those three (3) copies, one (1) must be a complete set of the application containing the information claimed confidential on colored paper and two (2) must be redacted copies. The DAQ reserves the right, however, to request additional copies of the information containing the confidential material.

Attachment

Attachment Q Business Confidential Claim

Company Name	Optima Belle, LLC	Responsible Official	
Company Address	900 W. DuPont Avenue	Confidential Information Designee in State of WV	Name J. Gene Williams
	Belle, WV 25015		Title President
			Address 200 Willacoochee Highway
			Douglas, GA 31535
Person/Title Submitting Confidential Information	J. Gene Williams	Phone	(912) 384-5101
	President	Fax	(912) 384-6330

Reason for Submittal Of Confidential Information : R13 Class II Administrative Update

Identification of Confidential Information	Rationale for Confidential Claim 45CSR31-4.1a-e	Confidential Treatment Time Period
<ul style="list-style-type: none"> -Equipment design and capacity information -Process descriptions -Process flow diagrams -Site Map 	<p>a. Information initially claimed confidential by E.I. Dupont De Nemours and Company, Inc. and The Chemours Company FC, LLC. Information continues to be confidential under Optima Belle, LLC. The claim has not expired by its term, or been waived or withdrawn. The confidential information should continue to be maintained as such for an indefinite time period.</p> <p>See attached for b-e</p>	Permanent

Responsible Official Signature:	
Responsible Official Title:	President
Date Signed:	01/12/2016

NOTE: Must be signed and dated in **BLUE INK**.

Rationale for Confidentiality Claim (Cont.)

b. Information claimed confidential is not available to the general public. Within the company, Optima Belle, LLC (Optima) distributes technical information on a need-to-know basis and has used its business confidentiality policy to prevent inadvertent dissemination of information. This policy includes:

- * Marking of business confidential documents,
- * Limited distribution of documents,
- * Shredding of confidential documents before disposal.

Employees are aware of the competitive nature of their business and are trained in guarding confidential information.

c. Information revealing the process technology in this submittal is not reasonably obtainable by persons other than Optima employees who need to know. To maintain the confidentiality of such information, Optima employees involved with confidential information sign a confidentiality agreement.

d. There is no statute that has been reviewed that requires disclosure of information claimed to be confidential.

e. Optima claims business confidentiality protection for the information submitted since disclosure would allow competent engineers within a competitor's company to determine the manner or process by which Optima produces this product and would provide competitors information without paying for technology or conducting research and development necessary to obtain the technology.